

Oskar Hasdinor Hassan
Shahriman Zainal Abidin
Rusmadiyah Anwar
Muhamad Fairus Kamaruzaman *Editors*

Proceedings of the International Symposium on Research of Arts, Design and Humanities (ISRADH 2014)

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Editors

Oskar Hasdinor Hassan
Formgiving Design Research Group
Faculty of Art and Design
Universiti Teknologi MARA
Shah Alam, Selangor, Malaysia

Shahriman Zainal Abidin
Formgiving Design Research Group
Faculty of Art and Design
Universiti Teknologi MARA
Shah Alam, Selangor, Malaysia

Rusmadiyah Anwar
Formgiving Design Research Group
Faculty of Art and Design
Universiti Teknologi MARA
Shah Alam, Selangor, Malaysia

Muhamad Fairus Kamaruzaman
Formgiving Design Research Group
Faculty of Art and Design
Universiti Teknologi MARA
Shah Alam, Selangor, Malaysia

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Preface

Designed through humanities and quality of life, results from the International Symposium on Research of Arts, Design and Humanities (ISRADH 2014) enrich the quality of research innovation, development, and education as an essential platform of design versatility. It represents valuable perspectives of authors from multi-disciplinary background to come together and discuss the global topics and issues within its parameter. ISRADH 2014 was organized jointly by IEEE and the Faculty of Art and Design, Universiti Teknologi MARA, that took place at Sutera Harbour Resort, Kota Kinabalu, Sabah, Malaysia, from 29 to 30 September 2014. The symposium covers the topics in the fields of art and science in industrial applications, arts management and social implications of technology, and art and design education.

ISRADH 2014 agendas were to provide a platform for researchers and designers to value, evaluate, synthesize, and associate the potential ideas and possibility; people, culture, and the disciplines that nevertheless contribute to transcend the body of knowledge. The program highlights some recent and ongoing design research/projects toward the various selection of design models and design language. Over the symposium period, delegates had the opportunities to present and discuss. At the same time, they explored further communication, collaboration, and networking through social activities during the symposium.

It is our hope through these chapters it will illustrate the diversity of opinions and interpretations, mediums and technologies, policies and methodologies that are at our journey of striving in this ever-changing fascinating humankind trends demands; that will stimulate to an infinite discussion, therefore making our knowledge significant and offer education valuable and productive sense.

Selangor, Malaysia

Oskar Hasdinor Hassan
Shahriman Zainal Abidin
Rusmadiyah Anwar
Muhamad Fairus Kamaruzaman

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Chapter 1

Revisited Artificial Reef Development in Malaysia

Abu Nain Umar, Rusmadiyah Anwar, Oskar Hasdinor Hassan, and Zainal Zakaria

Abstract Artificial reef is a way to help the breeding of marine life. The first artificial reef material produce is tires in 1975. This paper will discuss about the development of material used in Malaysia for artificial reef containing aesthetic value. Artificial reef has been manufactured using variety of materials such as PVC, wood, metal, and concrete. Usually, concrete is the most popular material in producing artificial reefs. Ceramic materials are more suitable than concrete to produce artificial reef because there is some limitation in concrete materials. The form of conventional designs usually used is square shaped and triangle shaped. However, in this study, we would like to produce a new artificial reef design by Malaysian element concept using local clay. At the same time, artificial reef also will become a marine ecosystem and a breakwater for speed waves to prevent soil erosion. The chosen local clay it is to relate with the natural artificial such as artificial fossil and others.

Keywords Artificial reef • Development • Material • Design

1 Introduction

Artificial reef is an alternative to preserve the marine life to growth. Artificial reefs (ARs) refer to any man-made structures or natural objects placed in marine water body to provide new habitat for fish and other flora and fauna and at the same time prevent the encroachment of destructive gears such as trawls into protected areas. Artificial reef also can be a habitat or shelter for marine life and also as a food source [1]. Artificial structures in the marine environment are responsible to this need by providing additional spawning ground and nursery habitat, additional productive surface area, additional substrata for filter-feeding benthic communities,

A.N. Umar (✉) • R. Anwar • O.H. Hassan • Z. Zakaria
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: aabuu89@gmail.com

and additional site at which aggregation of demersal, semipelagic, and pelagic fishes occurs [2]. Many researchers have produced artificial reefs in Malaysia with variety of methods and materials used, such as concrete, wood, steel, tire, ceramic, PVC, etc.

Artificial reef is a building material such as stone placed on the seabed to serve as a shelter or artificial habitat especially for marine life. This reef structure will evolve into a complete natural ecosystem. The period for this to take change is about a year, depending on environmental conditions. Reefs placed in the immediate vicinity of living corals grow faster than reefs that are placed on the muddy sea floor. Based on this study, artificial coral reef was made from a variety of materials to help the corals reproduce naturally. Materials used to produce coral reef and fish reef are the same, such as concrete, wood, steel, and so on. Coral reef is one way to produce coral reproduction easier and usually in place around the coral environment. In contrast, fish reef is used as a fish shelter, creating a suitable structure as a breeding site for fish. Normally, fish reef should be placed on the seabed. In fact, both are nearly the same as it facilitates the breeding grounds as a place for food.

Department of Fisheries Malaysia (DoFM) also uses derelict and confiscated fishing vessel, concrete, polyvinyl chloride (PVC), ceramic, a combination of several materials (reef ball), as well as abandoned oil platform as new materials for construction of ARs [1]. Based on research, they were combined with any materials to be new artificial reef. This method of production produces a similar size and dimension in each of the products. The larger size of artificial coral reef can also prevent intrusions into the area as the initial parcel of marine parks and so on. Artificial reef also can be developed if the artificial reef is placed in the right order. The structure must be built strongly and be durable so that it can withstand the direction of the waves.

The domestic ceramic cylindrical sewerage pipe was the main unit used for the construction of three-layer ARs targeted for lobsters. Each layer consists of two cylinder pipes. Two big size ceramics (0.4 m diameter) were used as a base. Flat concrete slab is placed on top of the cylinder pipes. All cylinder pipes had only one opening and were placed in a way that both openings face the same direction. They are using ceramic cylinder pipe as the artificial reef for lobster habitat [3]. This study showed the use of ceramic material as an artificial reef to produce a new design containing the identity of Malaysia. Concrete material has a limit on fabrication. The using of concrete material is better than ceramic to produce the product that use the variety of techniques. The physical reaction and character of ceramic stoneware body allowed the bird nest to develop naturally and totally depend on the density and porosity of the body [4, 5]. This study is to examine the greater detail of a representative sample of global artificial reef initiatives. This more detailed appraisal is to present information on specific artificial reefs, their material and design, purpose, monitoring, management, and performance in relation of their purpose [6]. This study is to determine the development of artificial reef materials in Malaysia and to produce the new design of artificial reef.

2 Conventional Artificial Reef Design

Conventional approaches to maintaining or rebuilding fishery productivity typically attempt to maintain fisheries by allowing a sufficient number of fishes to escape [7]. Previous research proves that artificial reef rebuilds fishery productivity. This research is to improve the recovery of old and new artificial design and to provide a greater impact than conventional products. Normally, the previous design comes with shape structure. Apart from that, there is also a form such as a home, using the pipe to make artificial reef. In Malaysia, most of the design is focusing on the artificial reef of corals and fish. They use a variety of materials such as concreted, tires, metal, and so on.

If we go beyond Malaysia, many sculpture artists who have used their talents as a maker of sculpture and produce artwork in water or sea. Indirectly, the sculpture was created as artificial reef for marine life and contains aesthetic value. However, for the future, study will be continued to create the new artificial reef design sculpture in the sea by Malaysian element concept.

Materials used in artificial reef design before were concrete, tires, metal, and wood. Until now, only concrete is the most popular material in producing artificial reef. In addition, they use concrete because it can maintain its shape and last longer than tires. This is because the structure of the building tires is easily broken and damaged when hit by waves.

Figure 1.1 shows examples of typical Japanese fish reef modules. This design is very suitable to make artificial reef for fish. However, this design only emphasizes on the structure and function of the hole for fish protection. Based on Fig. 1.1, the existing artificial reef doesn't have the artistic values and Malaysian element concept. This is because the old design focuses for marine habitat only such as shelter and to find food.

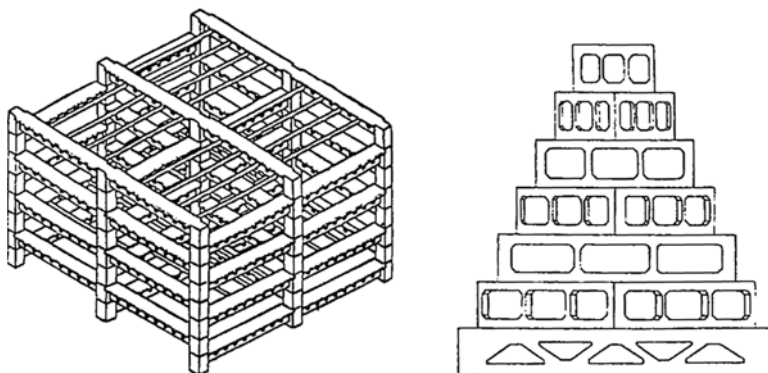


Fig. 1.1 Examples of typical Japanese fish reef modules, Grove, R. (1983)

3 Artificial Reef Development in Malaysia

Commonly, the shape of artificial reef is like a structure building design, triangle, concrete block, stacks of tires, and abandoned boat. These designs have a minimal aesthetic value for the art lover, but these are still suitable and function as artificial reef for marine life. Therefore, in this study, the researchers want to produce a new design focused on sculpture in the water for tourism. In creating this design, we are able to achieve a large tip displacement with high resolution and a large gripping force with high resolution. The theoretical model for the developed microgripper and the integrated sensors laid the foundation for designing and developing the control system. The future works will focus on the realization of the hybrid control of the microgripper with the feedback of the gripping force and the tip displacement [8]. Based on this research, in terms of design and functionality, they changed the old design with the new design to get more impact.

Table 1.1 shows the table of historical development of material used in construction of ARs by the DoFM. In this paper, we will discuss historical development of material used in construction for artificial reef and the most popular materials used in Malaysia from 1978 to 2005. This table based on the Head of Resource Enhancement Unit at Seafdec, Terengganu, shows the historical development of materials used in construction of artificial reef in Malaysia. The first year tires produce in 1975–1995. They are produced tires in 20 years as an artificial reef for marine life. With the use of tires, they form a structure with tie tires and made of strong structure. However, after 20 years, they used tires. The use of tires was stopped because it causes pollution in the ocean and affects marine life. The structure of the tire cannot withstand the waves and current causing it to be destroyed and submerged in mud and sand in the sea. Scrap tires have been widely used around the world to construct artificial reefs. They are a popular construction material, being readily available at no cost, durable, and with large void spaces. However, published information about the environmental impact of tires in the marine environment is

Table 1.1 Historical artificial reef development of material used in Malaysia

Historical development of material used in construction of ARs by the DoFM			
Year introduced	Material	Duration used	First site
1975	Tires	1975–1995	
1984	Derelict and confiscated fishing vessel	1984–present	Pulau Payar, Kedah
1986	Concrete	1986–present	Pulau Payar, Kedah
1990	PVC	1990–2007	Pulau Payar, Kedah
1992	Ceramic	1992–1993	Pulau Redang, Terengganu
1998	Reef ball	1998–2000	Pulau Talang-Talang, Sarawak
2005	Abandoned oil rig	2005	Miri, Sarawak

limited [9]. While the tires were used as artificial reef from 1975 to 1995, the derelict and confiscated fishing vessels were also made as artificial reef. Whether confiscated or wrecked, the vessel can be made as artificial reef for marine life. Similarly, the broken boat, they are using that's for artificial reef. By using the vessel and also damaged boat, it is more interesting when you see the area in the marine park created as a tourist. But confiscated fishing vessels and broken boat are hard to find. Among the places that have been made as artificial reef is Pulau Payar, Kedah. They started creating that artificial reef from 1984 and presented it until nowadays.

The others materials development is concrete and produce in 1986. Concrete is the most popular artificial reef material used. The first concrete site was produced in Pulau Payar, Kedah, Malaysia. According to the Head of Resource Enhancement Unit from Seafdec, Terengganu, using concrete is much better than the other materials because it can be produced in big size, is heavy, and is also suitable in producing artificial reef. But it is difficult to fabricate and design for artificial reef. Producing concrete as artificial reef takes a long time because in every stage the concrete must be dried before stacking to produce a superior structure. By using concrete also maybe must have to pay the expansive for making that such as much has to pay for engineer to check stage by stage concrete after finish, manpower, transport and also concrete chemical in the body maybe defect to marine life. Until now they produce concrete as an artificial reef material. Using concrete also easy to produce a lot of product as a structure and heavy is the suitable as a artificial reef. In 1990, PVC was developed as artificial reef. The first PVC site was produced in Pulau Payar, Kedah, Malaysia. Using PVC material, it is easy to drift waves and they are stop in 2007.

Ceramic became an artificial reef material in 1992. The first area which produced artificial reef using ceramic material was Malaysia at Pulau Redang, Terengganu. Two big size ceramics (0.4 m diameter) were used as base. The middle and top layer consist of smaller size (0.25 m diameter) cylinder pipe. Flat concrete slab was placed on top of the cylinder pipes. All cylinder pipes had only one opening and was placed in a way that both openings face the same direction [1]. Based on this study, they are using ceramic cylinder pipe for lobster sanctuary as an artificial reef. Ceramic is the best material in producing artificial reef because it is easy to fabricate and mass produce. Producing ceramic materials stop in 1993 it is so expansive. But, when we are discuss the expansive ceramic material. It depends on the material used and where the production is running. Using ceramic porcelain body is more expensive than red clay and stoneware clay. Porcelain body is not easy to produce and must have to be fired in high temperature [10], while stoneware clay is easy to produce and can be in low fire. However, using ceramic can reduce cost because in casting for mass production, there is no need for so much manpower. Ceramic also is the best replacement material for artificial reef because it is close in nature [11]. This is also because ceramic stoneware clay is a material from the clay of the Earth. Using ceramic also easy to fabrication design for artificial reef and it can be developing design from the structure to be a sculpture design.

In 1998, the reef ball is introduced and used as artificial reef until the year 2000. The reef ball site first introduced in Malaysia is located at Pulau Talang-Talang, Sarawak. And in 2005, an abandoned oil rig was introduced as artificial reef.

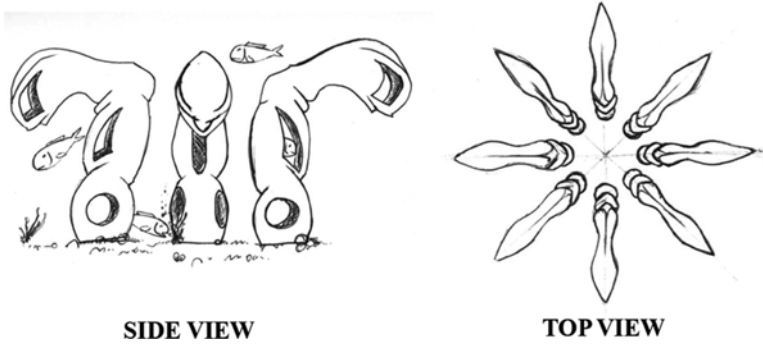


Fig. 1.2 Ideation and structure design for artificial reef sculpture

4 Future Work

The future work is the development of the design of artificial reef in Malaysia. We must have to produce new design of artificial reef, which can also attract tourists to visit the country. The opportunity of the finding shows the sociality of ceramic materials as part of design development enhancement [11]. A new design will show installation sculpture with elements of the Malaysian heritage. It will be shows from around view and on the top view unless from the bottom. Enhancement design development also becomes an innovation of the new design to replace the old design [12]. The investigation for structural design [13] in the sea also is important because the structure is to support the weight when installing them in the sea. Besides technical design, installation location for this artificial reef sculpture also will be considered when producing the product. Maybe in the future we will be hiring ceramic artists who will produce designs for an artificial reef in the sea.

Figure 1.2 shows the suggestion for design to create artificial reef. The new design shows the element of Malaysia as “hulu keris.” It still has the element of fish reef such as holes for the protection of fish, but the design and installation are different. Design was created to bring up the value of art in the sea for its tourism which may benefit the country by creating a beautiful sea or beach.

5 Conclusion

In conclusion, artificial reef is an alternative to preserve the marine life to growth and development materials for artificial reef is important. Nowadays, artificial reef in Malaysia is still in the development process of finding the best materials and design. Moreover, conventional artificial reef design such as tires, wood, metal, and concrete will be developed for the future artificial reef, which will benefit the country. The existing design will be developed from a structure to a sculpture as an

aesthetic value with Malaysian elements. By using ceramic material, it easy to fabricate and design for artificial reef with Malaysian elements such as “keris.”

The first development of artificial reef begins from tires in 1975. After that it continues with derelict and confiscated fishing vessel, concrete, PVC, ceramic, reef ball, and abandoned oil rig. The most popular material in Malaysia is concrete. But with concrete, it is not easy to produce a variety of designs such as sculptures. In this paper, the researchers aim to produce ceramic material as an artificial reef because it is cheaper to produce and easy to fabricate and install in the sea. For future work, this study will extend to produce artificial reef sculpture in Malaysia using ceramic stoneware body. This is because ceramic material is close in nature to coral and fish reef and long lasting. Other than that, ceramic stoneware is the most popular material used by artists in creating their artwork. Besides that, ceramic stoneware clay is easy to get and is better than red clay. The next study is to produce the result as a new design development for artificial reef sculpture installation using ceramic material. For future work, this study will undergo design development where the designer’s thinking will be brought into practice [14]. The methodology chosen due to the important stage to identify the most influence design criteria required and suitable for the artificial reef design.

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Chapter 2

Ceramic Art Form Alternative Fabrication Using Sketch on Clay

Nur Jannah Jamil, Nor Hamizah Mohd Yusop, Rasmadiyah Anwar,
Verly Veto Vermol, and Zainal Zakaria

Abstract Designing is part of planning a new design idea. In design process, there are various techniques, which normally start by researching the subject matter or subject planned using the appropriate equipment. The objective of this paper is to acknowledge a new method in a design process by using the sketch on clay. The methodology used in experimenting with a variety of distinctive tools is applied on clay surfaces with the ceramic decoration technique. Faceted is one of the basic ceramic studio pottery design decoration techniques. Hence, the development of equipment study can be expanded so that this technique is applicable to artist in producing intelligent ceramic artworks.

Keywords Design process • Sketch on clay • Faceted technique • Tools

1 Introduction

Nowadays, artists or designers produce many ideas of art form and creation using different techniques [1, 2]. Present manufacturing process that involved forms, materials, and techniques is related to design development nowadays [3]. Materials are another alternative ways in exploring the design development. A part from that, material is other ways in enhancing the development process. Sludge is an additive material added in the stoneware body to improve the ceramic artwork qualities. The strength of clay body is focused by the ceramic artist in production process [4]. The art form produced by developing the ideas through the study of form of an object called subject matter. Starting from the problems in the development process is another method in emerging design idea. Rapid drying is not suitable for large-scale piece; however, it is suitable and may be applied to small pieces of art form [5].

N.J. Jamil (✉) • N.H.M. Yusop • R. Anwar • V.V. Vermol • Z. Zakaria
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: nurjannahjamil@gmail.com

There is also example of artists studying a decoration on pattern to apply as a hidden pattern on ceramic lighting [6].

1.1 Design Process

Design is a process of creating a new ideation based on individual projects or purpose. It starts from the design research, planning, and collecting data to analysis of the projects to get the ideal outcome. In ceramics, design process is influenced by a variety of subject matter. The development of a personal, visual language through the manipulation of form and surface often takes maker’s personality [7] (Fig. 2.1).

1.2 Ceramic Clay Decoration

Ceramic basically can be divided into three types that are industrial, studio, and also sculpture. These types use clay as the main material in producing the product. Clay can come in three-dimensional forms where the form can be changed based on the desired idea. Clay is impressionable because texture can readily be added to wet pots through impressing a variety of tools and objects into the surface [8]. Ceramic clay decoration has been evolved from a long time ago according to the environment and the situation. The technique use in decoration also revolved. Ceramic art form has generated many styles from its own tradition, but is often closely related to contemporary sculpture and metalwork. Ceramic artists mostly have expanded their

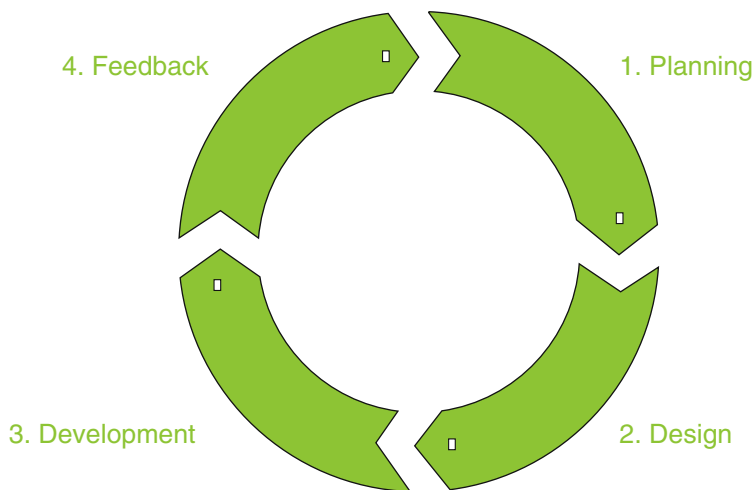


Fig. 2.1 Basic design process (Lane [7])

skills in clay decoration based on their experience by experimenting with the idyllic decoration.

Nowadays, there is a lot of art form created by an artist coming from the study of techniques and tools. Tool is related in designing a product because every single tool represents different pattern and forms. This surface carved by using range of hand tools creates unique style for ceramic art work. These tools are made of iron and steel and produce a texture neatly done on the clay surfaces. Equipment made of iron, steel, or metal is easier to use in the conduct of faceted decoration and carving. For example tool that can be used, wire cut, knife, and anything tool for create faceted technique. They invariably are seeking the one tool that will outperform all other, feel better in the hand, or just be more pleasurable in use [9].

1.3 *Maquette Clay Sketch*

In sculpting, maquette making is well known as a small-scale model or pieces of a sculpture. Maquette is a French word meaning “sketch.” Maquette making is similar to prototype modeling. Maquette making does not necessarily have to be finished or detailed, but at least be able to express the idea [10]. These techniques are other directions of designing ideas. It can be used to visualize idea before making a large-scale or real dimension of an artwork. Other materials can be used to sketch despite using only a drawing sketching and clay sketch.

Clay sketch is a diverse technique from the usual technique in ceramic design process. Normally, designers start their own design by studying the form and shape of the artwork and planning on a sketch paper; for this research sketch on clay is introduced to diversify the ways of design process. Thus, sketch on clay is another alternative in ceramic in improvising the design development. Design on paper sometimes gives a limitation in ceramic process because clay material is unpredictable and it requires great skills to follow the exact sketch on paper, whereas sketch on clay is much easier and tolerable according to the artists. Figure 2.2 shows Julie Spurgeon making her first model from clay. She then takes mold of the model (waste mold). She then turned the maquette into a model. After that, she altered the mold surface before casting [10].

Fig. 2.2 Example of maquette making by Julie Spurgeon (Quinn [10])



2 Methodology

Particular attention is focused on faceted techniques. The nature of working with tools is such that artists usually develop favorites that seem to become extensions of their hands [9]. The tools that seem to perform best with either soft or leather-hard clay—states where most slashing, scratching, carving, and cutting are done—primarily are tools with sharp points or edges [9]. This paper focused on producing surface decoration with ceramic studio faceted technique by using different hand tools. The types of material used for ceramic tool making vary from fairly soft alloy metals to knife-quality steel and beyond, into tungsten carbide, a fine, very hard crystalline material [9].

This research experiments with four different hand tools using faceted techniques. These tools are selected based on the different form of pattern created. Figure 2.3 shows the division of research methodology. It is clearly divided into three phases of investigation. The focus of this research towards fostering is generating design ideas for pattern work from 2D to 3D (forms), in a very creative and spontaneous way. However, all idea development includes data enhanced by design

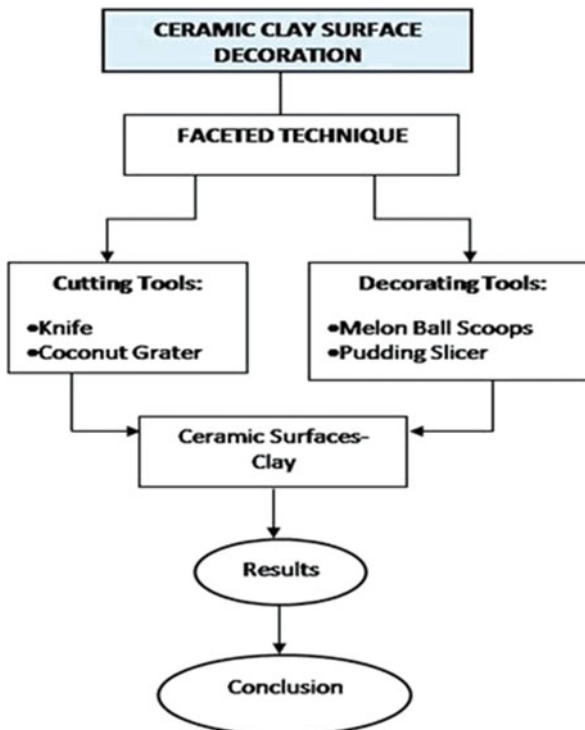


Fig. 2.3 The research methodology chart

through practices. The constructed process will begin with a literature study of faceted techniques applied by ceramic artist before. Their final artwork will focus only for those who created a surface decoration on the stage of clay only.

The research then will go on to investigate the possibilities of tool manipulation in order to get the fastest method in decorating clay works. At the same time, the decorations still maintained the principle of design needed as design standards. The design cycle as shown in Fig. 2.3 will be reconstructed in order to achieve the objective of this study where design development and planning are put in two ways of discussion.

2.1 Faceted Technique

This research proposed a faceted technique similar to the fluting technique. Fluting is not a tossed-off decoration. As spontaneous as the final effects may be, all of these techniques require planning before throwing the pot [11]. Faceted technique is one of the techniques used in the ceramic body to create a form of decoration with an angular shape. That technique can be performed by repetition and overlapping with their pattern using different types of hand tools.

2.2 Hand Tools

Hand tools can be categorized into scraping and cutting tools, forming tools, and decorating tools. Potters are great collectors and will hoard scraps of wood and metal that will substitute for expensive commercially produced tools [12]. There are many types of tools used to create texture on the clay surface, such as tools made of iron. Iron tools will provide a flat and neatly done texture on a surface. There are various types of equipment used to make decorations. Equipment made of iron, steel, or metal is easier to use in the conduct of faceted decoration and carving. For example tool that can be used, wire cut, knife, and anything tool for create faceted technique.

2.3 Ceramics Surface Decoration

The stoneware was used to construct the art form, most stoneware clay is a mixture of ball clay, and other minerals added to give particular qualities to the raw or fired state. Usually gray in color, it will fire from buff to white [12]. Clay is a wonderfully versatile medium that can be shaped into almost any form. As such, it provides great scope for the ceramic designer. However, one of the areas that designer seems to neglect is the surface quality of the object. The final detail of a design can be enhanced by developing the surface qualities of the material used to make the object [10].

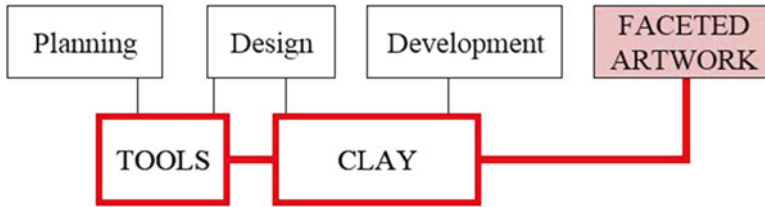


Fig. 2.4 Faceted artwork design framework

Decoration can be applied to plastic, leather-hard, dry, biscuit (bisque)-fired, raw glaze, or glaze-fired clay depending on the effect desired and the materials used. So that the decoration works as a whole with the ceramic piece and that it looks convincing, plan that approach to material and how to apply them right from the beginning [13]. Facet technique has to be a guideline on other to create the spontaneous artworks.

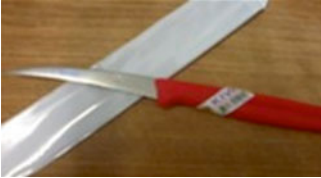

Figure 2.4 shows the technique used by Ginny Marsh to decorate her artworks. This technique requires tools to cut a part of clay surfaces. Without any guidelines of design, the artist proved the manipulation of tools can create a significance touch to the clay surface as decoration.

3 The Principle of Sketch on Clay

To do this facet technique, it needs to create a tool suitable in faceting. By reflecting the idea of aesthetic elements of bubbles, thousands of different shapes and forms can be elaborated by versifying the technique. Overlapping and repetition of technique reveals a new appearance of art form [14]. Therefore, this paper selects a few tools to investigate the pattern and textures which appeared on the clay surfaces. Table 2.1 lists the tools used in this research:

- Cutting tools
 - This research used basic tools in ceramic decorations which are knife and coconut grater. These tools are chosen due to its different function and form. Knife has strong and sharp edges. These edges produce a straight and sharp flat surface after cutting down solid clay. Coconut grater is curved and has serrated shape.
- Decorating tools
 - Other types of tools used in this research are food garnishing tools such as melon ball scoops and pudding slicer. Melon ball scoop has a rounded shape. The ball produced will be in two sizes since it has two scoops. Pudding slicer is a serrated metal form which will produce a similar nice cut of pudding.

Table 2.1 Alternative tools for decorating clay surface

Type	Figure	Name
Cutting tools		Knife
		Coconut grater
Decorating tools		Pudding slicer
		Melon ball scoop

4 Results

These four tools are used onto a rounded shape of stoneware clay. Stoneware has coarser textures and is easy to form using throwing or hand-built technique [15]. Each tool produces a different pattern although the same technique is applied onto the surfaces. These techniques are faceted techniques. The tools were made out of metal and steel. Clay can be cut easily using these materials when the clay is in leather-hard state. The result creates a spontaneous and control pattern from these four different hand tools.

4.1 Application of Knife

Knife cut produced a very sharp edge on the surfaces. The cut is made out in a spontaneous manner so it would not look symmetrical. Figure 2.5 on the right side shows an additional technique: after faceted using knife, pinch inside the faceted surfaces to give out more effects of the facet surfaces. Pinch by using finger pressing smoothly inside the clay.

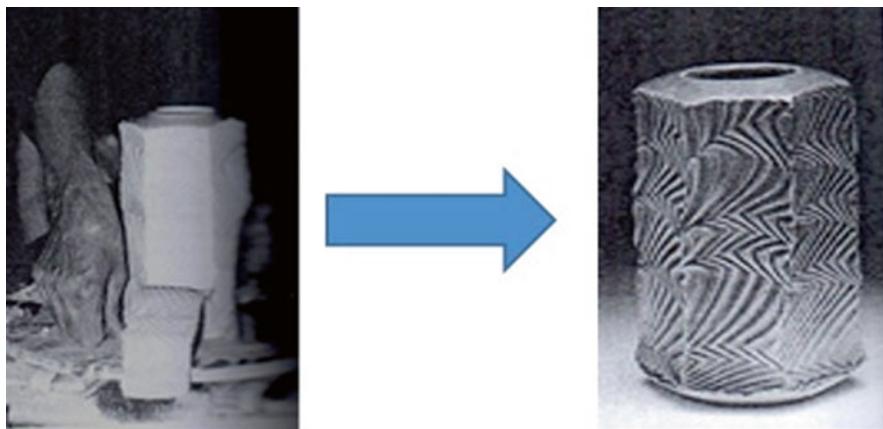


Fig. 2.5 Spontaneous vase decoration in 1994 applied on porcelain body

4.2 Coconut Grater Cutting

Coconut grater has a curvy and serrated form of metal. When applied onto the rounded clay surfaces, these results came out. The coconut grater produced a stacking effect like a ladder to the clay surface. Figure 2.6 shows the results of the coconut grater tools.

4.3 Melon Ball Scoops

Using melon ball scoops produced the effect of a curve scooped out from the clay body. A repetition of scoop pattern can be seen on the surfaces. Figure 2.7 shows the texture when the scoops are pulled down. A new dimension of clay decoration appeared.

4.4 Pudding Slicer

Pudding slicer has a straight form but is curvy inside it. When repeating the tools using faceted technique, a repetition of texture appeared. These textures are flat and curve. The edges can be seen on the surfaces. Figure 2.8 shows the textures of pudding slicer (Fig. 2.9).

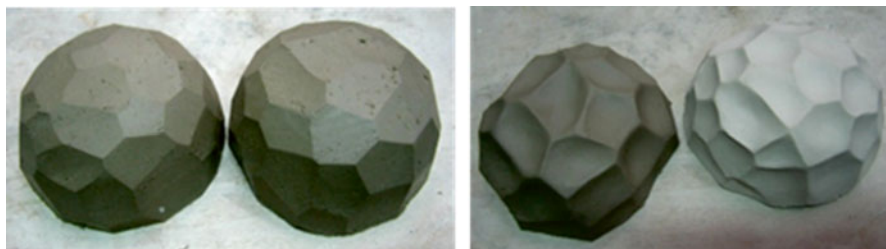


Fig. 2.6 Effects of knife tools



Fig. 2.7 Using the coconut application



Fig. 2.8 Application of melon ball scoop tool



Fig. 2.9 Using pudding slicer application

Based on the results, it is found that knife, coconut grater, melon ball scoops, and pudding slicer produce a unique and different pattern onto the ceramic surfaces. These techniques can form new ideas on design form. In market nowadays, there are a lot of equipment that can make unique forms and textures. The design process has achieved its entire objective and solved issues related to the design development and findings the method outcome in an art form. Design process methodology will be widened and easier to follow by using this sketch on clay process.

5 Conclusion

In conclusion, this research creates deviation of style in ceramic design process development. This is because interaction between the sketches on paper should align with the end product outcome. Therefore, this idea of clay sketch can be substituted using the diversity of tools used in ceramic clay decoration. The use of various types of hand tools such as kitchen utensils that knives, forks, and other hand tools such as wood, bone, awls, needles, saws, wire and anything else that can be something creative to create generate an image, mark or marks on the ceramic body. Decoration can be applied at any time in the making of ceramics [12]. Manipulation of technique, material, and also equipment helps in producing the idea. Changing the sources of idea development creates a new direction of brainstorming of an idea when designing a product. Hence, this paper proves that sources of idea can be changed by expanding and exploring the ways of generating ideas.

Acknowledgment We would like to acknowledge the generous participation of the interaction designers in the research. This study was conducted in Formgiving Design Research Lab established by Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to Malaysia Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 3

Decorative Elements of Traditional Wood Carving in Frieze Pattern on Terengganu Boats

Nur Irda Suriani Zainal Abiddin and Norwani Md. Nawawi

Abstract Wood carving plays an important element in decorating the traditional boat. Traditional wood carving is well known in Malay culture. The uniqueness of the Malay wood carving is shown from the selection of motifs used in the Malay traditional boats. Basically, on traditional boats, there are seven parts of the boat that are decorated with carving. The carving can be found on the following parts of the boat: the Bangau, Okok, Caping, Koyang, Cagak, head and tail. This paper aims to explore the patterns of wood carving used in decorating the traditional boats. Various patterns can be found in traditional Malay boats such as carving with motifs of living things. The carver used flora, fauna and human characters as motifs. Besides that, there are also woods carved with the motifs of shadow puppet characters. Therefore, the objective of this paper is to identify the traditional wood carving on traditional boats in Terengganu and analyse the motif used in the context of the mathematical pattern group in the twentieth century.

Keywords Wood carving • Traditional boat • Symmetry and frieze pattern

1 Introduction

Traditional Malay wood carving is one of the most important heritages in the Malay culture. The art of wood carving has long existed in Malay society. In ancient time, wood carving symbolised wealth and power. Therefore, wood carving is not just a form of decorative art forms that are created, but it also demonstrates the level of achievement and status. The palace and aristocracy were those who have used craft,

N.I.S.Z. Abiddin (✉)

Department of Post Graduate Studies, Faculty of Art and Design,
Universiti Teknologi MARA, Shah Alam, Malaysia
e-mail: irdasuriani@unisza.edu.my

N.Md. Nawawi

Faculty of Art and Design, Universiti Teknologi MARA, Shah Alam, Malaysia

particularly the art as a symbol in administration [1]. The uniqueness of the traditional Malay wood carving is translated from the skilled and the selection of the motifs and how they translate the meaning behind the creations. Features are hand carved and generated through certain techniques. Among the techniques that are commonly used are embedded sculptures, bas-relief, engraving and perforated cut through carving.

2 Wood Carving as Decoration on Parts of the Boat

Traditional wood carving can be found in Bangau, Okok, Caping, Koyang, Cagak, head and tail of the boat as an ornamental embellishment of traditional boats [2]. Bangau is a piece of wood in a hooked shape. The function of the Bangau is to keep the mast and prevent it from falling overboard into the sea when not in use. Bangau is situated on the left of the port side of the boat. According to [3], the Bangau is decorated and the design is carved deeply in the wood, usually using a bas-relief carved technique.

The Okok is on the right side when we are in the boat but on the left side when facing it from the sea [3]. It is counterbalancing the Bangau. Like Bangau, Okok is also being decorated on both sides, and the wood was carved in a bas-relief technique. There was a connection between Bangau and Okok. Bangau and Okok can both face one another or look at the same direction. Anyhow, there were also Bangau and Okok which are facing back to back. Besides that, both pieces are mobile which is why the fishermen may remove the Bangau and Okok during the monsoon season. Bangau and Okok have a certain monetary value and they are functionable. Bangau and Okok are built thick and strong enough to withstand the shock when the mast and the anchor are put in or taken off. The shorter Okok is attached to the keel and holds the anchor.

Caping is located between Bangau and Okok acting as a counterbalance to the Bangau. This ornament is a betel leaf (Sireh) or heart shape with the tip downward. It holds the front side of the boats together because the Caping is fixed deeply in the boats and goes down to the keel. The Caping is a unique piece. Certain boats have no Caping such as Sekoci boats. However, for boats like Kolek and Kolek Buatan, the Caping is well decorated and deeply carved with various motifs or patterns. In ancient practice, fishermen believe that Caping is like the soul of the boats [4]. As the central part, it is used as a sort of altar. The majority of the Caping is decorated with floral motifs, which includes the branches and flower stalks which are located in the bottom centre of the vase.

The other part is Cagak which means forked stick. It is a piece of wood at the rear on the left side of traditional boats. The use of Cagak is to rest the rudder's oar [4]. Next is Koyang which is the holder of the boat rudder. It is shaped like a stick in a tilted position. Koyang is placed in the middle of the rear parts. It is a long oar which acts as rudder that is tied with a rope. However, what we would like to find out is an analysis based on the three main decorated parts of the boat which are the Bangau, Okok and Caping (Fig. 3.1).

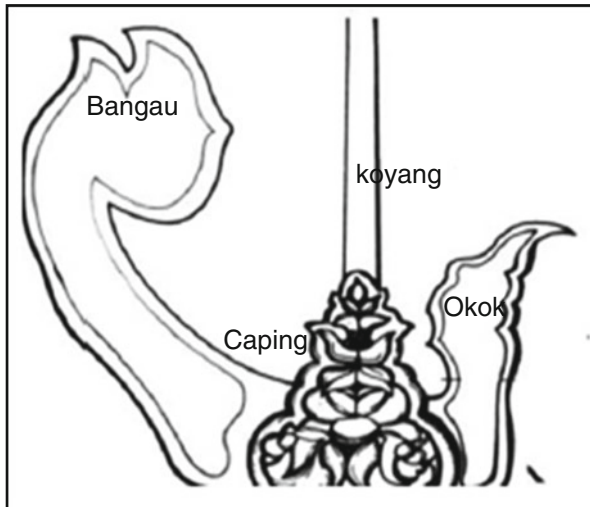


Fig. 3.1 The Bangau, Okok and Caping on the traditional boat

According to [5], the forms and motifs long seen in Malay wood carving were influenced by nature such as flora and fauna, the natural elements, the cosmos and Islamic pattern. In Malay wood carving on traditional boats, the main categories of motif popularly used are flora, fauna and shadow puppet characters (*wayang kulit*). Floral motifs are popular among the fishermen, whom have used these motifs in decorating their boats with fine wood carving. Anyhow, the distinction was influenced by the selection of motifs which are different, especially between after the advent of Islam and earlier. Animism, Buddhist and Hindu have played important roles in the development of wood carving [6]. However, in traditional boat decoration, the wood carving motifs were mainly floral in nature. Therefore, this study is to find out how the designs developed into which category in today's mathematical findings.

Baba [7] found that even though the use of wood carving is for boat decoration, the inspiration for composition in the art of wood carving is inspired from plant sources which are leaf, stalk, flower, fruit and tendrils. Based on decorated parts of the boats, there were different patterns for each part such as for Bangau, Okok, Caping and others.

3 Symmetry and Transformation Concept in Wood Carving Design on Traditional Boat

Motifs used in wood carving as boat decorations are mainly inspired from nature such as plant or living things. In wood carving design, the motifs that are carved represent the symbolic meaning behind each design. Sometimes, the carver used the motifs to appreciate the plants that are beneficial to human lives or represent a

certain story or memory for a special occasion in life. Other than plants, the usage of living things as motifs in wood carving design is often held as symbolic significance [8]. Usually, in the selection of motifs, they are based on the characteristics of the animals. The exploration of motifs has portrayed the Malay carver's talent that sparked the creative works in conveying an amazing pattern in wood carving design. Therefore, certain motif design in wood carving is carved by the symmetry principle. Symmetry is a vague sense of harmonious and beautiful proportion and balance. Besides that, symmetry is also referring to the pattern being made of approximately similar parts facing each other or around an axis. The most common four perspectives in symmetry consist of reflections, rotations, translations and glide reflections. Some other findings stated that a combination of these basic operations is also a perspective in symmetry principle. While under isometric transformation, a geometric object is symmetry if the transformed object is parallel to the original. In order to classify the motifs and pattern in wood carving design on boats into the mathematical pattern groups, it is important to understand the symmetry study.

As of four concepts in symmetry principle and transformation, the pattern can be defined in any of these repetitives. Reflection symmetry or mirror symmetry is symmetry with respect to reflection. The motifs are flipped over the line and reflected, and the image is reversed as in a mirror. Therefore, reflection symmetry is an object or motif which is indistinguishable from its transformed image. The wood carving design is built based on carver's individual interpretation. Anyhow, the motifs are carved in two or three dimensions arranged and composed.

3.1 Classification of Pattern on Wood Carving Design in Traditional Boats

In this paper, the analysis of symmetry principle of wood carving design on boats is covered. It is a study on the arrangement of motifs that form the pattern which fall either in frieze pattern. The frieze pattern is a mathematical concept to classify design on two-dimensional pattern that is repetitive in one direction. The frieze pattern has seven different types and most of the patterns on wood carving are individual; however, in this study, the pattern of the motifs will be analysed to identify the pattern as symmetrical groups of patterns (Figs. 3.2, 3.3, 3.4 and 3.5).

4 Pattern in Wood Carving Used on Boat as Decoration

In this study, the wood carving design is analysed according to motifs used on Bangau, Okok and Caping. Different approaches are used in motif arrangements; therefore, this study is conducted to classify the frieze pattern that can be found in wood carving design. The Bangau, Okok and Caping are the most frequently

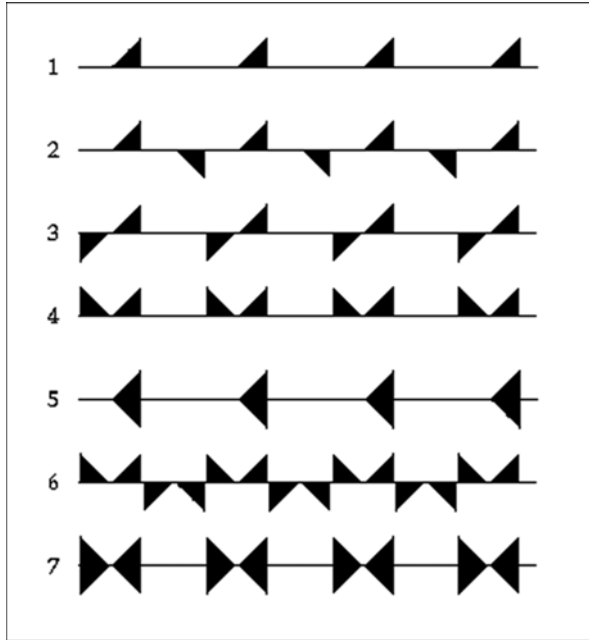


Fig. 3.2 Frieze patterns have seven different types of groups



Fig. 3.3 Symmetry in Malay wood carving (ukiran tebuk tembus)

decorated parts on traditional boats. The body of the parts are made of wood in various shapes. These parts play an important role on the boat (Fig. 3.6).

1. *Bangau*

The *Bangau* is decorated with wood carving where the motifs are inspired from plant parts such as the leaf, stalk, flower, fruit and tendrils (Fig. 3.7). The design is arranged in group on type 1g of frieze pattern, where the motifs are arranged in glide reflection and the shapes of the motifs are not similar. The motifs of plants are usually related to the beauty of texture, shapes and good smell of the flowers. This is an example of the criteria that most of the carver took from the motifs. Plant elements are favoured by the carver because of its softness and

Fig. 3.4 Symmetry in wood carving with reflection repeat



because plants are readily available especially when the carver needs inspirations in their carving artwork. The complete form will cover the entire tree where it started from the roots, trunk, branches, leaves, fruit and buds to its basal shoot once.

2. *Caping*

Caping is an ornament in a shape of a betel leaf (Sireh) or a heart with the tip pointing downward (Fig. 3.8). Previously, the fishermen hang offerings of pinang (areca nuts), limau nipis (lime) and flower on the Caping as they use it as a sort of altar. The majority of the Caping is decorated with floral motifs, which includes the branches and flower stalks which are located in the bottom centre of the vase. This wood carving pattern is type m1 of the frieze pattern which is vertical reflection in one direction. The axes of reflection are parallel to one axis of translation and perpendicular to the other axis of translation. There are neither rotations nor glide reflections.

3. *Okok*

Like Bangau, Okok is also being decorated on both sides and the wood was carved in a bas-relief technique. There was a connection between Bangau and Okok. Bangau and Okok can both face one another or look at the same direction (Fig. 3.9). Anyhow, there are also Bangau and Okok facing back to back. Okok










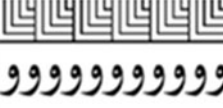




TYPE	MALAY WOODCARVING	ILLUSTRATION
m1 <i>Vertical Reflection</i>		
1m <i>Horizontal Reflection</i>		
g <i>Half turn</i>		
Mm <i>Vertical and Horizontal Reflections</i>		
11 <i>Translation</i>		
12 <i>Two Half Turns</i>		
1g <i>Glide Reflections</i>		

Fig. 3.5 The classification of seven frieze patterns on wood carvings

is mostly found in several shapes and motifs which consist of flowery and abstract pattern. This wood carving design shows a young flower bud or shoot appearing behind or below the main branch of the leaf, which depicts that the young should give the elders priority or precedence. From the motif arrangement, the pattern that can be found in this wood carving is one of the frieze patterns which is type 1g (glide reflections). The motifs flip and glide reflection in three directions, third-turn on and off axes.

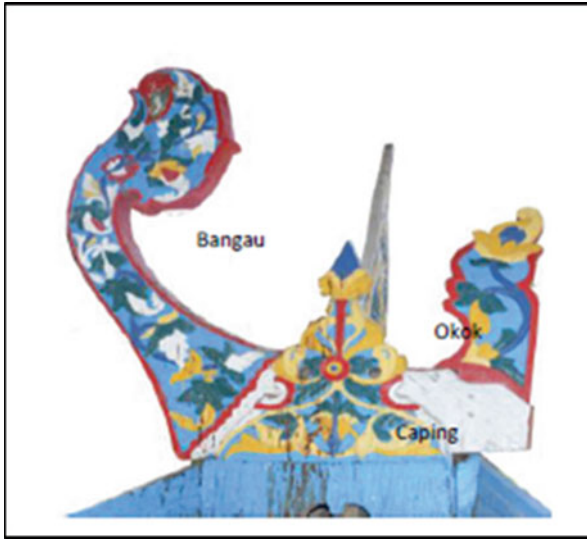


Fig. 3.6 The placement of Bangau, Okok and Caping

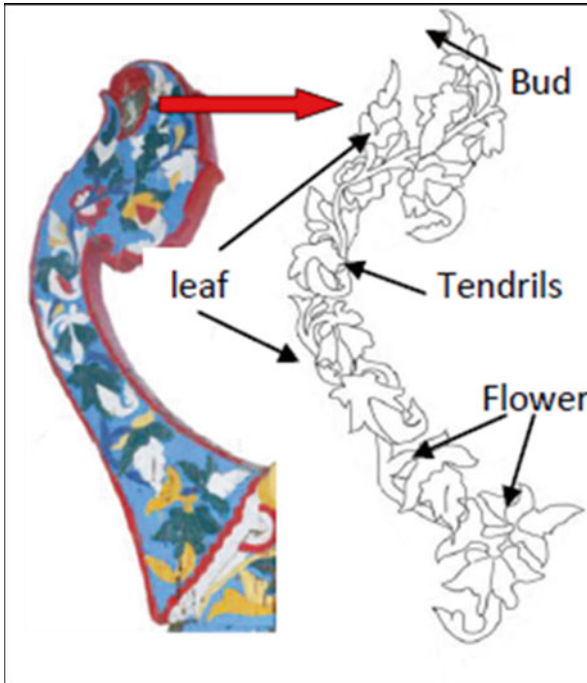


Fig. 3.7 Decoration at the Bangau

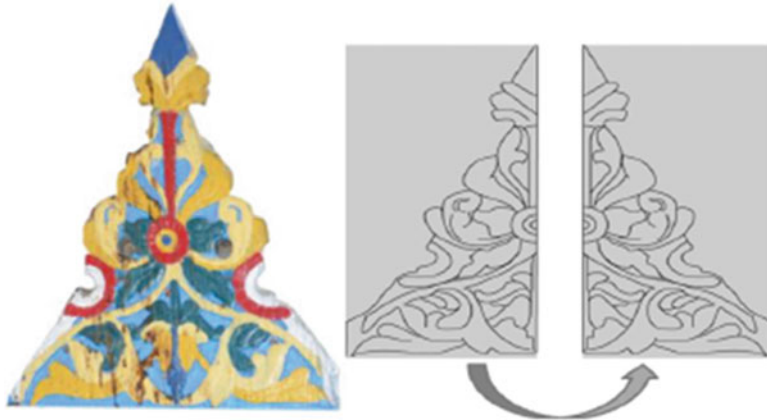


Fig. 3.8 Caping with symmetric pattern that has mirror repeats on a plane

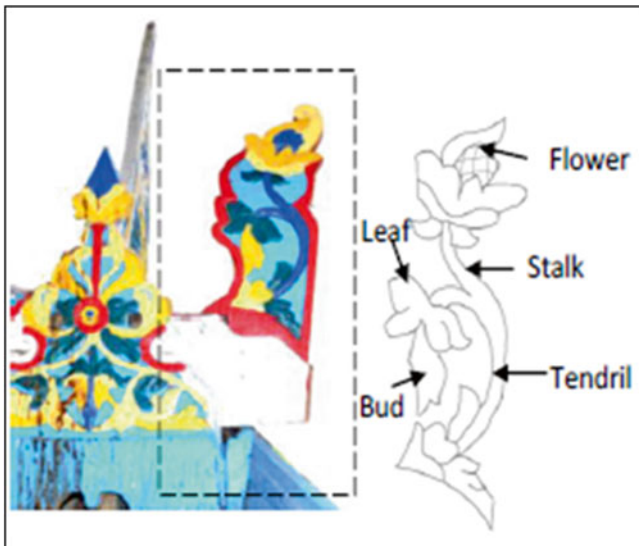


Fig. 3.9 Okok is part of the boat near the Bangau

5 Conclusion

In conclusion, the Malay wood carving is being creatively designed by the master wood-carvers in beautiful and elegant designs showing the highest of Malay civilisation. There are rules which conceived deep meaning in some of the kerawang Malay wood carving. The layout of the motif arrangement is in harmony, organised based on nature. The decorations of wood carvings that are found in the traditional

boats have their own philosophy which shows the influence of the old beliefs and Islam. Most of the motifs are in flora although some of the names are given in fauna; for example, the Bangau is a bird and the decoration on it is the flora having tendrils of stems, leaves, flowers and buds. The interesting factor in this study is the arrangement of motifs that can be categorised into mathematical ways of documentation.

The research emphasises on the analysis of pattern in wood carving on Terengganu boat in a mathematical context in the twentieth century which can be classified according to the principle of symmetry and transformation. For this study, we only discussed the three main parts of the boat which are the Bangau, Okok and Caping. It is found that the transformational geometry from frieze pattern can be used in the study of analysing designs on the decorated traditional boat of Terengganu. Most of the motifs on these three main parts of the boat are mainly in floral and in the category of type 1g and m1 from the frieze patterns. Moreover, there are other motifs in wood carving that are yet to be analysed, and this study should be continued. The results of classifying wood carving in decorated boats should be documented as database and can be used by other researchers, historian, designers and students in their future research.

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Chapter 4

Incorporation of Canon Lens Polishing Sludge in Stoneware: An Exploratory Study

Soudeh Salehi, Rusmadiyah Anwar, and Oskar Hasdinor Hassan

Abstract In order to explore the modified stoneware body suitable for ceramic artwork production, the canon lens polishing sludge as residue of camera lens polishing has been combined with stoneware in different shares. The silica content of the canon lens polishing sludge is high, while aluminum, iron, alkalis, and alkaline earth oxides are less in quantity. The characteristics of the sintered modified stoneware body have been assessed in this study in accordance with the amount of the sludge that had been added. The stoneware which was being used in artworks has been combined with sludge (up to 20 wt.%). The final mixture formed in test bars was shaped and sintered at two temperatures of 800 °C and 1,000 °C. The altered stoneware has been evaluated in terms of mechanical and physical characteristics such as water absorption, dried and fired shrinkage, microstructural properties, and mechanical strength. The preparation procedure has been illustrated and assessed. According to the results obtained, the physical and mechanical characteristics of the final product did not have any significant changes, while mechanical strength has been decreased except in the modified body by 5 wt.% of the sludge as it increased. The results of the tests demonstrate that the utilization of canon lens polishing sludge in stoneware body is applicable for ceramic artwork production.

Keywords Stoneware • Sludge • Artwork • Canon lens polishing

1 Introduction

The industrialization phenomenon has made the rate of waste production rise up dramatically. The public health is in danger caused by environmental pollution and waste by industries as a result of technology advancement [1]. Recently, the waste management has become one of the main concerns of the public over the

S. Salehi (✉) • R. Anwar • O.H. Hassan
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: soudehsalehi@yahoo.com

entire world. Almost all of the industries have been involved to eliminate this concern by providing an appropriate solution to recycle and reuse of the waste material to save the environment. In this process the industries are facing two crucial issues: initially, the cost increase of natural raw material and, secondly, the great rate of waste production [2]. The recycling of the waste material has been practiced earlier by a large number of industries in a way to lower the amount of industrial by-product in the production process in order to produce an eco-friendly output. On the other hand, the producers play another role in the sludge reduction by application of recycled waste in the production of their products either as raw material or as contributory agent as the reutilization of industrial waste in the manufacturing process plays a positive role in the energy and financial saving in economical section [3].

Basically, the application of waste material either as raw material or an auxiliary agent will prove the importance of ceramic production process as a target for waste material [4].

As a result, this method has a remarkable influence on the environment and natural resources through saving and preservation of the energy resources. Additionally, this idea will have a positive economic effect. A lot of researchers have investigated the application of oil-based waste, sediment, calcium carbonate residue from the construction stone industry, marble sludge, urban sewage sludge, furnace steel dust, and bagasse, brewing industry sludge, olive mill wastewater, and coffee ground residue in ceramic material production [5–9].

Additionally, one of the disadvantages of the clay ceramic material production is destruction of the arable land in the production process. Resultantly, the clay development and waste combination in purpose of high-quality ceramic material production are under a great focus. The great requirement of the clay has made by direct relation between the ceramic material demands and the economic development while the clay resources are not able to supply all the demands [10].

The reality that the properties of some wastes are close to the natural raw materials that are being used currently is neglected, while some of the waste content not only is matched but is useful in ceramic production [11]. With regard to this idea, improvement of the waste material to become an alternative raw materials is quiet noteworthy technically and economically in varieties of demands.

The objective of this project is to promote a modified stoneware body by application of canon lens polishing sludge as silica-based waste in ceramic artwork production process. In fact, the clay bodies are capable to be combined with other materials which might be applied in ceramic products in accordance with the ultimate body assessment in terms of physical and mechanical characteristics [12]. Generally, ceramic artists utilize stoneware body for their artworks. Apparently, to be an important part of green production process might encourage ceramic artists to utilize modified body in their artworks as the mechanical and physical properties of the stoneware are maintained after addition of the waste.

2 Material and Method

The common stoneware which is being consumed by ceramic artists in their artworks has been combined with dry canon lens sludge, and then it has been fired at 800 °C to 1,000 °C. The canon lens sludge has not passed through any beneficial treatment except homogenization for 1 h at 400 °C; it is selected as raw material and characterized and applied as it had been collected from the canon camera lens polishing industry. The term characterization in this method refers to chemical composition of both stoneware and sludge and physical and mechanical properties of the modified body analysis. Different groups of mixture in terms of waste content from 0, 5, 10, 15, and 20 wt.% of sludge have been selected and prepared [13]. Afterwards, the 100 ml of water which was measured using an Erlenmeyer flask has been added to each selected mixture. Then, the tests bars have been formed by molding the mixture in plastic clay condition by means of plaster mold. The efficiency of the final product strongly depends on the process where the body has been produced and then treated and processed [14]. In order to have better formability and stickiness in the clay with great pressure and height in ceramic artworks, it is recommended to apply medium plastic condition [15]. Then, the tests bars which had been numbered accordingly have been dried in room temperature firstly under plastic cover for a week; afterwards, they have been dried completely by application of electrical drier for 7 h at 70 °C. The slow and even rate of drying of the plastic clay avoids ceramic warping, crack, and deformation. As a result, as one part of the clay dries faster than the other, the uneven shrinkage took place which led to warping and cracking in the clay [16]. The test bars have been fired at 800 °C and 1,000 °C in oxidation kiln. The selected temperatures are the ones that match with quartz inversion which clay will become ceramic [17]. Afterwards, all the test bars have gone through physical and mechanical tests such as dried and fired shrinkage, water absorption, mechanical strength (MOR) (PK-1000), and scanning electron microscopy (SEM) (Hitachi S-2500, at 20 kV) [18–21]. Final ceramic component and product exploit and reliability depend on the powder selection and mixing procedures where the deficiencies of the products could be rectified [22].

3 Result and Discussion

3.1 *Characterization of Stoneware and Canon Lens Polishing Sludge*

In this study, the utilized stoneware is prepared by the same formula which ceramic artists use for their artworks. The majority of the artists, in order to produce their desired stoneware, follow the formulation of plastic fire clays (0–100 %), ball clays (0–15 %), quartz (0–30 %), and feldspar (0–15 %). Three components of plastic component like clay, fluxing component like feldspar, and inert component such as quartz

Table 4.1 Chemical composition of canon lens polishing

Chemical composition	Amount (%)
Silicon dioxide (SiO ₂)	55.00–70.00
Alumina (Al ₂ O ₃)	12.00–22.00
Ferric oxide (Fe ₂ O ₃)	2.00–500
Calcium oxide (CaO)	1.50–3.50
Magnesium oxide (MgO)	2.00–3.50

and sand had been utilized in traditional ceramic production [23]. The varieties of waste materials which are being applied as alternative raw material or contributory agent are categorized with regard to their impact on the final ceramic body. The waste material which is inert and non-dangerous and does not have any limitation in supply is an appropriate option to be utilized in ceramic industry [13].

The canon lens polishing sludge had been calcinated at 400 °C for an hour. As it is shown in Table 4.1, the waste is high in silicon dioxide (SiO₂) content. Basically, the source of each waste material is recognized from the waste composition with regard to the rate of contamination in processing and production methods. The amount of silica oxide (SiO₂) is dominantly high in waste materials, followed by lime (CaO) and lastly by fluxing oxide (alkaline and iron) [24, 25].

3.2 Characterization of the Modified Body

The physical and mechanical deviation assessment of the ultimate body was the main concern in the majority of the ceramic projects which had been done on ceramic body composition [26–29].

All pieces of each group of test bars which had been fired at 800 °C and 1,000 °C have passed through the water absorption test. The weight of the test bars has been measured in both condition of air and water for dry weight (*D w*) and wet weight (*W w*) [30]. Then, the water absorption has been calculated after the excessive water had been wiped off by rags (4.1):

$$W (\%) = [(W w - D w) / D w] 100 \quad (4.1)$$

By a glance to Table 4.2 and Fig. 4.1, the water absorption of the modified body remains steady after addition of canon lens polishing sludge.

All the test bars have gone through the dried and fired shrinkage test [31]. According to Table 4.3 and Fig. 4.2, the shrinkage of the ultimate body remains almost unchanged after application of the sludge.

In order to assess the mechanical strength of the test bars, they have been tested in both conditions of immersed and non-immersed states by three-point loading

Table 4.2 Averaged water absorption of canon lens polishing sludge with stoneware at 800 °C and 1,000 °C

Sludge (wt.%)		0	5	10	15	20
Water absorption (%)	800 °C	9.2	8.9	9	8.8	9.1
	1,000 °C	2.7	2.4	2.4	2.9	3

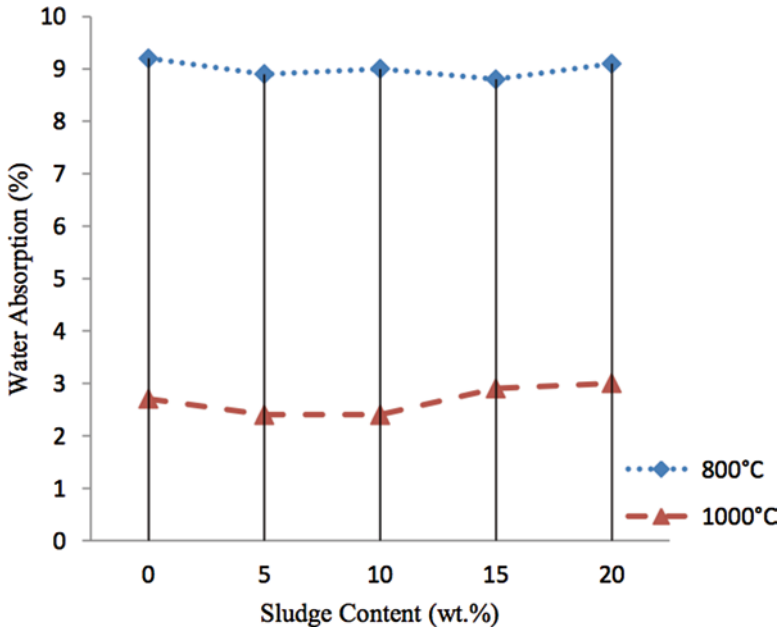


Fig. 4.1 Averaged water absorption of modified body at 800 °C and 1,000 °C

Table 4.3 Averaged dried and fired shrinkage of modified body

Sludge (wt.%)	Average dried shrinkage (%)	Average fired shrinkage (%)	
		800 °C	1,000 °C
0	2.0	2.8	6.7
5	2.0	3.0	6.8
10	2.2	3.2	7.0
15	1.9	2.6	7.2
20	2.4	3.1	6.3

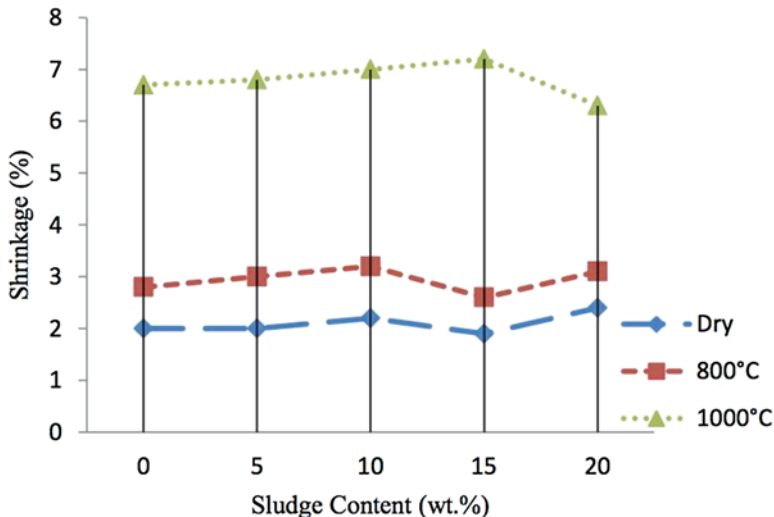


Fig. 4.2 Averaged dried and fired shrinkage of modified body

method by application of INSTRON electrohydraulic apparatus as the span was 80 mm and the crosshead speed was 0.1 mm/min [32]. The results have been achieved by (4.2) where F refers to maximum load, L is the distance between the support, and d and b are the thickness and the width of the prismatic test accordingly:

$$\delta = \frac{3FL}{2bd^2} \quad (4.2)$$

With regard to Table 4.4 and Figs. 4.3 and 4.4, the mechanical strength of the test bars which were fired at 800 °C and 1,000 °C has dropped after application of sludge in both immersed and non-immersed states, while there was an increment at 1,000 °C after addition of 5 wt.% of sludge whether in immersed and non-immersed states while MOR is close to the original body strength at 800 °C.

In purpose of sintered bar microstructure analysis, the scanning electron microscope (SEM) method had been used. In this method, the samples of A (0 wt.%), B (5 wt.%), and C (20 wt.%) were fired at 1,000 °C, cut, and sank in resin in order to gain mirror polished test bars. Then, the samples have been wrapped by copper band for conductivity and have been splashed by platinum at almost 2–30 nm. There was an increment in the density of the grain structure in samples B and C in contrary to sample A as illustrated in the SEM photos in Fig. 4.5. It proves that the porosity of the modified body has been decreased by addition of the sludge.

Table 4.4 MOR at 800 °C and 1,000 °C

Sludge (wt.%)	MOR (N/mm ²)			
	Immersed		Non-immersed	
	800 °C	1,000 °C	800 °C	1,000 °C
0	37.63	132.27	33.48	137.91
5	34.10	155.14	33.72	179.87
10	22.55	96.80	23.63	120.04
15	27.01	96.93	29.69	99.33
20	25.18	87.98	25.21	113.51

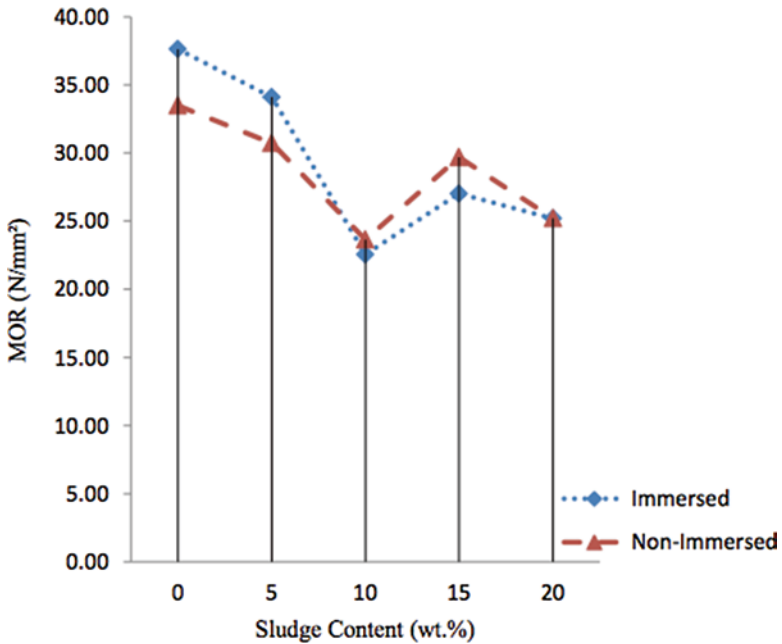


Fig. 4.3 MOR immersed and non-immersed states at 800 °C

4 Conclusion

According to the achieved results, it is obvious that there was a minor change or alteration in characteristics of the stoneware although there was a reduction in mechanical strength in other groups with different sludge content, but it is noteworthy that in 5 wt.% sludge content, the mechanical strength is increased at 1,000 °C firing temperature. The ceramic body in order to be utilized must have the minimum required properties. For instance, the ceramic body must have a good level of formability to be practiced on the wheel and shaped in plastic form [15]. Additionally,

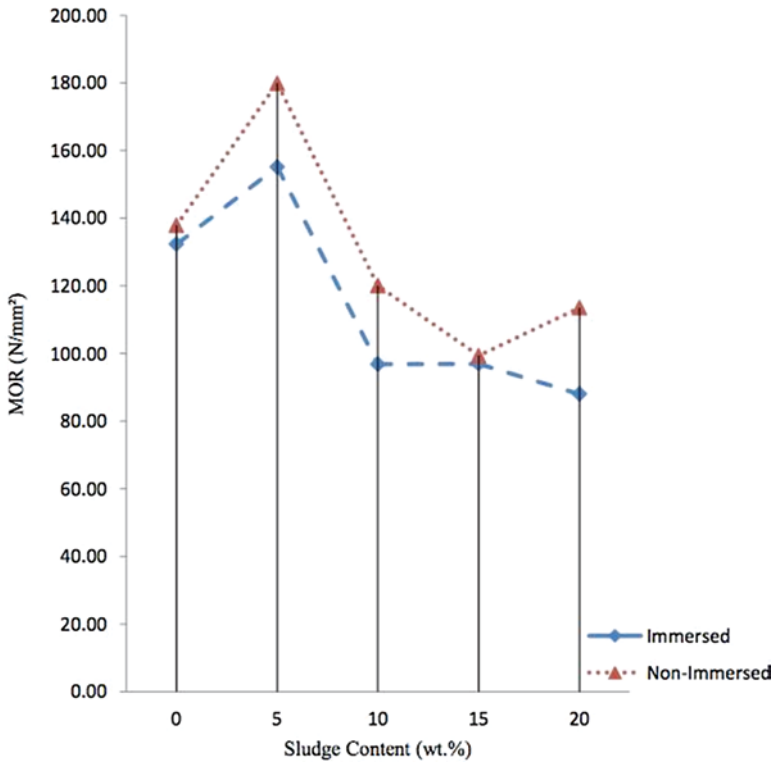


Fig. 4.4 MOR immersed and non-immersed states at 1,000 °C

the ceramic body must be dried without being brittle in structure. In terms of firing properties, the ceramic should be strong enough with high density and minimum or no shrinkage, while the ultimate product color in terms of appearance should be fine and translucent [33]. As a result and with regard to the findings, it is clear that the stoneware body is an appropriate target in terms of reuse of the canon lens polishing sludge even with strength improvement by the addition of 5 wt.% of sludge. Subsequently, the level of waste which is being left from the industries in the environment will be decreased, and the raw material reservation will be increased as well.

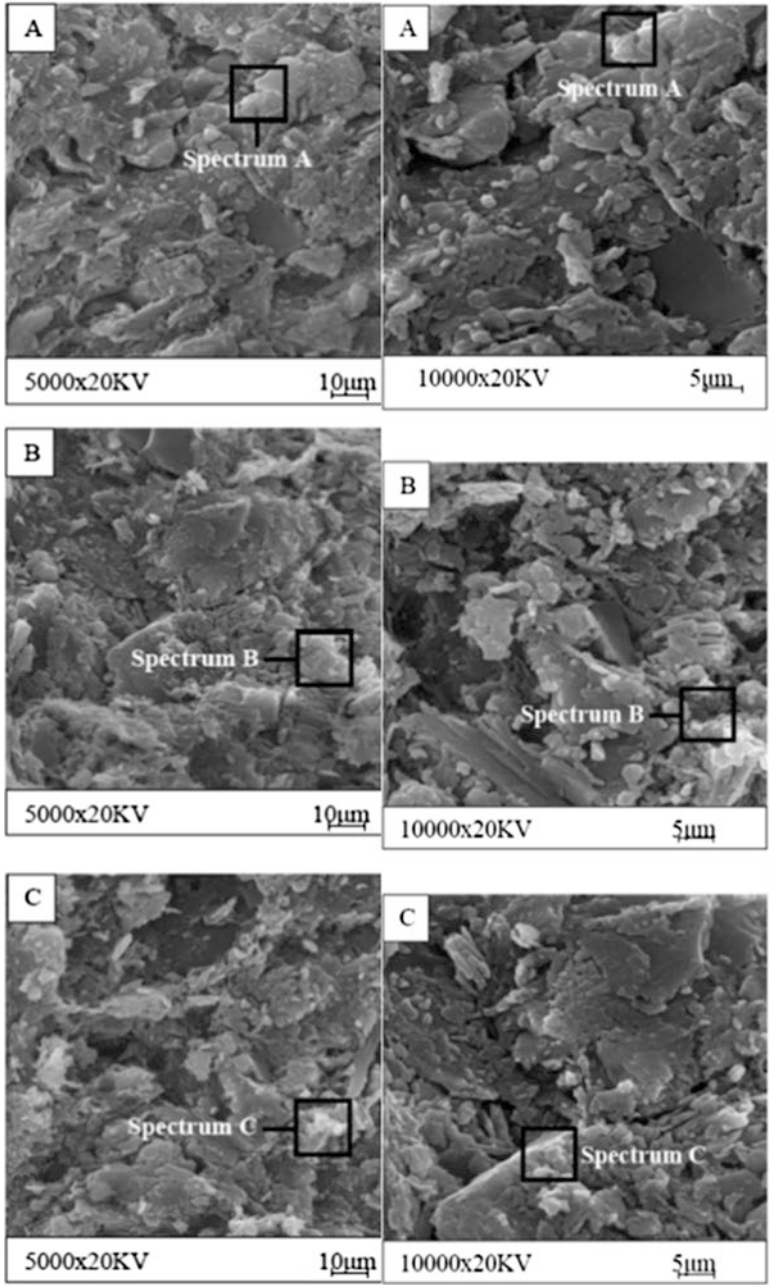


Fig. 4.5 SEM images of fractured surfaces of ceramic bodies contain 0, 5, and 20 wt.% of sludge fired at 1,000 °C in 5,000×20 KV and 1,000×20 KV

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Chapter 5

Reuse of Palm Oil Sludge in Stoneware: An Eco-friendly Project

Soudeh Salehi, Rusmadiyah Anwar, and Oskar Hasdinor Hassan

Abstract The applications of waste material particularly palm oil sludge in the production of stoneware as a contributory agent will reduce the cost of production and enhance waste management as well. Moreover, it will be a solution for the environmental problems caused by such waste. In this project, the addition of palm oil waste in different content (5–20 wt%) to the stoneware in purpose of eco-friendly artwork production has been assessed. In order to investigate the ultimate body characteristics, various factors such as linear shrinkage, water absorption, and bending strength have been tested. In accordance with the output characteristics, there was a least proportion between content of the residue and linear shrinkage finding. On the other hand, the level of water absorption has risen by addition of sludge, while there was a drop in bending strength after application of sludge. The modified stoneware changes have not affected the ceramic artwork production. Although the modified body shows some changes due to addition of waste, it has met the standards and expectations for the stoneware body used by artist, and it has followed the same procedure as ceramic artwork production.

Keywords Stoneware • Sludge • Palm oil • Artwork • Eco-friendly

1 Introduction

Industrial activities as a part of mankind's life affect environment positively and negatively. The negative impact of human life on the environment is one of the most crucial concerns of human which is not simple to eliminate or at least reduce it. Consequently, the environment will react to those impacts in different ways. In recent centuries, industrialization phenomenon, industries' development in all

S. Salehi (✉) • R. Anwar • O.H. Hassan
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: soudehsalehi@yahoo.com

over the world, and lastly industrial by-product production have led the nations to look for the best and appropriate solution for the problem of by-product management. Occasionally, the recycle of the waste material in a method to bring them back to their original elements has lower potential rather than reuse them in the same or other industry. To illustrate, the secondary recycling is more possible in waste management which will lead industries to reuse by-product in their production process [1]. Environmental problems, conservation of nonrenewable resources, public health, and waste elimination cost appraisal are some other reasons which encourage the nations to focus more on recycling and waste management [2, 3]. Recently, the problem that the landfill site is prohibited for the industrial waste and only urban solid waste can be left by this method has become the greatest concern of the industries as they have to look for an alternative solution for their waste [4].

In fact, the industrial waste might be recycled or brought back to their initial elements in order to reuse in the same or other industries either as raw material or auxiliary agent [5–8]. The resemblance of composition of sludge with some raw material is one of the points which have been neglected. It means that some sludge has similar content with raw material and they might be suitable to reuse in some applications [9]. In some particular cases, the properties of the raw material which was produced by waste have better matched with the application requirements [10].

With regard to the great effect of art in social public lives, it is able to get involved in the process of recycling and eco-friendly phenomenon either directly or indirectly. Subsequently, majority of the artists in any kind intend to create artworks with concept of eco-friendly and environment support advert in order to prove their position and steps in the global progress of a world free of waste and pollution. For instance, some artists have applied used material in creation process of their artworks in order to contribute in recycling process. In accordance with the ceramic production development and final product properties, varieties of bodies which have the prerequisite features have been utilized. The raw material and maturing temperature are two factors which determine the ceramic body categories and arrangement in a group [11]. Design properties and physical and mechanical characteristics such as shrinkage, translucency level, and final product color are the criteria which ceramic artists select their ceramic body and raw materials. In some circumstances, ceramic artists do some alteration on the raw material in order to change the body properties with respect to the final product requirement [12].

So the ceramic production process is a suitable target for waste reutilization [13, 14]. It cannot be neglected that some wastes have some similarities in their composition that make them suitable to be matched with ceramic materials [9].

The purpose of this study is to recommend the altered stoneware body as an eco-friendly material. The eco-friendly stoneware is the ultimate mixture of palm oil sludge as silica-based waste from the edible oil production process with the stoneware body for ceramic artworks.

The application of palm oil residue promotes more benefits economically and environmentally. This study exemplifies the probability of palm oil sludge

application in stoneware body in various percentages. The study on the final product properties before and after of the firing process has been performed right after the ceramic pieces had been molded in plastic condition. The modified stoneware has been tested in the aspect of water absorption, shrinkage, mechanical strength (MOR), and microstructural properties (SEM).

2 Experimental Procedure

Initially the palm oil waste has been collected as by-product of edible oil production. In order to remove its moisture and water content, it has been dried at 400 °C for an hour. The powder of the waste has sieved to obtain uniform particles in 100 µm sieve [15]. In accordance with the Table 5.1, the amount of silicon dioxide (SiO₂) in the waste is high. Basically, the composition of the waste depends on some factors like its source and amount of contamination with respect to the processing method. Generally, the dominant oxide occupies a great space in chemical composition of the waste materials and then the silica (SiO₂) which continues by lime (CaO) and ultimately by fluxing oxides (alkaline and iron) [14].

The common formulation which most of the artists apply in the stoneware in their artworks is composed of plastic fire clays 0–100 %, ball clays 0–15 %, quarts 0–30 %, and feldspar 0–15 %. One time firing is normally utilized in stoneware, while it depends on the flux content of the formula as twice firing might be used for glazed stoneware. In this project, the stoneware has been crushed and sieved in 100 µm in order to get finer particles after it had been dried in electric dryer at 80 °C for 24 h.

In this study, five groups of stoneware have been arranged with various content of waste to evaluate the ultimate product characteristics. Each group differs from the others in terms of waste content percentages (0, 5, 10, 15, and 20 wt%). Then 100 ml of water which was measured by Erlenmeyer has been added to all sub-groups to gain preferable plasticity [16, 17]. Afterwards, the test bars have been shaped in plaster mold in plastic clay state and have been left at room temperature for a week under plastic cover. After that, the test bars have been placed in electric dryer for 7 h at 70 °C in order to completely dry the test bars. Afterwards, all the test bars had been sent for firing at 800 and 1,000 °C in oxidation kiln. Then the test bars have passed through the water absorption and shrinkage tests. The sintered

Table 5.1 Chemical composition of palm oil sludge

Chemical composition	Amount (%)
Silicon dioxide (SiO ₂)	55.00–70.00
Alumina (Al ₂ O ₃)	12.00–22.00
Ferric oxide (Fe ₂ O ₃)	2.00–500
Calcium oxide (CaO)	1.50–3.50
Magnesium oxide (MgO)	2.00–3.50

specimens have been tested in terms of mechanical strength (MOR) by means of a universal testing machine (PK 1000) in three-point bending tests in immersed and non-immersed state. Hitachi S-2500 at 20 KV has been utilized in order to perform the scanning electron microscope (SEM) on selected test bars [18].

3 Result and Discussion

Microstructure of ceramic products and ceramic properties like mechanical strength, drying and firing shrinkage, and water absorption are main factors which the ceramic product quality depends on [19].

All the test bars with different sludge content which had been fired at 800 and 1,000 °C have gone through the water absorption test. The test bars have been covered in breaker and boiled for 2 h after the weight of the test bars had been measured in air (W1). Then all the specimens have been quenched and dried with rag and their weight has been measured (W2). Equation (5.1) is used to calculate the water absorption of the specimens fired at 800 and 1,000 °C with different amount of the sludge [20].

$$W(\%) = [(W2 - W1) / W1]100 \quad (5.1)$$

According to the results which have been illustrated in Table 5.2 and Fig. 5.1, the water absorption rose up drastically from 6.9 to 9.5 % at 800 °C after addition of more sludge up to 20 wt%. Moreover, it shows that the addition of palm oil sludge to the stoneware body caused an increment of porosity. There was a sharp drop of water absorption for sintered samples at 1,000 °C from 4.3 to 0.6 % after addition of 5 wt% of palm oil sludge, and the decrement went on to 0.1 % after supplement of 10 wt% of sludge, while there was an increment of water absorption to 1.9 % and 1.2 % after adding 15 and 20 wt% of sludge.

The shrinkage takes place in both drying and firing states in clay which is in accordance with its filler content and other materials. In order to calculate the shrinkage of test bars, a line of 10 cm has been marked out of the test bar surfaces. Equations (5.2) and (5.3) were used to calculate the drying and firing shrinkage [21]. In order to make the clay plastic and work on it easy, the clay particles move within the water. The moisture evaporates from the spaces between the clay particles in clay drying. So the space between the particles decreases which will cause the

Table 5.2 Averaged water absorption at 800 and 1,000 °C

Sludge (wt%)		0	5	10	15	20
Water absorption (%)	800 °C	6.9	8.6	9.6	9.7	9.5
	1,000 °C	4.3	0.6	0.1	1.9	1.2

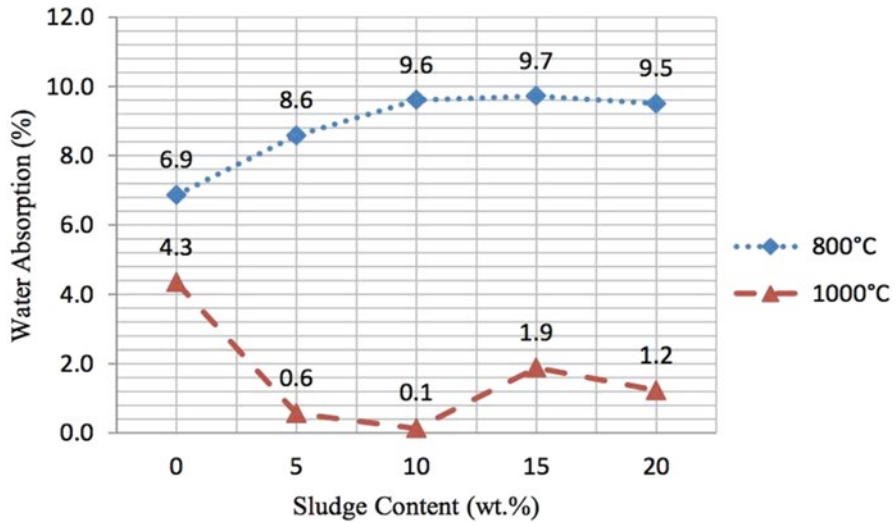


Fig. 5.1 Averaged water absorption of palm oil sludge with stoneware at 800 and 1,000 °C

Table 5.3 Averaged dried and fired shrinkage

Sludge (wt%)	Average dried shrinkage (%)	Average fired shrinkage (%)	
		800 °C	1,000 °C
0	2.4	3.5	6.3
5	2.4	3.6	7.1
10	2.2	3.2	7.3
15	1.9	2.9	7.2
20	2.7	3.9	7.8

whole shape to shrink. The rate of the shrinkage is directly proportional to the characteristics of the clay.

$$\text{Driedshrinkage}(\%) = [(W_i - D_i) / W_i]100 \tag{5.2}$$

$$\text{Firedshrinkage}(\%) = [(F_i - D_i) / F_i]100 \tag{5.3}$$

With regard to the results shown in Table 5.3 and Fig. 5.2, there was not any remarkable alteration in dry shrinkage after addition of palm oil sludge except a decrement of dry shrinkage to 1.9 % after addition of 15 wt% of sludge. The same variation has taken place at 800 °C to 2.9 % by addition of the same amount of sludge though there was not any change on other test bars. With regard to the found results, the negligible changes happened in shrinkage on modified stoneware body

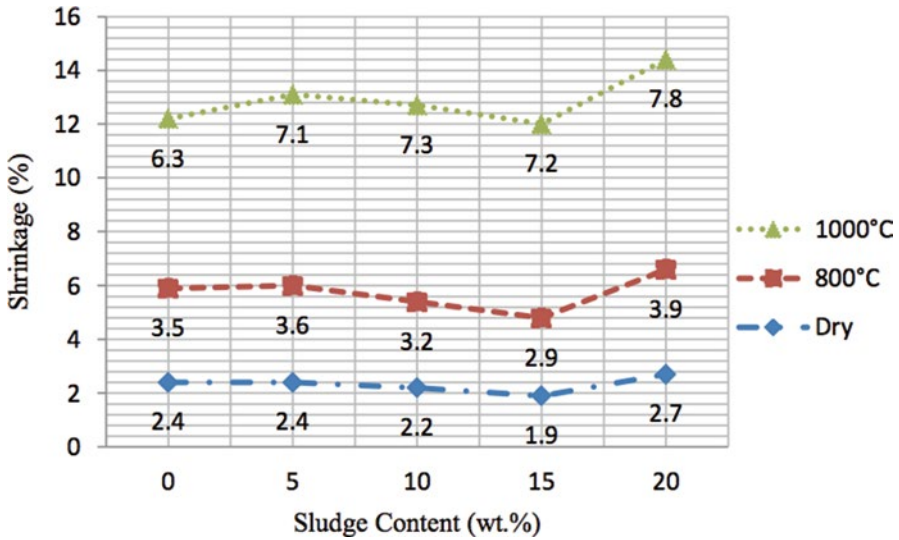


Fig. 5.2 Averaged dried and fired shrinkage of stoneware and palm oil sludge

in bone dry stage at 800 °C firing temperature. On the other hand, the shrinkage has risen up from 6.3 to 7.8 % at 1,000 °C by addition of more sludge.

All the test bars have gone through the MOR test in immersed and non-immersed states. Test bars have been arranged in two groups with five subgroups in each group according to their firing temperature at 800 and 1,000 °C. The lower tension rods were positioned in 80 mm distance during MOR test. In Eq. (5.4) which has been used for MOR calculation, F refers to maximum load, L is the distance between the supports, and d and b are the thickness and the width of the prismatic test accordingly.

$$\delta = \frac{3FL}{2bd^2} \quad (5.4)$$

According to Table 5.4 and Fig. 5.3, in general, there was a decrement in strength in both immersed and non-immersed states. The decrement rate in strength in immersed state at 800 °C is from 37.02 to 33.81 % and is from 47.84 to 35.03 % in non-immersed state.

On the other hand, the results at 1,000 °C in Table 5.4 and Fig. 5.4 illustrate that there was a drop in strength of the stoneware body after addition of sludge from 159.33 to 116.96 % in non-immersed state and from 114.48 to 86.76 % in immersed state, while there was an increment in MOR after addition of 10 wt% of sludge in immersed state at 1,000 °C.

Table 5.4 MOR results at 800 and 1,000 °C

Sludge (wt%)	MOR (N/mm ²)			
	Immersed		Non-immersed	
	800 °C	1,000 °C	800 °C	1,000 °C
0	37.02	114.48	47.84	159.33
5	31.14	100.23	35.80	109.48
10	28.79	116.46	36.50	26.76
15	32.17	81.28	29.24	116.12
20	33.81	86.76	35.03	116.96

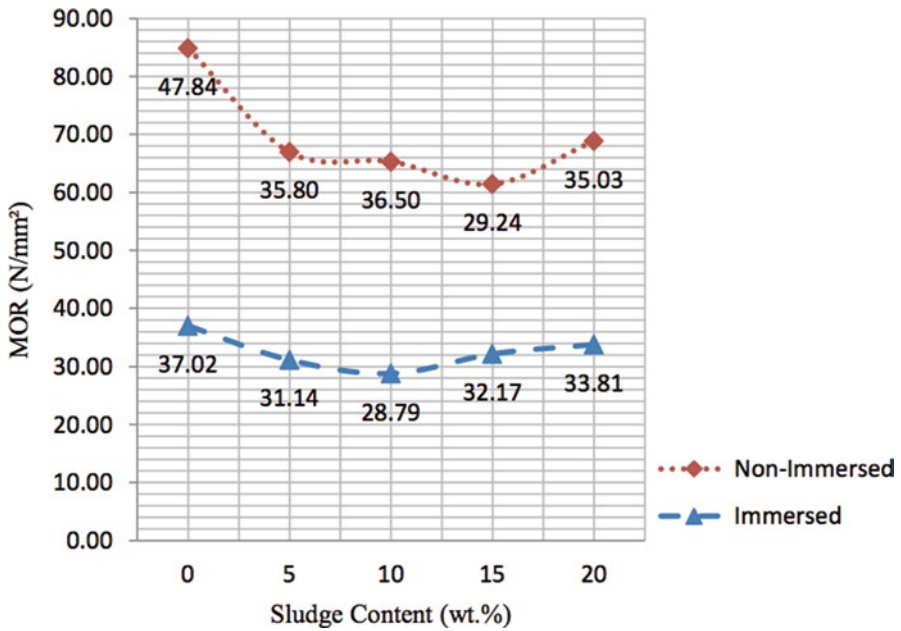


Fig. 5.3 MOR immersed and non-immersed states at 800 °C

The test bars E (0 wt%), F (10 wt%), and G (20 wt%) of mixture of palm oil sludge and stoneware have passed through the SEM test in 5000×20KV and 10,000×20KV. According to Fig. 5.5, sample E which has not any sludge content in it is more porous than sample F and G. Moreover, sample G density is greater than sample E and F. By a glance to SEM images in 10,000× 20KV, sample G porosity is least among the other samples.

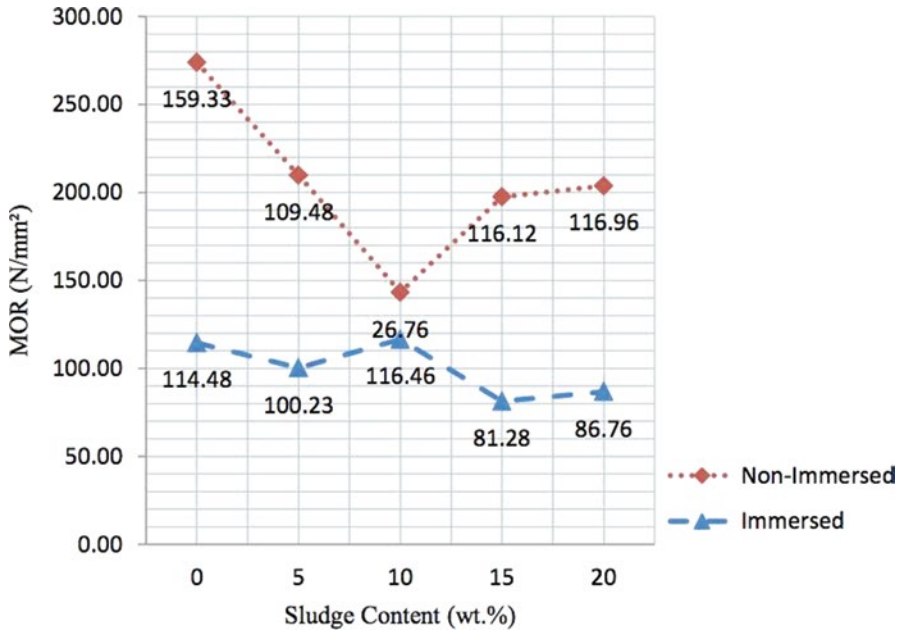


Fig. 5.4 MOR immersed and non-immersed states at 1,000 °C

4 Conclusions

To conclude, palm oil sludge is to be added to the stoneware body in the purpose of eco-friendly ceramic artwork production [22]. The size of the particles in both palm oil sludge and stoneware body must be alike. The characteristics of the eco-friendly body such as linear shrinkage, water absorption, mechanical strength, and micro-structural properties had some changes which have not affected the ceramic artwork production. It means that while the modified body shows some changes due to addition of waste, it requires the standards for the stoneware used by artist. Technical properties of clay-based ceramic products depend on several material additions. Mineralogy, chemistry, plasticity, firing conditions (temperature, soaking time, heating rate, and atmosphere), and particle size diffusion are the main factors which affect the clay-based ceramic product properties [23, 24].

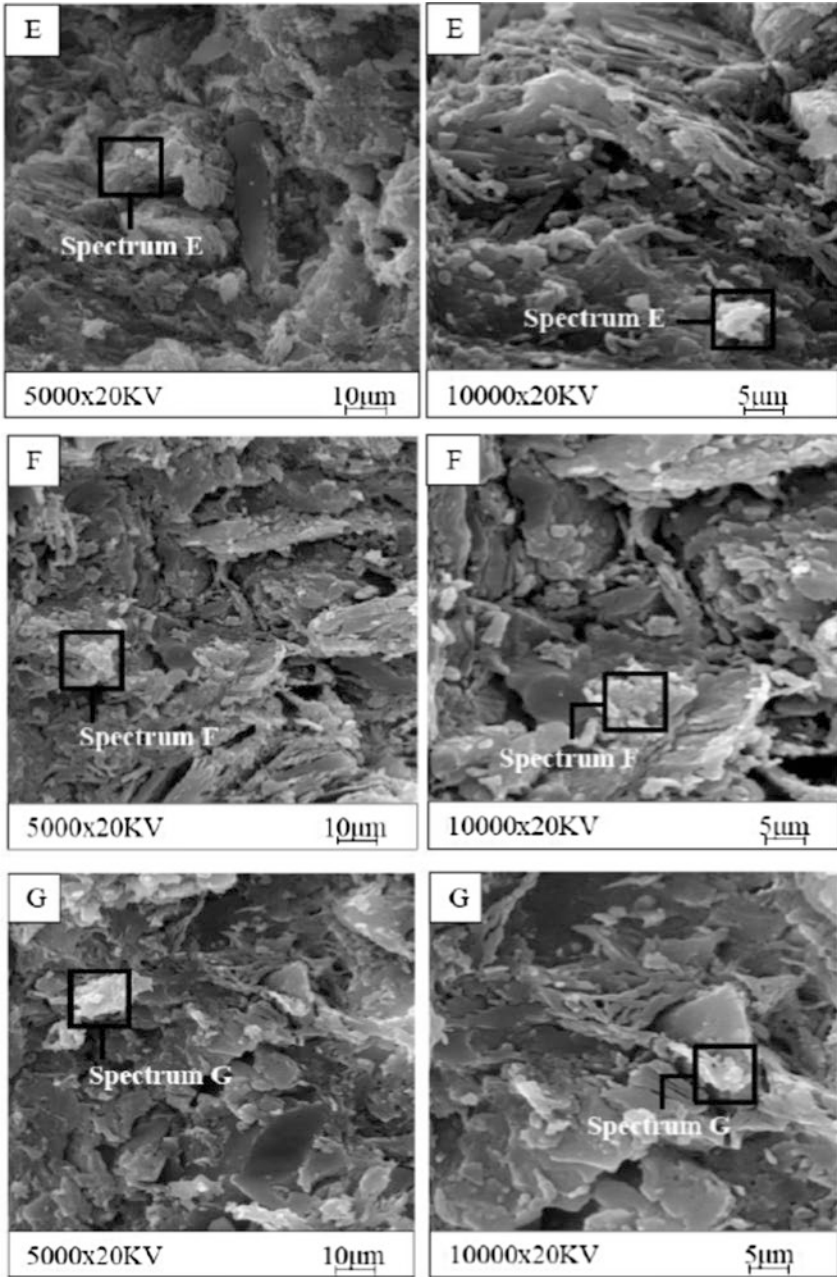


Fig. 5.5 SEM images of fractured surfaces of ceramic bodies containing 0, 10, and 20 wt% of sludge fired at 1,000 °C in 5,000×20 KV and 1000×20KV

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Chapter 6

Classification Design Motifs of Traditional Malay Wood Carving

Suhaimi Tohid, Rafeah Legino, Ruzaika Omar Basaree, Ponirin Amin, and Rahman Amin

Abstract The art of traditional wood carving is part of the common tangible heritage, which can be seen in traditional houses, mosques, and palaces in Southeast Asian countries. Therefore, the intricate design motifs of wood carving displayed intermix of design features and characteristic. Traditional wood carving is the most significant Malay ornamental art. The creative expressions of the Malay wood carving are very much influenced by the religious, moral, and ethical values of the craftsmen, which are developed as an act of submission to the Almighty. The study of this research examines the practical aspects that explain the creative and aesthetic aspiration of Malay wood carving. Data collection and analysis are gathered through a variety of means such as observation, interview, photograph, and written description, which occur concurrently with data analysis, where the explanations provided are analyzed and interpreted. It is hoped that the study would provide useful evidence of the existence of ethical values on Malay traditional wood carving. The findings could serve as valuable references for researchers who are concerned with the study of Malay traditional art of wood carving.

Keywords Traditional • Malay • Wood carving • Classification • Design motifs

S. Tohid • P. Amin • R. Amin
Faculty of Art and Design, Universiti Teknologi MARA,
40450 Selangor, Shah Alam, Malaysia

R. Legino (✉)
Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Malaysia
e-mail: leginorafeah@gmail.com

R.O. Basaree
Cultural Center, University of Malaya, 50603 Kuala Lumpur, Malaysia

1 Introduction

In the world of the Malay wood carving, the creative expressions of the wood-carvers were actually influenced by the act of total devotion to the creator of the universe. Nature was the main source of inspiration, and the design motifs reflected the principles of harmony that existed between the designer and their environment. The study aims to raise questions about the features of design motifs of the Malay wood carving and to show the artistic process in executing the traditional character. The objective of this study is to determine the appropriate classification for the design motifs from several samples of wood carving in order to classify and categorize the type of design pattern application.

The designs of the Malay wood carving are the result of a transformation of nature to art through changes in features that conform to suitable motif patterns, which emphasize aspects of beauty and norms of the Malay culture. This is related to the act of designing the wood carving, which usually involves a process of deliberately selecting, assembling, and arranging the design motifs according to the requirement to the certain concept of design. Furthermore, the design motifs, which are constrained by the bounds of moderation, hardly protrude but instead suggest the idea of humility. On the other hand, the intricate designs depict the element of repetition, which constitute to the spiritual purification of the soul.

2 Literature Review

Related research of the literature asserting a brief study on the traditional Malay wood carving development from different region. The origins, development, location, and organization of production of the early Malay wood carving, which might have begun since time immemorial, included with a brief account on the design and motif used in the Malay wood carving [1]. Furthermore, the detailed account of the historical background is attached with plenty of pictures and illustrations and provided a brief philosophy behind the making of the Malay wood carving. The discussion also noted that traditional Malay wood carving could be found in the remains of old palaces and Malay houses in different parts of Peninsular Malaysia [2].

The ancient Malay kingdom of Langkasuka, the Southern Thai state of Pattani, and the east coast states on the Malay Peninsula such as Kelantan and Terengganu have been the center of traditional arts. Indeed, the background of Malaysia grows from different ethnic, cultural, and religious communities for centuries. In Malay Archipelago, there emerged a number of important Malay-Hindu and Buddhist kingdoms such as Majapahit and Srivijaya, although China on the other hand brought with it distinctive Chinese styles and modes of living that were blended with local culture. Cultural influences are evident in Malay art, culture, and architecture [3]. The study on Malay wood carving through architecture and cosmology, which is integrated with Malay aesthetics and its relation to basic principles of

Islamic thought, was embedded with the pre-Islamic traditions that are inherited from the Indian and Chinese cultural influences. Therefore, the Malays affirmed and assimilated their traditions in new perspective in the light of Islamic religion [4].

The achievements of any civilization were reflected in the sophisticated forms of art and emphasized the manifestation of decorative motifs by the Malay craftsmen. The creative process was actually derived from the observation, perception, and the intimate experience through surroundings. This could be seen in the design motif patterns of the Malay wood carving, which include the symbols that reflected the philosophy of life and social lifestyle so as to fulfill the demands of the surrounding environment [5]. In recent years, examination about the Malay traditional art of wood carving from two different categories, which deal with the geometrical and cosmological point of view, is significantly emphasized. Besides, the study stated with the concrete application in between ideas and interpretations from the Muslim scholars about the Malay wood carving. Conclusively, the analysis also relates with the nature of the design patterns of wood carving, in which most of the design was linear in character and fell under the line groups belonging to the frieze patterns.

3 Methodology

The case study was conducted mainly by visiting the wood carving maker where most of the sample wood carvings were exhibited and kept. Data collection and analysis are gathered from the primary and secondary sources through a variety of means such as observation, interview, and photograph and written description. The accumulated material and knowledge are thoroughly scrutinized and remodeled using CAD and Illustrator software, as this was seeking the correlation between characteristics, features of design motifs, and functions of Malay wood carving through proper classification.

4 Classification and Analysis

The whole research of the case studies revolves around the interpretative content analysis approach. The focus of the study is to look and identify the presence of meaningful relationship between the concepts of Malay ethical values and the wood carving of Wan Mustaffa. These analyses seek to get beneath the surface meanings and examine instead the more implicit social conations of the traditional wood carving that has become one of the inherent values of the Malays. The Malay wood carvings besides being designed for specific functions and purposes. The basic concept and set of rules that were related to ethical values as well as aesthetic considerations of the Malays. In fact, these values governed and uphold the Malay cultural legacy and at the same time had such a great influence on the design characteristics of the wood carvings.

There are three basic classifications of design patterns in the traditional Malay wood carving, namely, the pola bujang or single pattern (Fig. 6.1), where the motif is executed in a freestyle manner that mostly depicts subjects like flowers, fruits, sun, moon, and elements of living creatures; the pola pemedang or frame/screen pattern (Fig. 6.2), which used simple elements that displayed certain meanings; and the pola lengkap or complete pattern (Fig. 6.3), which is usually combined with many motifs that are derived from roots, stumps, branches, leaves, flowers, and fruits. Likewise, the design motifs used curved lines that were not representative of the natural state of the growth itself as illustrated in Fig. 6.4. The design should start with a rounded flow called kepala kala, which most of the time ends with motifs of flowers, buds, and young shoots or sometimes the kepala kala itself.

The positive and negative spaces between the void and the design motifs should be distributed evenly and be seen visually balanced (Fig. 6.5).

The design motifs that depict the lines of growth should be in one direction of flow, which is moving forward and not backward as illustrated in Fig. 6.6.

In Fig. 6.7, the design motifs that depict the lines of growth should be in one direction of flow, which is moving forward and not backward. The projection of any of the end tips of these parts (i.e., the stem, leaves, shoots, buds, and flowers) in the design composition should not protrude and cut across one another aggressively (Fig. 6.8).

Fig. 6.1 Pola bujang
(Drawing by Mohd
Suhaimi Tohid, 2014)

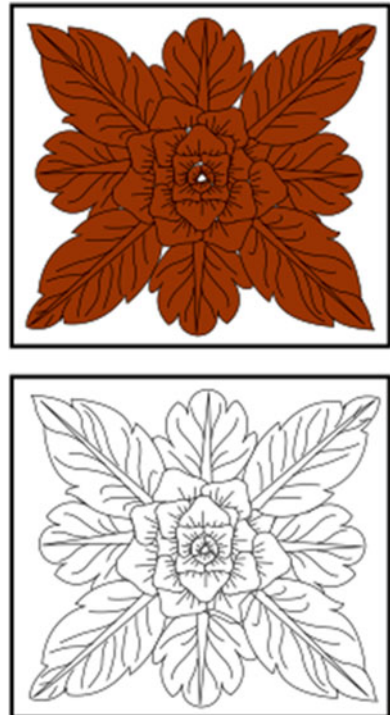




Fig. 6.2 Screen pattern (Photo by Mohd Suhaimi Tohid, 2014)

Fig. 6.3 Complete pattern (Photo by Mohd Suhaimi Tohid, 2014)



The classification from selected samples followed accordingly the style of the vegetal design motifs that intertwine and intersect gracefully as well as beautifully among themselves in perfect harmony to show the principles of refinement, flexibility, balance, and unity. Moreover, the projection of any parts that protrude and cut across each other violently and aggressively would not be permitted. This is simply

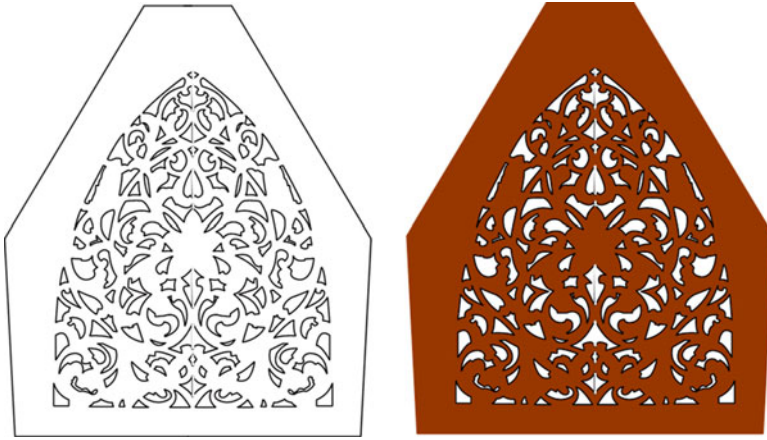


Fig. 6.4 Design motif used curved lines (Drawing by Mohd Suhaimi Tohid, 2014)

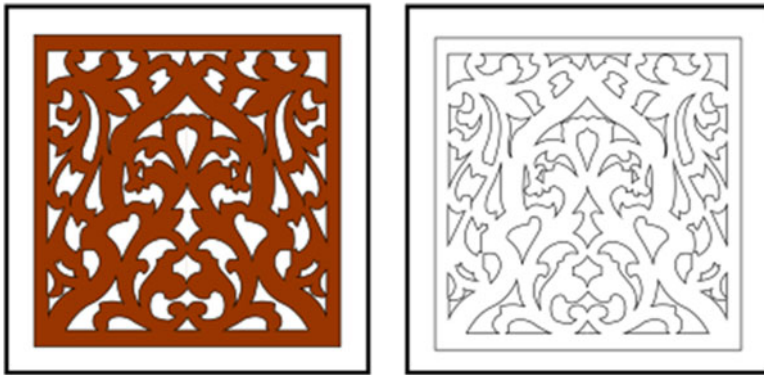


Fig. 6.5 Positive and negative spaces (Drawing by Mohd Suhaimi Tohid, 2014)

to show that man must never be cruel, oppressive, and offensive toward his fellow human beings. Most of the design patterns from wood carving samples are embedded with symbolic and philosophical significance, which were imbued with sacred contents. Nature was imitated in its archetypal spirituality, that is, it was not represented in its external form, but instead the emphasis was focused on the non-naturalistic patterns that were marked by a combination of various motifs.

The Malay wood carvings can be regarded as the treasures of Islam because these works were the result of a manifestation of an artistic expression that was inspired by the teaching of Islam. The process of assimilation, adaptation, and transformation in the Malay wood carving gave birth to the flowering of an Islamic art tradition. The enjoyment of beauty is being blessed in the religious, practical, and material needs of the community. For instance, the design motifs, which are mostly

Fig. 6.6 Vertical and horizontal reflection (Drawing by Mohd Suhaimi Tohid, 2014)

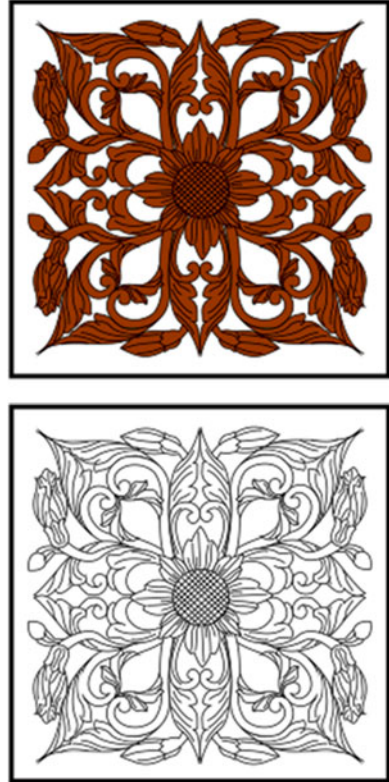


Fig. 6.7 Design motifs depict the lines of growth (Drawing by Mohd Suhaimi Tohid, 2014)

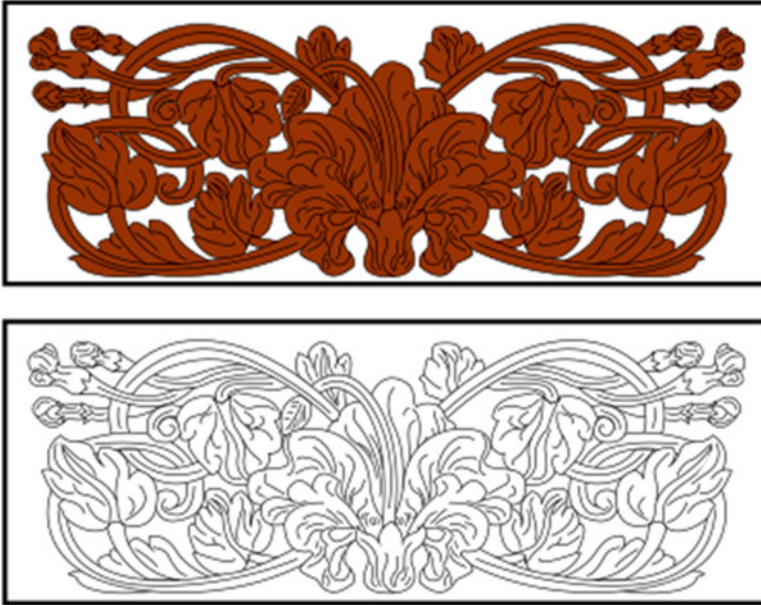


Fig. 6.8 The stem, leaves, shoots, buds, and flowers (Drawing by Mohd Suhaimi Tohid, 2014)

symbolic, reinforce the moral and spiritual teachings that are the source of guidelines to the community itself. The vegetal design motifs, which are based from the study of plants from the environment, symbolize the essence of the creator and act as a remembrance of God in the life of the Malay craftsmen.

5 Conclusion

To sum up, the analysis from each sample of wood carving clearly determined that every design was created and enhanced with appropriate design arrangement. The classification analysis stated that the wood carving design is formulated through single pattern, screen pattern, and completed pattern. Interestingly, the motif designs were transformed into stylized forms that illustrated with natural elements but still maintaining the order of pattern characteristic. For example, the stylized vegetal motifs were arranged in a series of interweaving character, depicting the concept of pattern classification. Each design pattern of wood carving still continues to use certain traditional elements of the pre-Islamic era, as long as it does not contradict with the Islamic principles and values.

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Chapter 7

Iconic Transformations from Hinduism to Islamic Art

Khatijah Sanusi and Rafeah Legino

Abstract The strategic location of the Malay Peninsula at the Straits of Malacca became the key attraction to the successful trade route between the East and the West. It became the meeting point for traders who not only brought their trades but also their religious belief system. Since the beginning of the Christian era, other religious culture such as Hinduism, Buddhism, and Islam had arrived the shores of the Peninsula. The coming of Hinduism in 500 AD has brought an end to animist culture of the Malay people. Gradually Indian belief system became the embodiment of Malay art and culture not only in the form of literary Sanskrit words but also in carved wood and textiles to fulfill religious devotions and the daily utilitarian needs. Therefore, the objectives for this paper are (1) to investigate how Hindu worldview influences the form and content of its artistic element in selected field-woodcarving and textiles, (2) to postulate the Malay-Islamic aesthetic principles derived from the Qur'an and hadith, and (3) to discuss the transformation from Hindu icons to Islamic worldview in art. The appropriate approaches that merged and integrated with the iconic elements of such transformations are determined. In addition, based from the key evolution factors of Hindu characteristics, several samples of iconic images were identified and classified. The samples presented justified when Islam came to the Malay Peninsula in the fifteenth century; it has brought Hinduism to an end. Indeed, through the whole Islamization process, Islam has transformed the body and soul of the Malay mind. It shaped both religious and spiritual vision of reality specifically in terms of artistic and cultural expressions.

Keywords Islamic art • Hinduism • Malays art • Iconic motifs

K. Sanusi (✉)

Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor Darul Ehsan, Malaysia
e-mail: katysa47@gmail.com

R. Legino

Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Malaysia

1 Introduction

The Malay Peninsula's position where three ocean worlds came together was the key attraction to the successful trade route between the Indian continent and the Far East. It became the meeting point for traders who not only brought along their trades but also their religious belief system. Since the beginning of the Christian era, various religious cultures such as Hinduism, Buddhism, and Islam had arrived the shores of the Peninsula. According to an eminent Muslim scholar, Syed Muhammad Naquib Al-Attas, the coming of Islam to the Malay world in the thirteenth century constitutes a momentous event that decisively shaped both the worldview and ethos of the Malay society [1]. Islam not only shaped the religious and spiritual vision of reality but also its artistic and cultural expressions of the Malays. Such influences were visible in various traditional forms including performance, literary, sound, and visual art. Specifically in traditional Malay art, the impact of Islamization of the Malay world has profoundly affected significant change in the iconography, morphology, and their functions in the Malay society. However, the shift of worldview from Hindu Buddhism to Islam did not result in a drastic change especially in the manifestation of the Hindu traditional art forms due to the ingenuity of Sufi masters who were able to accommodate what was permissible in Islam that gradually dovetailed with the new faith [2].

The impact of Islamic tradition of the Malay woodcarving and textiles is still pervasive after more than five decades when Malaysia gained her independence. Impressive woodcarving work adorned the interiors of grand palaces throughout the country. In the hands of traditional Malay woodcarver, it is the profound understanding and beliefs of the Malays' aesthetic principles that exude in their elaborate expressions and confounding patterns and composition that astonish the viewers. It is here that the local genius of traditional Malay woodcarver as the artist observes and interprets the ambience that surrounds him [3]. As posited by scholars, the traditional Malay art forms are but the visual embodiment of the spiritual and moral-ethical values of the Malay society. Apart from their importance as everyday ceremonial utilitarian artifacts, they have numerous other functions as religious hangings, royal insignia, sacred talisman, and others for they are all interconnected with religious and political organizations, marriage, social status, and exchange purposes. As a corollary, it is only by seeing these art forms in their cultural context that we can understand their true value and meaning [4]. Thus, this paper attempts to discuss iconic transformation from Hinduism to Malay-Islamic art forms specifically in woodcarving and textiles. First, it will delve briefly the historical background of these icons in the Malay Peninsula during the pre-Islamic period; this is to provide the background of such art forms before cultural transformation. Second, the coming of Islam and its worldview in art and culture of the Malay people will be elucidated. And third, this paper will postulate on the change and transformations of Hindu icons to accommodate the Islamic aesthetic principles.

2 Traditional Malay Art in the Pre-Islamic Period

Before the advent of Hinduism, the Malay Peninsula, like any other indigenous groups in the region, believed in animism. They had faith in the existence of spirits, which reside in all living things. Nothing was more meaningful to these people than to be able to live in harmony with nature and harboring deep respect to these spirits that in turn will be their perennial guardians. As a corollary, creative art activities among these groups are but their iconic visual interpretations expressing collective animistic beliefs inspired from living creatures from their immediate environment—be it in the form of wood, stone, fiber, textiles, and others.

3 Hinduism and Its Worldview

The coming of Hindu religion brought by the traders to the Malay Peninsula in 500 AD ended the pervasive animist culture. The Indianization was introduced by the Indian traders who were responsible for the spread of Hinduism in the Malay Peninsula [4]. It was spread by intermarriage alliances between traders, rulers, and the local people. Hindu culture and way of life was steadily absorbed into the culture of the Malays for centuries before the coming of Islam in the thirteenth century. The influence of Indian art and culture in the development of traditional Malay art is not only in the literary Sanskrit words, literature from Hindu epics, the Ramayana, and the Mahabharata, but also in the form of carved stone, wood, and textiles. Not only these forms were expressions of religious devotions but were made to fulfill utilitarian needs with exquisite beauty.

The Hindu belief system of Trinity or Trimurti resides in their three main gods who are responsible in the well-being of the universe. They are the Brahma, the Creator whose mount is the goose; Shiva, the Destroyer with the bull as his mount; and *Vishnu*, the Preserver with *garuda*, the mythical bird, as his mount. Hindu gods and heroes play a considerable role in artistic expression. For instance, more often than other gods, *Vishnu* and his mount, *garuda*, are pervasive in Hindu artistic forms—both in sculptural works and in paintings. This is simply because *Vishnu* is the god who is actively involved in preserving religious rites and everyday concerns of the Hindu's social life; see Fig. 7.1.

In addition, the elements found in the Indian cosmology also became significant icons, as in the notion of upper and lower worlds. The mythical birds, *garuda*, represents the upper world, while the dragon, *naga*, a significant icon in Buddhism (an offshoot of Hinduism), is considered the ruler in the lower world. Such revered icons the *garuda* and *naga* are prominent symbols associated with regalia throughout the Southeast Asian regions that appeared in various guises and materials [3]. However, these symbols are restricted only to royalty and the aristocrats in most Asian regions.

Fig. 7.1 Trimurti of the Hindu god: from *left* Brahma, Shiva, and Vishnu [13]



Notwithstanding, the Hindu perception of dynamic energy or vital life force embodied in all living things (i.e., continuously moving in a state of flux) exudes in all forms of its visual expressions. This is evidenced in the voluptuous of female figures symbolizing fertility (rather than eroticism to some!). Similarly such concepts of effervescence of energy and vital life force are all discerned in the treatment of living things—animals, flora, and fauna to the most natural and exuberant forms even to the minutest details. As Hinduism became further absorbed in the daily life of the Malays, the role and functions of textile objects also changed. They were dominantly used as religious and status symbols as in marriages and the inauguration of leaders or rulers. Till today, yellow, for instance, becomes the color preference for royal attires, and court regalia is still in practice.

4 The Advent of Islam to the Malay Peninsula

When Islam came to the Malay world in the thirteenth century, it brought the Hindu-Buddhist era to an end [4]. As yet, another social transformative experience was brought about by the new faith to the coastal areas of Malacca, Kelantan, and Terengganu. Similarly during the Hinduism period, in the second mass religious conversion, it was the Muslim traders, coming from as far west as from Arabia, Persia, and the west coast of India and as far north as China, who were responsible for the spread of Islam in the Malay world. Such mass conversion to Islam among the Malay commoners was attributed to the conversion of the royalties and leaders

who acted as their role models. Due to the subtleties of the Sufi teachers in integrating the preceding religious beliefs and practices with the mystical aspects of the new faith, Islam became a strong attraction to the rulers in the Peninsula and so was in the rest of the Muslim world. Parallel to Hinduism, the main emphasis in artistic creativity in Islam is also the visual manifestations of religious beliefs. That Islam became a dominant factor in Malaysian traditional art and a major “civilizing force” of the Malay culture is the opinions shared by many scholars, for instance:

The process of Islamization of the Malay Archipelago, which culminated in the 13–16th century, brought about the greatest, known Cultural Revolution in the region. It was the momentous event that transformed both the body and souls of the Malays. [1]

What is it that Islam brought to the Malay world that is artistically and civilizationally determining? According to Lamnya Al-Faruqi, Islam brought the holy Qur’an, the scripture of Islam, which provided a concrete model for artistic form and content. It also brought the *hadith* (the sayings of the Prophet Muhammad) literature [5]. It was from these core materials which came the transformation of the whole culture and civilization of the Muslim Malay [2]. It was often mentioned that Islam was disseminated to the general populace via the royal courts, as asserted by Osman: The spread of Islam in the Malay Archipelago has been linked with the princely court since Islamic scholarship and Muslim prestige were associated with the royal courts. Not only were the Muslim traders and scholars from the West flocked to these centers but also the princely courts provided a base for proselytization by Muslims in the area [6].

5 Transition from Hinduism to Islamic Weltanschauung

Islam brought a new vision of reality. As a monotheistic religion, it defines God as a unique transcendent Being, which is inexpressible. Such concept of God is directly in contrast with the pre-Islamic Hindu religion, which is rooted in polytheism expressed through various depictions of Hindu deities as evidenced in religious monuments and architectures. As opposed to the iconographical nature of Hindu art, Islamic art, in the words of Nasr, “is essentially aniconic” (non-imaginary) in nature since in Islam the rendition of naturalistic or representational images is prohibited. Although the Qur’an itself does not explicitly prohibit pictures of human or animal form, a *hadith* is quoted stating that “he who makes images will suffer the most severe punishment on the last day... the angels of mercy do not enter dwellings where there are such images” [7]. While it is true that such images are avoided in a religious context like the mosque, however, outside of a religious setting, artists are happy to draw images of animals for the purpose of education or storytelling through pictures. Notwithstanding, most Muslim artists, however, resorted to the process of abstraction through stylization and denaturalization in their art forms. According to Sulaiman Esa, the Sufi *ulama*, guru, and saints were responsible in determining the form and direction of Islamic traditional Malay art [8]. This was

made possible through their metaphysical interpretations of the Qur'an concept of man nature and beauty that proved essential in the shaping of Malay worldview pertaining to the iconographical aspects of Malay art [9].

6 Tawhid as the Determinant Factor in Islamic Art Aesthetic

In the book of *Islam and Art* [5], Lamnya al-Faruqi has eloquently addressed how Islamic worldview determines the form and content of Islamic art. Art from an Islamic perspective, she maintains, "is primarily an abstract art. Since Allah (SWT) is so completely other-than-the natural world could stand a symbol for Him," (p.20). She further posits that the main function of Islamic art is to reinforce the concept of *tawhid*—that is, a visual manifestation of the meaning of the *Shahadah*—there is no god but Allah (oneness of God). But how could an artwork, a painting, for instance, reinforce the concept of unity of God? To answer this, we need to understand the message of *tawhid* with the idea of monotheism. Allah is other than His creation. He is inexpressible. As the Qur'an cites:

No vision can grasp Him,
But His grasp is over
All vision: He is Above all comprehension,
Yet acquainted with all things. [10]

As a corollary, in the form of content, Islamic art is abstract in nature, as mentioned above; it is only rational that in order to intuit to the idea of God, an abstract Being or a *Dzat* as in Abdullah Muhammad's (Nakula) word, the most appropriate image has to be one that is equally abstract in nature. If otherwise (i.e., in representational image), it will in the end definitely lead the viewer to representational image immediately discerned in his/her mind. In the same book, Lamnya Al-Faruqi has stipulated three artistic devices to conform to the Islamic principles of abstraction processes. These are (1) stylization, (2) non-individuation, and (3) repetition. In stylization process, the object is simplified in order to revoke its natural appearance or becomes denaturalized. While the concept of non-individuation is the portrayal of images showing their lack of variations and/or individuality that they ceased to be portrayal of living things or persons, they are just blocks of colors, shapes, or textures in space [5]. The method of repeated images in symmetry denotes structures with meaning that needs to be interpreted. It provides another manner in conforming to the Islamic aesthetic to achieve abstraction principles. The transformation of realistic iconographic images into aniconic ones through stylization is thus genuine attempts created by the past Muslim artists to express the inexpressible. Notwithstanding, objects in symmetry are testament to the incredible creative energy which Jose Argüelles mentions as *an internal technology* of the artists since the abstraction process involves mathematical principles and art goes hand in hand. And this is pervasive in the Islamic world [7].

Another pertinent aspect of Islamic art aesthetic principles, as cited by Nasr, is that Islamic art does not add foreign elements to the shape of the objects, rather it brought forth their potential qualities. It is a method of ennobling matter. Through the creative process of ornamentation, artists unearthed the veil that hides its spiritual and divine qualities. An Islamic art thus becomes a cosmogram. Its archetypal and divine origin illuminates, purifies, and transforms the soul of the onlooker. A work of art is beautiful because it obeys cosmic order and therefore reflects universal beauty [11].

7 Transformation of Hindu Icons to Malay-Islamic Art

Since the coming of Islam, the process of transformation of artifacts from the preceding culture to the new faith has become phenomenal. In order to interpret objects into nonrealistic images from the natural world, human figures, for example, Muslim artists resorted to stylize and denaturalize their chosen motifs to accommodate to Islamic aesthetic principles as stipulated by Lamnya Al-Faruqi [5]. Such images are ubiquitously seen in the Persian miniatures and local treatment of figures as in *wayang kulit*, shadow play in Fig. 7.2, and its evolution from the Indian folktales in *wayang golek*, in Fig. 7.3.

Fig. 7.2 Sri Rama,
Wayang Kulit Hindu
folklores [14]



Fig. 7.3 *Wayang golek purwa* taking its stories [13]



Fig. 7.4 The evolution of Hindu *makara* into *bangau* motif [3]

Another fine example of innovations and transformation of icons from the preceding culture is the mythical bird *makara* and its transformation in drawing as in Fig. 7.4.

This mythical sea monster of the Hindu period was the protector of fishing boats from the sea evil forces. It is located on the port side of fishing boats (to provide

Fig. 7.5 The dematerialization of form via *awan larat* pattern on a *bangau* [14]



support for the masts when not in use). The process of Islamization saw such an image being transformed into intricate ornamentation of a *bangau*, an egret, in Fig. 7.5. It is no doubt an astounding adornment unveiling the concept of ennobling matter will bring forth the potential quality of the wood through complex lacelike embellishments. Further examples in the transformation of three-dimensional form of the Hindu myth can also be discerned in garuda icon that has been transformed into a pair of wings only with its new name as *merong* in Fig. 7.8.

Besides content, structure, and form as discussed in the preceding paragraphs, the limitless of Allah, the concept of infinity, as proclaimed in His attributes is emphasized visually through infinite abstracts and motifs swirling endlessly without end nor beginning, which is locally known as *awan larat*, the Malaysian version of arabesque. Such a motif is believed to be an innovation and transformation of the dragon icon inherited from the previous culture. This image has evolved into an exquisite form of ornamentation of plant forms called the *awan larat*. Though such creativities have changed the auspicious symbol from its original characteristic, one can still discern its original structures of swirling motifs typical of the dragon image in Figs. 7.6 and 7.7.

Similarly in textiles art, in order to conform to the Islamic aesthetic, images from the natural world of fauna and flora have also been stylized into abstract ornamental motifs such as in Fig. 7.8, in which the mythical phoenix bird changed into decorative ornaments, with stylized garuda wings at the hemline.

The infinite repetitive *awan larat* motifs pervasive in traditional Malay art designs are but a visual reminder of an intuition of the infinite to Muslims in their daily life activities. Ismail Al-Faruqi maintains the unique function of ornamentations: Instead of being an unessential component added superficially to a work of art after

Fig. 7.6 Dragon motif in *songket* textile influenced by Hindu-Buddhist period [15]



Fig. 7.7 Transformations of the dragon icon into an abstract *awan larat* motif [3]



Fig. 7.8 Stylization of the phoenix bird and *sawang*, *garuda* wings into decorative ornaments on batik sarong [16]

its completion, ornamentation is the core of the spiritualizing enhancement of the artistic creation and Muslim environment [11]. As an effort in the shaping of human ambience as proclaimed by Ibrahim T. Burckhardt [12], the *awan larat* which is the Malay version of infinite pattern is embodied in the architectural and interiors of built environment as well as in utilitarian materials of everyday use as in Fig. 7.9. Thus, the ubiquitously found arabesques patterns in Muslim environments are not the psychological avoidance of horror *vacui* as claimed by M.S. Dimand and many other western orientalists, rather it is the Muslim artists' expression of an intuition of God's attributes—infinity and transcendence! [9]. In tandem with Ismail al-Faruqi, Lamnya further posits: The beautiful, the significant in art, therefore, has been for the Muslim not an aesthetic portrayal of humanity. Instead this transcendence-obsessed culture sought, through the creation of the beautiful, to stimulate in the viewer or listener an intuition of, an insight into, the nature of Allah *subhanahu wa ta'ala* and of man's relation to Him [5].

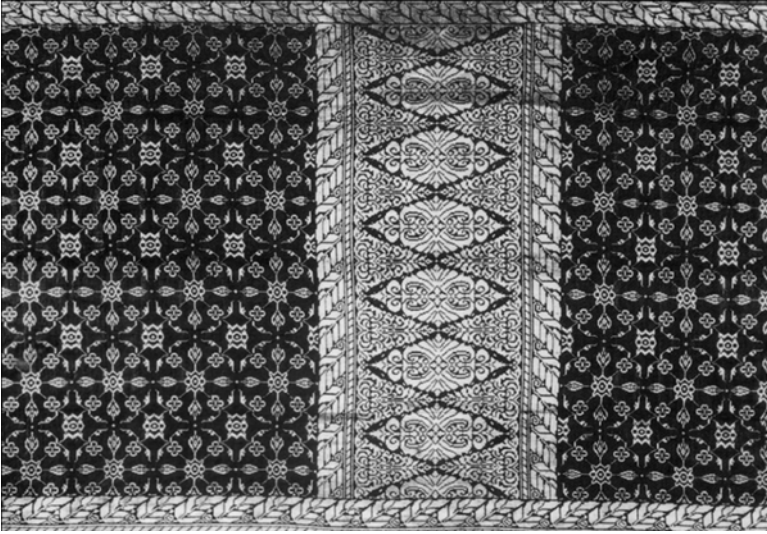


Fig. 7.9 Abstract geometric motifs with infinite concept in *songket* material [4]

8 Conclusion

Traditional Malay art will remain as human expressions of creativity and beauty. Its future depends on the artists' and designers' abilities in adapting to new needs, ideas, and technology. In order for the spirit of traditional values to become sustainable in this globalized world, there is an urgent need for these practitioners to generate expression of traditional art forms in contemporary *language* both in media and technology. This is to ensure that contemporary traditional Malay-Islamic art is not only moving in the same par with the mainstream art but also sustaining our art as a living tradition specifically from this region.

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Chapter 8

The Philosophy and Geometric Patterns of Malay Woodcarving

Ruzaika Omar Basaree, Rafeah Legino, and Mohd Yusof Ahmad

Abstract This paper investigates the Malay woodcarving in terms of its philosophy and innovative potential. Its philosophy emphasizes creative expressions of the woodcarvers that are influenced by moral ethical values, which are connected with the worldviews of the Malays. The display of fine craftsmanship serves as a real multicultural artistic value inherited from various cultures. It is an attempt to investigate and examine the characteristics of the design motifs used within the carvings, which manifest the cultural values that exist between the religion and cultural heritage shared by the dominant Malay-Muslim people. It also inspects the esthetic dimensions of the creative aspirations of the Malay woodcarvers where the enjoyment of beauty is not only present but also blessed in the religious, practical, and material needs of the Malays. Malay craftsmen make use of the practical applications of geometric principles to execute a wide range of geometrical patterns that they use in their work. The principles of organization involved are usually aimed at finding certain solutions for unity, in an attempt to create a unified whole out of diverse elements of balance between harmony and variety. Through the intricate construction of geometrical patterns, Malay woodcarving functions as cultural link that ignites artistic imagination of human activity built upon intuitive understandings of an instinctive mathematical knowledge used in the community in producing artistic products. Analyzing its design patterns will not only extend but also develop new ideas in this area of research. Even though the connection between traditional art and mathematics is considered ancient, it is not clearly established and defined in the study of the Malay woodcarving.

R.O. Basaree (✉)
Cultural Center, University of Malaya, 50603 Kuala Lumpur, Malaysia
e-mail: zeqah@yahoo.com

R. Legino
Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Malaysia

M.Y. Ahmad
Faculty of Administrative Science & Policy Studies, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

Keywords Malay woodcarving • Malay geometric patterns • Malay concept of beauty • Hierarchy of Malay woodcarving

1 Introduction

Malay woodcarving is defined and modeled from the cultural, historical, and philosophical points of view. The act of designing the woodcarving involves a process of deliberately selecting, assembling, and arranging the design motifs according to the philosophy of the Malay woodcarving that stresses the concept of the *awan larat*. The concept of *awan larat* emphasizes the characteristic of a steady movement that emanates from a mysterious source, which slowly and naturally grows in equilibrium and harmony such as found in:

In growth is source
 Rooted in mystery
 Its sharpness harms no foe
 Encircles nay a friend
 Yet together entwined in blissful harmony

The design motifs, which are constrained by the bounds of moderation, hardly protrude but instead suggest the idea of humility. On the other hand, the intricate designs depict the element of repetition, which constitute the *zikir*, which is the spiritual purification of the soul.

2 Literature Review

Traditional Malay woodcarving depicts the Malay concept of beauty, which governs seven basic principles like (1) spiritualism or mysticism emphasizing Divine principles based on religious beliefs of higher spiritual values; (2) unity depicting harmony that organizes and unifies all elements of design and motifs into a complete whole composition; (3) symbolism based on signification and connotation representing the viewpoint that highlights hidden meaning; (4) refinement demonstrating the finesse or delicacy signifying esthetic qualities of intricacy, subtlety, and complexity; (5) symmetry regarding regularity or orderly, which is equated with the idea of geometrical framework; (6) flexibility depicting gracefulness and fluidity, which refers to refined artistic sensibility and skillfulness of the work; and (7) functionality that deals with usefulness or utility, which stresses the functional or utilitarian aspect of a work of art besides beauty.

In the Malay woodcarving, the most significant ornamental art emphasizes creative expressions hierarchically. An account of its background is attached with pictures and illustrations as in Figs. 8.1, 8.2, 8.3, and 8.4.



Fig. 8.1 Woodcarving in calligraphy (Courtesy of Othman Mohd Yatim)



Fig. 8.2 Woodcarving in architecture (Courtesy of Ruzaika Omar Basaree)

The concept of symmetry and transformation is a comprehensive study to recognize that the geometry of the Malay woodcarving would in one way or the other provide a different kind of observations which will generate interest especially in analyzing and translating patterns to formal mathematical representation.

Symmetry, like pattern is omnipresent. It is the glue that binds the Universe. It is physically, aesthetically, morally and in all kinds of other ways – some obvious, some remaining mysterious. (Syed Jan Abas and Amer Shaker Salman, **Symmetries of Islamic Geometrical Patterns**, World Scientific, Singapore: 1995, p.viii)

Fig. 8.3 Woodcarving in artwork (Courtesy of Ruzaiika Omar Basaree)



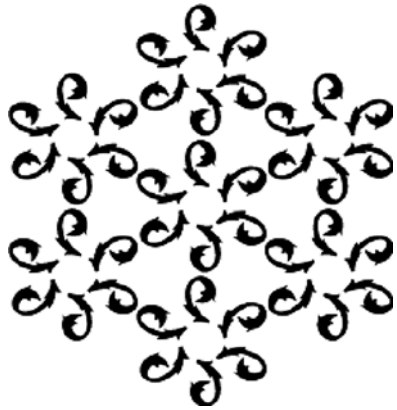
Fig. 8.4 Woodcarving in artifact quail trap – photo by David Lok (Courtesy of Farish Noor and Eddin Khoo)

It is hoped that by introducing the mathematical principles behind the classifications of these patterns, it will indirectly uncover the contributions and examine to what extent the patterns of the Malay woodcarving have provided the underlying mathematical ideas about geometry. The patterns in the Malay woodcarving are ornamental designs made up of repeated and combined motifs. These patterns are in

Fig. 8.5 Vertical, horizontal, and diagonal directions



Fig. 8.6 Order 6 in 60° rotation



fact repetition of one or more elements of designs such as lines, shapes, and textures found in the vegetal design motifs that are usually arranged symmetrically.

The concept “symmetry” is very useful to symbolize the interdisciplinary co-operations since it is widely known that it has both scientific and aesthetical meanings since ancient times. Interestingly, the very term “symmetry” was strongly associated in particular with mathematics and architecture in a complex way. (cf., D. Nagy “The 2500-year old term symmetry in science and art and its ‘missing link’ between the antiquity and the modern age”, *Symmetry: Culture and Science*, 6, No. 1, 18–28, 1995)

The techniques that are used for these four types of repetition are called transformations, which include (Figs. 8.5, 8.6, 8.7, 8.8, 8.9, 8.10, 8.11, and 8.12):

- *Translations*
- *Rotations*
- *Reflections*
- *Glide reflections*

Fig. 8.7 Order 4 in 90° rotation



Fig. 8.8 Order 3 in 120° rotation

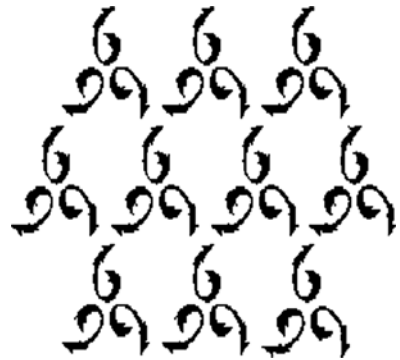
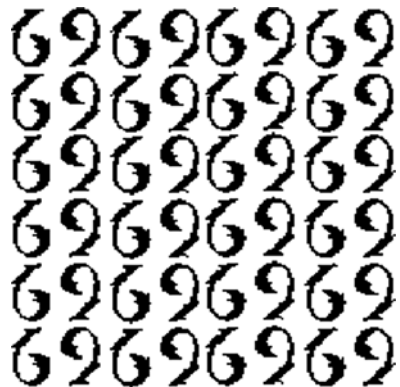


Fig. 8.9 Order 2 in 180° rotation



3 Analysis and Interpretation

This research identifies and recognizes the philosophy and geometric patterns of Malay woodcarving which manifest the cultural values that exist between the religion and cultural heritage shared by the dominant Malay-Muslim people.

Fig. 8.10 Vertical reflection



Fig. 8.11 Vertical and horizontal reflections

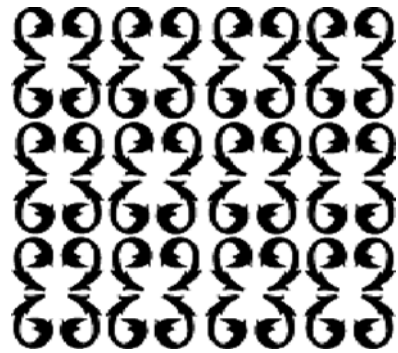


Fig. 8.12 Glide reflection



It focuses the presence of meaningful relationship between the concepts of Malay ethical values and the work of the woodcarvers. It also pursues to get beneath the surface meanings and examine the more implicit social conations of the traditional woodcarving that has become one of the inherent values of the Malays. The Malay woodcarving besides being designed for specific functions and purposes, its

making was actually based on the basic concept and set of rules that were related to the esthetic considerations of the people. In fact these values governed and uphold the Malay cultural legacy and at the same time had such a great influence on the design characteristics of the Malay traditional art of woodcarving.

The comprehensive study recognizes that the geometry of the Malay woodcarving would in one way or the other provide a different kind of observations which will generate interest in analyzing and translating patterns to formal mathematical representation. Nature was the main source of inspiration, and the design motifs of the woodcarving reflected the principles of harmony that existed between man and his environment. The design motifs of the Malay woodcarving are the result of a transformation of nature to art through changes in features that conform to suitable patterns, which emphasize aspects of beauty and norms of the Malay culture, the ethics, and moral values which are connected with a worldview of the people.

4 Conclusion

The Malay traditional works of art can be regarded as the treasures of Islam because these works were the result of a manifestation of the evolution of an artistic expression, which was somehow deeply rooted and inspired by the teachings of Islam. The process of assimilation, adaptation, and transformation that took place in the Malay world gave birth to the flowering of an Islamic arts and crafts tradition.

The design patterns used are symbolic and abstract deriving mostly from the vegetal motifs where the transformation of nature is its essence. These motifs are beautifully stylized and executed in repeated patterns emphasizing the concept of infinity, where there is no beginning and ending. Everything in the design is inter-related through the contemplation of the repeated patterns, which direct our mind to turn towards the Divine.

The basic mathematical concepts such as symmetry and transformation are used in the design motifs of the woodcarving. The principles of organization involved in the designs are usually aimed at finding certain solutions for unity, which attempt to create a unified whole out of the diverse elements that result in a balance between harmony and variety underlying the process of creating the woodcarving.

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Chapter 9

Reformulating Glaze Defect Recipe to Be Recycled as Ceramic Surface Treatment

Nurul Shafinaz Ibrahim, Diana Mohamed Raif, Verly Veto Vermol, and Rusmadiyah Anwar

Abstract Glaze is considered as essentially an important layer to cover the ceramic body. It is formulated by clay-based components and mixed with the formulated ratio as a base glaze. The color or effect will base on the reaction of opacifier used. The main problem faced by this ceramic surface treatment was the defects. It is mainly due to the unstable recipes used. Most of the ceramic industry rejected akin of glaze. However, the creative industry like studio's ceramic works including the sculpture has never faced with this issue due to the art perspective. Yet, it's difficult for the ceramic artist to replicate the significant effect from the defects glazed recipes. This study has explored the character of glaze defect to be recycled and to be used for artistic works. The five types of defect identified which considered as rejected glazed and reformulate the recipes. The result then shows which materials influenced and generate the defect. The investigation of glaze recipes, application technique, and firing segment has confirmed that defect can be recognized and replicable.

Keywords Glaze • Ceramic defects • Parameter formulation • Surface treatment

1 Introduction

1.1 Glaze Components

The article by the International Syalons explaining about the use of glazes is familiar; however, the technology involved in the composition and application is complex and diverse. A number of variations are possible within many generic types, e.g., clear, glossy, matt, colored, and textured. Glazes are usually mostly comprised of a

N.S. Ibrahim (✉) • D.M. Raif • V.V. Vermol • R. Anwar
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: shafinaz0143@salam.uitm.edu.my

Table 9.1 Basic component of a ceramic glaze

R ₂ O oxides	R ₂ O oxides	RO/R ₂ O oxides
Acidic oxides	Amphoteric oxides	Basic oxides
Glass formers	Stabilizer	Flux
SiO ₂ (silica)	Al ₂ O ₃ (alumina)	BaO (barium oxide)
	ZrO ₂	CaO (calcium oxide)
	TiO ₂	SrO (strontium oxide)
		ZnO (zinc oxide)
		PbO (lead oxide)
		Na ₂ O (sodium oxide)
		K ₂ O (potassium oxide)
		Li ₂ O (lithium oxide)
		B ₂ O ₃ (boric oxide)

glassy material. In the case of opaque and matt glazes, the glassy matrix contains crystalline matter [1]. Opacity is occasionally produced by a phenomenon described as glass-in-glass phase separation. Although several glass-forming systems exist, ceramic glazes are almost exclusively based on alumina-silicate glass systems [2]. The main glass-forming oxide, silica (SiO₂), is modified by the addition of a range of other oxides. The modifiers act to alter thermal, chemical, and physical properties (Table 9.1).

1.2 Glaze Application Techniques

The firing atmosphere of the kiln affects the glaze color and quality, whether it is oxidized or reduced. The temperature reached, the length of firing, and the thickness of the glaze application are important factors that will affect the final appearance of the glaze [3]. The article by Brother Handmade explains that there are several methods to apply the glaze onto the ceramic product and can be divided as:

- **Dipping**
In this method, the pottery is immersed in the glaze for about 2–4 s. The glaze usually is the consistency of heavy cream. This is the method often used with large quantities of pottery to glaze. It’s a much faster method used. And it will give an even glaze coat. If this method is chosen, the bottoms typically get a good coating of wax resist so that the glaze won’t stick there [4].
- **Pouring**
The artist typically wants the same consistency as dipping glazes that being like heavy cream. To glaze interiors, glaze can be poured into a pot; the excess can be poured into another pot and so on. Pottery glazes can also be poured over the outside of a pot. Usually it is done when a thinner coat of pottery glaze is applied as a top glaze to an underglaze. The two glazes interact, often resulting in a greater visual depth [4].

- **Brushes**

A lot of pottery glazes are made to work well when applied with a brush. These glazes are much thicker than dipping and pouring glazes. Some are as thick as pudding. Glazes that are made for this application are made to blend well during application and will not show brush marks. Synthetic sables work well for your brush's bristles. They will come back after cleaning and give a nice even stroke and will want to investigate brushes more in depth, as the selection of brushes is vast. It is important as in any trade to use the right tool for the job at hand [4].

- **Sponges**

The type of the sponge and texture will translate into interesting patterns in the glaze. Sponges are used in many steps of pottery creation, including glaze application. Use a fine-textured potter's sponge, either synthetic or natural to apply the under glaze. For applying the decorative second layer of contrasting glaze, it may use a more porous sponge. This will cause a different look and an artistic moment of own ability could show up. There is quite a selection of sponges, also will be able to experiment [4].

- **Airbrush**

When using this method, safety is very important. Always make sure a respirator, gloves, glasses, clean workspace, and a thought-out system. A spray booth would be a very good idea. Some of the glaze bases are very caustic. Volcanic ash pottery glazes are particularly dangerous, but the effect produced is worth the extra work and care. Borax, nickel cadmium, chrome, cobalt, copper, iron, ferrous sulfite, lead, and manganese are some of the chemicals in the glazes [1]. Some of the glazes are totally nontoxic, but ceramist would not want it in the lungs, eyes, or skin. Whenever using an airbrush, be cautious of the size of nozzle to use as there are particles in glaze and they need to fit through the gun [4].

2 Unindustrialized Ceramic Surface Treatment

Decoration is one of the medium to enhance the beauty and interesting aspect of a product. There are many types of the decoration techniques that could be applied on to the product [5]. The examples for the decoration techniques are carving technique, stamping, decal, slip trailing, and others. The effects created from the use of glazing materials can also be used as a decoration on the product [6]. For example, the glaze defects that occur naturally or planned may create an interesting effect on the product. Therefore, researcher wants to study the effects of the glaze defect as the decoration technique that can be applied to the ceramic products. Indirectly, it could change the public perception of the use of glazing defects and can also give a good impression. The elements to be tested are five types of glaze defects. In this experiment, samples of the study will be conducted using test pieces. In addition, it will go through several processes such as simple forming process, bisque firing process, and high-temperature firing or glaze-firing process [7]. As a whole, this experiment began with the treatment in terms of research topic, followed by the

selection of five types of the glaze defects, the processes of the experiment, and the material that will be used for the experiment. Then, the problem will be described in detail from the observations during the experiment. In addition, the problems exist where no exposure on the knowledge of glaze defects, and often considered as defect glaze, will damage the product. The hypothesis is one of the solutions of the problem. In the end, conclusions can be made for the title and experimental study of glaze defects can be done successfully and completely through the information and collecting data by the experimental method. Based on the topic and the information that the researcher has obtained, the researcher will focus on five types of glaze defects:

- (a) Crawling
- (b) Crazing
- (c) Pinholing and pitting
- (d) Blistering
- (e) Shivering

The material to be used for the experiment is stoneware clay. During the experiment, researcher will use the electric kiln for firing oxidation process. The temperature of the firing process is 1,200 °C.

Based on the research, there are various types of glaze defects in which each type of defects has different effects that are potential to be transformed as ceramic surface decoration techniques. Indirectly, it could change the public perception that the disability will not necessarily impair the ceramic products. Preliminary research on the glaze defects was not able to identify that the glaze defects can also be used as a decorative technique that can be applied on the ceramic surface. Based on the variety of glaze defects, it will suggest new decorating techniques that can be applied to the surface of ceramic product. The purpose of this experiment is basically to study about the glaze defects as one of the decoration techniques that can be applied on to the ceramic products. The objectives of this research are:

1. To identify the significance of glaze defects
2. To manipulate defected glaze as surface decoration for ceramic art form

3 Local Stoneware Body

The decision to use a particular clay body is an important one. The researcher has chosen the stoneware clay as an alternative to do the experiment. Its smooth, plastic consistency makes it excellent for throwing as well as modeling, coiling, and slab building. Stoneware clays vitrify and mature from 1,200 °C (2,192 F) up to 1,320 °C (2,408 F) and sometimes beyond [8, 9].

The clay mineral which occurs most commonly throughout the world is kaolinite. This is aluminum silicate in a hydrated form with the chemical formula of $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$. It is commonly known as a kaolin or china clay. If water is added to

kaolin, it will become plastic and the resulting “clay” can be transformed and molded into some semblance of form, although this apparent plasticity is possible not of sufficient quality in itself for use by contemporary artist potters [10]. A very fine-grained form of kaolinite which also has unusual plasticity and stickiness when it is added to water is called ball clay. Ball clays tend to be the opposite of kaolin in their characteristics and properties [7, 11]. They contain more iron, tend to be more easily fused on firing, have a finer particle size, and have a higher plasticity. Ball clays are secondary or transported clays and by themselves, in their plastic form, have the disadvantages of having excessive shrinkage both during the drying process and also on high firing. This shrinkage can be as much as 18 % when fired to maturing temperature, and this feature can prove to be a real disadvantage to makers of high-fired ceramic [10].

4 The Experiment of Glaze Physical Reaction

For this experiment, the stoneware clay is supplied from the local supplier. The researcher decided to prepare the test pieces using the slab technique. The test pieces have two sizes because the researcher wants to see the differences in both two sizes. The first size is 10 cm × 10 cm and the surface of the test pieces is clear without the texture, while the second size of test pieces is 6 cm × 4 cm which has the texture on the surface of the test pieces.

After finished preparing the test pieces until the bisque firing process, the researcher has to identify the best base of glaze defect that to apply on to the test pieces surface to observe whether any effect would occur. Each type of glaze defect recipes needs to be measured [12, 13].

4.1 *Base Glaze of Crawling Defect*

To identify the effect of crawling, the researcher tried to change the percentage of magnesium carbonate and the researcher only prepare 50 % from the recipes (Table 9.2).

4.2 *Base Glaze of Craze Defect*

The researcher uses two base glazes from the crazing defect to identify which will contribute to the effect of crazing based on the different percentage of potash feldspar and silica (Table 9.3).

Table 9.2 Crawling glaze formulation


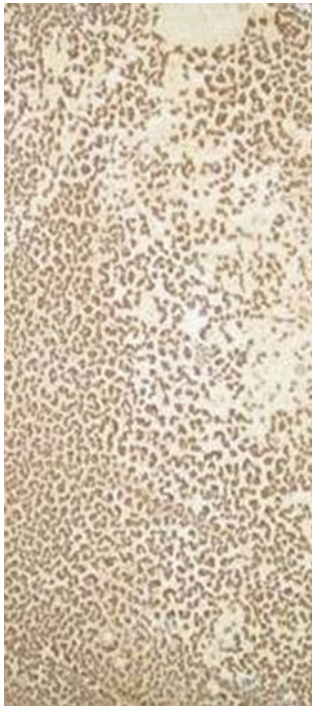

Test piece	Components	Percentage	Results
A	Nepheline syenite	70 %	
	Magnesium carbonate	25 %	
	Ball clay	5 %	
	Yellow iron oxide	1.5 %	
B	Nepheline syenite	70 %	
	Magnesium carbonate	60 %	
	Ball clay	5 %	
	Yellow iron oxide	7 %	

Table 9.3 Crazing glaze formulation

Test piece	Components	Percentage	Results
C	Potash feldspar	52 %	
	Whiting	16 %	
	Zinc oxide	5 %	
	Kaolin	8 %	
	Flint	19 %	

4.3 Base Glaze of Pinholing/Bubble Defect

To identify the effect of pinholing or bubble, the researcher used only one base but tried to change the different oxide to see any surface changes of the test pieces and if the effect of pinholing or bubble occurs (Tables 9.4 and 9.5).

4.4 Base Glaze of Shivering Defect

For this kind of glaze defect, the researcher only used one base to identify the shivering effect. From the recipe of the glaze, the researcher tried to change the percentage of the material like potash feldspar, flint, and kaolin to see whether shivering effect occurs (Table 9.6).

4.5 Base Glaze of Blistering Defect

For this type of glaze defect, the researcher tried to combine the two base of glaze to identify the effect of blistering whether it is successful or not. From both two base glazes, the researchers try to identify if the Frit contribute to (Table 9.7).

5 Conclusion

Glazes do not always come out the way we expect or hope they will. There are many things that can go wrong with a glaze. Even after testing and compensating for the composition of local ingredients when using recipes, lots of things can go wrong. The examples of glaze defects are crawling, crazing, pinholing and pitting, blistering, creeping, shivering, loss of gloss, running off, eggshell, and others. All the information available for this study was investigated by experimental methods. The opportunities of applying the glaze defect as replacement for tableware [14] and sculpture [15], including artware [16], will not face glaze design applications. As a recommendation for future works, we suggested the next stage from this finding is to implement the glaze defect into ceramic mass production. To test the core relation between technical and conceptual design, CSWD research methodology should bring into practice. It happened to observe how the designer or artist finalized their problem solving in identifying form and surface treatment [17].

Table 9.4 Bubbling glaze formulation


Test piece	Components	Percentage	Results
D	Nepheline syenite	48 %	
	Kaolin	6 %	
	Bentonite	26 %	
	Flint	20 %	
	Cobalt carbonate	1 %	
	Dark rutile	4 %	
	Red iron oxide	2 %	

Table 9.5 Bubbling glaze formulation


Test piece	Components	Percentage	Results
E	Nepheline syenite	48 %	
	Kaolin	6 %	
	Bentonite	26 %	
	Copper oxide	20 %	
	Flint	1 %	
	Purple iron oxide	1.5 %	

Table 9.6 Recipe development (control group)

An example of a column heading	Material	Percentage
Base 1	Potash feldspar	40 %
	Whiting	22 %
	Flint	23 %
	Kaolin	9 %
	Zinc oxide	6 %
Base 2	Potash feldspar	70 %
	Whiting	22 %
	Flint	40 %
	Kaolin	20 %
	Zinc oxide	6 %

Table 9.7 Recipe development (test group)

An example of a column heading	Material	Percentage
Base 1 (a)	Nepheline syenite	69 %
	Frit	20 %
	Whiting	10 %
	Bentonite	1 %
Base 1 (b)	Nepheline syenite	69 %
	Frit	40 %
	Whiting	10 %
	Bentonite	1 %
	Talc	3 %
	Whiting	14 %
Base 2	Frit	13 %
	Potash feldspar	46 %
	Kaolin	6 %
	Flint	17 %
	Tin oxide	2 %
	Zinc oxide	4 %
	Cobalt oxide	1 %

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Chapter 10

Factors Contributing to Internet Abuse in the Workplace: Behaviour in SMEs

Roshaliza Mohd Rosli, Anitawati Mohd Lokman, Azhar Abdul Aziz, and Saidatul Rahah Hamidi

Abstract The Internet is indispensable in the current working environment; in fact, it has become a standard office facility. Using the Internet for personal use during working hour beyond the acceptable usage levels either using office computer or personal smartphones is still an account of Internet abuse. Internet abuse may lead to productivity loss, security incidents, liability and network congestion which therefore are a serious concern by the employers. Since there is lack of emphasis for research on this area, therefore the aims of this study are statistically to prove existence of Internet abuse and gain better understanding of the phenomenon. There are three objectives of the study: (1) to investigate the employees' Internet abuse activities, (2) to investigate the relationship between demographic, personality and external factors with the intention to abuse the Internet and (3) to recommend countermeasure to overcome Internet abuse during working hours. This study adopted modified theory of planned behaviour (TPB) as the research model. The study was conducted by distributing questionnaires to employees in three small-medium (SME)-sized organizations in ICT sector located in Kuala Lumpur and Selangor. Further to that, interviews were conducted with higher management, HR, IT and an employee to get more information on the subject. This study would give insight into factors contributing to Internet abuse in the workplace and the Internet abuse activities that the employees engaged in which can then be used to plan adequately and manage the issue. It also can help employees to increase the awareness and possibility of change in behaviour with regard to Internet abuse through sharing the result of this study by the employers in monthly bulletin or incorporating the countermeasure in office policy.

Keywords User behaviour • Ethics • Internet abuse • Information and communication technology

R.M. Rosli (✉) • A.M. Lokman • A.A. Aziz • S.R. Hamidi
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA,
40450 Shah Alam, Selangor Darul Ehsan, Malaysia
e-mail: roshaliza@gmail.com

1 Introduction

Organizations are utilizing the Internet as a mechanism to gratify the business demands and to stay competitive. This is even more within professions that require computers and the Internet on daily operations for online meeting, remote troubleshooting, conducting research or selling and marketing.

Despite its myriad use to improve work-related productivity, ubiquitous problem affiliated with the use of the Internet by employees is plausible for misuse for non-work-related activities [1]. Internet abuse is an unethical behaviour which is studied under the field of computer ethics. In the context of workplace, an unethical behaviour can be any action by the employee that does not adhere to the code of conduct established by the organization. By taking a few minutes to check Facebook status, it might take him or her twice as long to get back into work. It is actually ‘stealing’ time from the organization leading to productivity loss and revenue.

In a news by The Star in February 2013, from the conducted survey, it shows that Malaysians are spending 2 h on social networking or the Internet during the 9–5 office hours. It is a concern for all employers when Internet abuse is causing productivity loss, legal liability, technology drained and network security risks [2]. There is a gap from the previous research where study [3] provided limited working definition of Internet abuse or cyberslacking (using computer ‘for personal email and text messaging’ and ‘to look up information of personal interest such as news, sports or stocks information’).

Internet abuse is becoming a rampant and increasingly serious problem in the workplace [4]. It is imperative for employers to have an insight into factors contributing to Internet abuse in the workplace and the activities that the employees engaged in as to plan adequately and manage the issue. By investigating factors that lead to Internet abuse, researchers and employers would better understand the phenomenon. Different industries may have different characteristics, and different roles of the employees may produce different results as regards to the phenomenon [2]. Hence, deduce the different countermeasures suitable for organizations in different industry.

Three research objectives that would be achieved by completing the research are:

1. To investigate the employees’ Internet abuse activities during working hours
2. To examine the relationship between demographic, personality and external factors with the intention to abuse the Internet during working hours
3. To recommend countermeasure to overcome Internet abuse during working hours

This study takes Internet abuse as the personal use of the Internet during working hours through computer or mobile devices. Three organizations participated in this study. The sample was relatively small and not representing the entire population of ICT SMEs. Of the participating organizations, respondents were gathered from various departments. There were 72 respondents who answered the online questionnaire which asked pertaining only to personal use of the Internet during working hours.

2 Internet Abuse and the Workplace and the Contributing Factors

Internet abuse has various definitions depending on which studies one is reading. Young [5] in her study has a loose definition of Internet abuse. According to her, the earlier term could be defined as conducting personal research, performing personal banking activities, talking with friends over chat rooms, using Twitter or Facebook or job searching activities. Instead of working definition, Galleta and Polak [6] in their study gave examples on the abuse of the Internet in the workplace by employees such as exchange of personal emails, online shopping, sports scores checking, online gambling, viewing pornographic material and chatting on instant messaging services. A better definition of Internet abuse defined it as the use of the Internet and mobile technology during working hours for personal reasons [7, 8]. The fact is that now corporate emails and other similar applications to facilitate daily work can be accessed via smartphones, tablets, iPad and the like; therefore, it is worth to expand the definition to Internet access from all points of connection within the workplace [9]. In this research, the term 'Internet abuse' refers to 'employees' use of the Internet and mobile technology access from all points of connection during working hours for personal use [3].

According to Merriam-Webster Online Dictionary [10], workplace is defined as 'a place (as a shop or factory) where work is done'. Traditional workplace can take various settings including offices, manufacturing facilities or factories, stores and any location where work is performed [11]. The new workplace revolves around creating completely different way of working from corner office to home office. This is made possible with new technologies and new generation of mobile devices where employees are highly connected. In this research, 'workplace' refers to the environment setup that is physical or virtual, characterized by connections, collaboration and employees preferred, facilitates them to be more agile and perform activities anywhere, anytime [12]. Employees can be working from office, home, Starbucks or whenever work needs to be completed, anytime it needs to be done.

A preliminary study was conducted and the result shows employees admitted to browsing the Internet during work hours. Most of the respondents answered they are aware that accessing the Internet for personal use during working hour is maybe against company regulations. Few previous studies are being referenced, in order to identify the twelve Internet activities selected for the preliminary [13–15]. Those are relevant activities based on assumptions that it best fits the definition context and controversial sentiment that would impact truthfulness answer from respondents. Of the twelve activities, we asked them to rank from the most committed to the least committed activity. Following Table 10.1 is the preliminary survey result.

SurveyMonkey, a Web-based solution, was used to analyse the result. The most popular activities committed by the employees are information searching followed by personal emails and online shopping/e-commerce. The least committed activity by the employees is playing the online game and pornography at eleventh and twelfth place, respectively.

Table 10.1 Preliminary study result

Ranking	Activity	Average ranking
1	Information searching	10.45
2	Emails	9.27
3	Shopping/e-commerce	8.45
4	Social networking	8.00
5	Messaging services	7.64
6	Chatting	7.45
7	Data streaming	6.09
8	Image/video sharing	5.91
9	Blogging	5.36
10	Downloads	5.27
11	Gaming	3.09
12	Pornography	1.00

2.1 Previous Research

Galleta and Polak [6] in their study found that the use of the Internet for personal reasons is most predicted by employees' attitudes and norms within the workplace. The greatest influence on Internet abuse intention and behaviour are social factors, habit and affect. Interestingly, higher level of job satisfaction has more positive affect towards Internet abuse [1]. Another study in 2008 by Chen et al. found that personality factors such as self-esteem and locus of control significantly influence employees' Internet addictions, and Internet addiction can lead to Internet abuse. Study by Vitak et al. [14] found that being educated, younger, male and routinized Internet use positively predict Internet abuse variety and frequency.

From a literary review of similar research studies, there are few theories being applied in this field: theory of planned behaviour (TPB), Triandis' theory of interpersonal behaviour (TIB) and locus of control. TPB is extensively used for understanding a variety of unethical human behaviours [6, 16, 17]. Therefore, TPB was selected as the theory to be applied for this research study based on the nature of the problem, psychological attributes and worthy determinant used as variables to be investigated. This study explores to expand on the previous studies and to provide a more comprehensive insight of the factors contributing to Internet abuse in the workplace through expansion of the Internet abuse essence and introduction of external and deterrent factors. Based on TPB, the study however would be using a modified version.

2.2 Contributing Factors

Factors contributing to Internet abuse range from personality [2]; social factors; job satisfaction [6]; attitude; psychological, demographic and virtual environments [13]; and task relevant [14].

This research looked into demographic, personality and external factors contributing to Internet abuse in the workplace. External factors refer to virtual work environment and task-relevant factor. Since the research is also looking into possible countermeasures to be recommended to the employers, therefore, another factor is being introduced which is 'countermeasure'. This factor acts as deterrent to the intended behaviour.

Personality factors are referent to the big five personality factor model. This model was designed by Goldberg [18]. The theory suggests that individual characteristics and patterns of thinking, behaving, feeling and responding to environmental demands can be explained in terms of five domains: (1) extraversion, (2) emotional stability, (3) agreeableness, (4) conscientiousness and (5) intellectual. Demographic refers to the background of the population which includes gender, educational background, age, position, race and many others. Virtual work environment factor can be described as nontraditional working space (anywhere, anytime) and medium used. Task-relevant factor is deemed suitable in the context of this research since the study is sampling on ICT SMEs where employees are mostly computer literate and equipped with Internet access allowing employees to be distracted to use the Internet for personal use.

To overcome Internet abuse in the workplace, employers are advised to begin deploying deterrent measures [13] which basically equate to policies and guideline on acceptable and unacceptable use of the Internet. Other measures can be taken in the form of awareness training, monitoring and enforcement [5]. Countermeasures such as employee monitoring to monitor and block access to websites often cost huge financial investments, which many organizations are not able to justify for the investment [15]. This would be explored during the interview to gain more information pertaining to ideal countermeasures to both employer and employee.

3 Procedures

This research is based on a case study approach and a mixed method whereby quantitative data to be supported by qualitative data as to provide more complete understanding especially on the objective to make recommendation on countermeasures.

3.1 *Modified Theory of Planned Behaviour (TPB)*

Despite substantial support for TPB as a means of predicting unethical behaviours, research continues to examine additional variables that might be more suitable in certain circumstances. It is said that intention can be used as a proximal measure of behaviour though there is not an ideal relationship between behavioural intention and actual behaviour [19]. Figure 10.1 depicts the modified TPB.

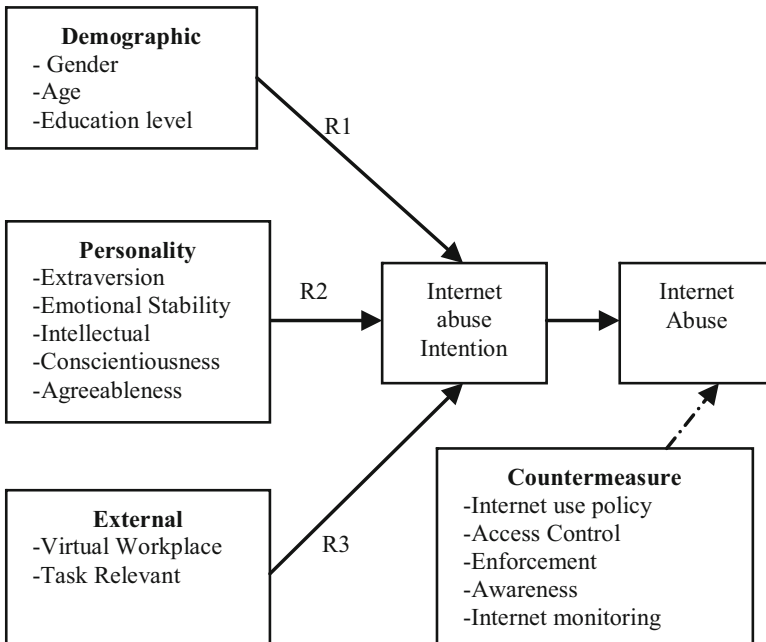


Fig. 10.1 Modified TPB

The modified TPB adopted in this research takes the same guide as the original TPB but chose to arrange other potential factors, namely, demographic, personality and external that predicts the occurrence of Internet abuse in the workplace. Intentions are the precursors of behaviour. Relating to the modified TPB, intention to abuse the Internet precedes the actual Internet abuse by the employees. Additionally, countermeasure was added to see if the factor is in place will that deter and change in behaviour thus reducing the Internet abuse case.

This research investigated employees' demographic factor relationship with Internet abuse intention denoted as R1 in Fig. 10.1, whereas R2 and R3, respectively, show the employees' personality factor and external factor relationship with the Internet abuse intention.

Three major hypothesis statements are derived to match the investigated relationships:

- H1 There is significant relationships between demographic factors and the intention to abuse the Internet during working hours.
- H2 There is significant relationships between personality factors and the intention to abuse the Internet during working hours.
- H3 There is significant relationships between external factors and the intention to abuse the Internet during working hours.

3.2 Sampling Strategies

Three ICT SME organizations were selected based on criteria: small-medium-sized enterprise, involved in ICT sector, and employees are provided with Internet access while at work.

For quantitative data collection, sampling frame was based on the list of email addresses of the employees provided. There are 78 employees. Nonprobability samples of purposive sampling were applied because for a small population it was unlikely the researcher could choose some of them at random. Qualitative data collection was based on purposive sampling as well in which the researcher hand-picked the sample of whom believed to be credible in their area, represented by different job background; higher management, HR, IT and employee.

The purpose and benefits of the research well communicated to the participating organizations that they gave the needed support such as access to resources. In return, detail finding of this study has to be shared with the organizations for their reference.

3.3 Data Collection

TPB-oriented questionnaire [20] was designed with elements of the big five personality measurement [21]. It was divided into five parts: demographic, work relevant, personality, intention and countermeasure. All items were assembled into an online instrument that contained five demographic questions and further 31 items. For part 2 onwards, five-point Likert scales were used which comprised to measure respondents' agreement on each item statement.

At face value, the questionnaire appeared to measure the target variable. For example, item like 'My work environment allows me to perform work-related activities anywhere and anytime therefore I am often distracted to surf the Internet for personal use' used to measure external factor relationship with Internet abuse behaviour. To enhance the questionnaire validity, reliability test was carried out using Cronbach's alpha where this statistical test would measure internal consistency.

Interviews with few individuals were conducted to explore their views, experiences, beliefs on Internet abuse among employees and the countermeasure. As part of establishing validity, triangulation approach was applied where data from multiple perspectives of higher management, HR, IT and senior employee were conveniently selected. Turner [22] has cited some excellent recommendations by McNamara on interview design which were incorporated for the implementation stage of the interview process. In designing the interview, selection of questions was likely to yield as much information about the interested area as possible and also would be able to address the third objective of the study. Questions were open-ended type, clearly worded and as neutral as possible such as 'In your opinion as HR manager, does the current countermeasure is sufficient to overcome Internet

abuse in the workplace?’ The length of each interview would vary between 30 and 40 min. Each interview schedule would have five major questions which was conducted in semi-structured manner. Before an interview took place, respondents were informed about the study details and given assurance about anonymity and confidentiality. Audio tape recording and transcripts were used to capture the interviews.

For this study, exploration of secondary data came from journals, books, newspaper article and document from websites related to Internet abuse in the workplace particularly on the Internet activities engaged by employees for personal use. First was to conduct the literature review of secondary sources. Then, the information on Internet abuse activities gathered were being confirmed through preliminary study [23]. The search of secondary sources would supply excellent information that lead to answering the first research question and meeting the first objective.

4 Discussion of Findings

A total of 78 invitations participated the online survey in which 72 were returned, and that makes 92.3 % response rate. However, only 57 were usable in which the remaining was either incomplete or not spending time online on the Internet for personal matters during working hours. Therefore, final completed response rate is 73 %.

Majority of the respondents from the three organizations were female (56.9 %) from age group 34–44 years old (45.8 %) with a bachelor’s degree (66.7 %) and worked as executive or senior executive (66.7 %). Being in ICT sector organizations with the particular demographic background, the majority of the respondents answered yes to committing Internet abuse during working hours (57 employees, 79.2 %). Reliability analysis of Cronbach’s alpha was used to measure the questionnaire reliability, and the result shows a high reliability based on the alpha score ($\alpha=0.743$).

On the Internet abuse activities committed by the employees in the workplace during working hours, most of them (33.3 %) spent 30 min on daily average abusing the Internet for personal matters. The case may be that some employees underestimated the honest time spent online for personal matters. A total of 19 employees (33 %) at least agree or strongly agree with use of personal email during working hours. A total of 20 employees (35 %) at least agree or strongly agree with use of social networking during working hours. More than half of the employees (38, 64 %) at least agree or strongly agree with information searching engagement during working hours. As many as 44 employees (77 %) at least agree or strongly agree with the use of messaging services during working hours. The fifth Internet abuse activity, namely, personal banking or online shopping, was engaged by 31 employees (56 %) who at least agree to strongly agree with it.

Correlations between variables of interest are measured to look for existence of significant relationship ($p<0.05$). None of the demographic factors are significantly correlated with Internet abuse intention. This could be due to across demographic; employees

Table 10.2 Summary of correlation analysis

Factor relationship with Internet abuse intention	Result
<i>Demographic</i>	
<i>Gender</i>	<i>No significant relationship</i>
<i>Age</i>	<i>No significant relationship</i>
<i>Education level</i>	<i>No significant relationship</i>
<i>Personality</i>	
<i>Extraversion</i>	<i>There is a significant relationship</i>
<i>Emotional stability</i>	<i>There is a significant relationship</i>
<i>Intellectual</i>	<i>No significant relationship</i>
<i>Conscientiousness</i>	<i>There is a significant relationship</i>
<i>Agreeableness</i>	<i>No significant relationship</i>
<i>External</i>	
<i>Virtual workplace</i>	<i>There is a significant relationship</i>
<i>Task relevant</i>	<i>There is a significant relationship</i>

are computer literate and work very much dependent on computer considering the organizations are of ICT sector. Every employee, be it female or male, generation X or Y or low or high education level, has equal chance to deviate from work and engage in Internet abuse activities. Based on the big five personality factor model, the result shows extraversion, emotional stability and conscientiousness are significantly correlated with Internet abuse intention. Employees who are stressed out, extraverts and conscience employees would have better chance to commit the abuse. Both external factors significantly correlated with Internet abuse intention. This shows job routine that requires the use of the Internet somehow allow the employees to be distracted. Furthermore, work environment that allows employees to perform work related virtually anywhere and anytime too could cause them to resort to surfing the Internet for personal matter during working hours.

Table 10.2 in the following is the summary of correlation analysis.

The results of relationship between factors contributing and the intention to abuse the Internet would answer the hypotheses:

- R1 There is no significant relationships between demographic factors and Internet abuse intention.
- R2 There is significant relationships between extraversion, emotional stability and conscientiousness and Internet abuse intent.
- R3 There is significant relationships between external factors and Internet abuse intention.

Five items were asked on countermeasure as the factor that would discourage employees to commit Internet abuse during working hours if implemented in the workplace. 34 employees (59 %) at least agree or strongly agree with 'Internet abuse at work' policy, 33 employees (58 %) at least agree or strongly agree with implementation of access control, and 41 employees (72 %) at least agree or strongly agree with strict enforcement. Continuous awareness scored 35 employees (61 %)

Table 10.3 Suggested criteria for countermeasure

Countermeasure	Criteria
<i>Internet usage policy</i>	<i>Define acceptable and unacceptable</i>
	<i>HR, IT, management and other stakeholder involvement</i>
	<i>Review of policy – new technology</i>
<i>Access control</i>	<i>Authentication prompt</i>
<i>Enforcement</i>	<i>HR, IT, management and other stakeholder involvement</i>
<i>Awareness</i>	<i>Not a one-off initiative</i>
	<i>Describe Internet abuse activities</i>
	<i>Information on lawsuit and impact of Internet abuse</i>
	<i>Communication of the Internet usage policy</i>
<i>Internet monitoring</i>	<i>Flexibility during certain time</i>
	<i>Assessment of the effectiveness</i>
	<i>Prompt employees when access being block</i>

while Internet monitoring scored 34 employees (60 %) agreement for the implementation would discourage them to engage in Internet abuse activities.

An interview with four individuals each from higher management, HR, IT and employee was recorded. Views and expressions were analysed and then selectively coded where significant responses were broken down into few themes.

Internet abuse is happening in the organizations because the type of employee management is said to be overly liberal in which employees are free to use the Internet as long as the job is done. Though one organization adopted strict employee management, policy and controls not able to manage employees access the Internet using smartphones, own 3G broadband and data plan. Internet abuse is not an issue in two organizations; if ever the incident happened like in organization A, the IT manager would help to forward access log and other details as evidence to support the accusation. Present countermeasures in the organizations are only general policy non-specific to Internet usage at work, no monitoring for two organizations, monitoring is done in one organization but without assessing the effectiveness. Countermeasures comprises of awareness, Internet monitoring, Internet usage policy, access control and enforcement by the management and support from everyone else involved. Table 10.3 summarizes suggested criteria for countermeasures to overcome Internet abuse in the workplace.

Cost of the solution, manpower to manage, technology selection and buy-in from every level in organization are among the criteria that suggest the weightage of a fair countermeasure. Employers might be concerned more on investment needed and the operation since they are of small and medium size, whereas employees would be more interested for flexible system. Therefore, the key is to choose the right balance and that would make an ideal countermeasure for the organization.

5 Conclusion

The study has achieved its aims to statistically prove existence of Internet abuse among employees in the workplace. That shows even a small- and medium-sized organizations affected with Internet abuse phenomenon. The findings provide employers with information about Internet abuse activities, the contributing factors and suitable countermeasures. As for employees, this study would help them to increase awareness and possibly to change mannerism about Internet abuse. If employees are heavily using messaging services during working hours and affecting productivity, the fact that lack of current countermeasures implementation with liberal type of employee management, do the context still fit? How about extrovert, more sensitive and conscience employees who feel demotivated because of strict countermeasure that stops them from the usual diversion from work, does that imply positive working environment that will lead to high productivity? Organizations have to find the right balance to overcome this phenomenon. For this study, a contribution worth to be highlighted, tangible and instantly could be utilized is the information graphic (infographic) prepared to be disseminated to the organizations. Future research in continuing from the current work can be suggested to investigate more organizations with wider respondents' base and multiple sectors of SMEs and look into the development of the code of conduct for Internet abuse suitable for SMEs. To broaden the scope, future research could also look into other types of Internet abuse such as those of crime felony: gambling, hacking, espionage and many more. Also of interesting initiative is to investigate the extent of disruption or negative effects caused by Internet abuse to an organization.

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Chapter 11

Socioeconomic Study of *Arenga pinnata* Smallholders in Malaysia

Rafidah Anwar, Fazleen Abdul Fatah, Nasuddin Othman, Abdul Halim Nawawi, and Zakaria Tajuddin

Abstract Socioeconomic in this study refers to the way of living of sugar palm farmers, and this includes their incomes from sugar palm activities. Social is defined as something that is closely related to society, culture, and demographic, while economic relates to individual's financial status. Full utilization of yield contributes to farmers' incomes since it became a valuable product. This study was conducted at Benta, Lipis, in Pahang within these areas: Kg. Peruang, Kg. Peruang Lama, Kg. Kekabu, Kg. Tualang Padang, and Kg. Chat. Investigation research study was done by interviewing farmers which focused on five elements. Findings showed that sap yield was being fully utilized and became the main source of income for most farmers. For farmers who were planting palm, their practices of distance with triangular method were similar with practices in oil palm planting, but both differed in planting density. Most of these practices were applied in the pre- and postharvest activities. These practices were based on farmers' indigenous knowledge, and any differences were depending on the time or the amount of the used variables. On the other hand, the products were being sold either directly to consumers or through intermediaries.

Keywords Socioeconomic • Current practices • *Arenga pinnata* or sugar palm • Pre- and postharvesting

R. Anwar • F.A. Fatah (✉) • N. Othman • Z. Tajuddin
Faculty of Plantation and Agrotechnology, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: fazleen5201@salam.uitm.edu.my

A.H. Nawawi
Faculty of Computer and Mathematical Sciences, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia



Fig. 11.1 Location of *Arenga pinnata* being planted

1 Introduction

Nowadays, sugar palm, or also known as *Arenga pinnata*, gains world attention due to its beneficial yield produce [1]. Sap is the main yield of palm that gives it the sweet taste and may produce up to several products after being processed. As such, palm sugar serves as the major product produced by sap. This is the reason why palm is one of the alternative crops that produce sugar as the sweetener, apart from sugarcane. Other than palm sugar, ethanol, wine, and vinegar are products that can be produced from sap too [2]. Amazing part is that palm can be fully utilized from its root to sprouts which contribute great potential incomes for farmers (Fig. 11.1).

Palm originates from Asia and has grown abundantly at the region of Minahasa in North Sulawesi of Indonesia. It makes them a country with great quantities of palms that can produce sugar [3]. Due to *Arenga pinnata*'s ability in producing palm sugar products, the national need of sugar has reached up to 2.3 million tons [4].

2 Utilization of Sugar Palm

In order to increase and help the economy of the sugar palm's society, sugar palm has been fully utilized because it is a valuable plant that can produce various types of products. Utilization is a practice which plays a significant role in obtaining main yield from the palm, as producing products such as palm sugar or by-product from other parts of palm may contribute to farmers' side incomes. Regarding to [3], the sap yield of the palm might be influenced by the varieties, sizes, or the locations of the palm growth.

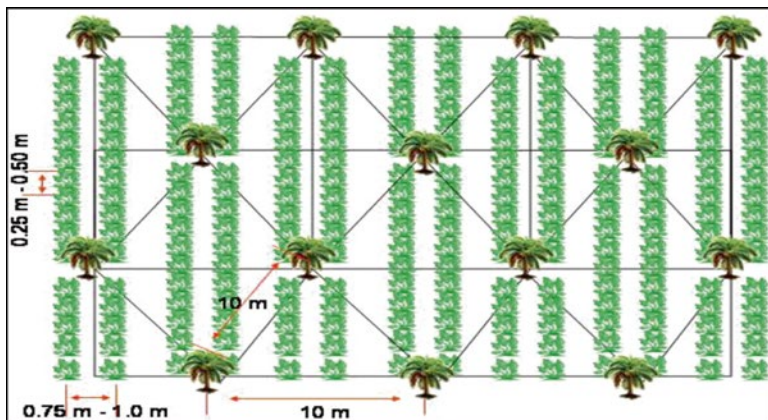


Fig. 11.2 Examples of intercropping practices in coconut field for triangular methods in the Philippines

As being mentioned earlier, palm is multipurpose as it can be utilized from the root to sprout. Even so, Malaysia is still not being exposed to the diversity of products which can be derived from this palm. At this moment, the only most familiar product produced in Malaysia is the palm sugar, obtained from the sap, though the fact is that palms are able to produce more than just sugar, ropes, starches, vinegars, wines, bioethanol, and many more [2].

This potential crop gains attention from local and foreign entrepreneurs. Until now, most conducted studies in Malaysia were the experimental studies, while there is lack of studies in management base, even though this crop exists long time ago. Therefore, there are no specific assessments on agricultural practices which are being carried out by sugar palm's farmers and on the utilization of palm in producing products in Benta.

This planting density is the recommended efficient method in order to obtain high yield for coconut. The conducted intercropping practice is as shown in Fig. 11.2 [5]. However, the sugar palm in Benta was planted based on the oil palm plantation. One of the examples of the planting distance in oil palm plantation was 29–30 ft triangular with 60 palms per acre [6].

3 Socioeconomic of *Arenga pinnata* Farmers

In order to evaluate socioeconomic, sources of botanical and technical information help in the socioeconomic aspect of *Arenga pinnata*'s utilization [7]. The examination of socioeconomic factors which are affecting rural households' tree management behavior involves the relationships between households' plantation management

behavior with intentions and the socioeconomic characteristics with their attitudes to forest [7]. The information required for socioeconomic are age, household size, level of education, size of farm, adoption of farm practices, level of living, length of farming experience, and farm income [8].

Planting of *Arenga pinnata* requires many workers during harvesting process, especially sap yield. From the report specified by [2], they found out that each employee is able to collect the sap yield of twenty palms per hectare per day and thus in need of three to four employees per hectare. Juvenile period of *Arenga pinnata* grown in Indonesia can reach up to 9–10 years, and it brings potential loss to the economy within juvenile period of sugar palm until it is over.

This study helps in identifying the influence of socioeconomic activities among *Arenga pinnata* smallholder's farmers. The investigation consists of currently performed practices and which part of palm that are being utilized by farmers in order to produce product, including its market selling price.

In addition, factors affecting the demand and supply are the socioeconomic pressures, growth of population, availability, and the technology and development [9].

4 Methodology

This study was conducted at Benta, Lipis, in Pahang. Besides socioeconomic study, this study also focused on the agronomic practices, observed from the cultural practices on field and processing activities of *Arenga pinnata*. The utilization of *Arenga pinnata* which focuses on four major parts of palm (sap, leaves, fiber, and fruit) was also being assessed.

Survey was conducted by interviewing each farmer who was operating *Arenga pinnata* in Benta based and about 23 farmers were selected using a convenience sampling. Based on DOA's list, there were 28 farmers conducting sugar palm, but it was found that only 3 farmers were still active in this activities. However, the other 20 farmers did not register with DOA yet were currently active conducting the sugar palm activities. Since *Arenga pinnata*'s farmers were available in small quantity and the exact population was unknown, thus, the selected sample size depends on the farmers' availability and farmers who were still active in operating sugar palm activities. Numbers of respondents at each specific location were different: two respondents from Kg. Peruang Lama, two respondents from Kg. Kekabu, eleven respondents from K. Peruang, four respondents from Kg. Tualang Padang, and one respondent from Kg. Chat. The questionnaire consists of six parts.

1. *Part One was the respondent's profile which consists of farmers' demographics, such as age, gender, marital status, race, educational level, and others.*
2. *Part Two consists of seven major questions that covered on the current practices by farmers in operating *Arenga pinnata*'s activities, from the field until the process. This part also included the utilization of obtained yield.*

3. *Part Three covered on the socioeconomic of these farmers. This part asked on their income, which includes record keeping, training, and loans or subsidy.*
4. *Part Four covered on the selling products.*
5. *Part Five covered on the barriers faced by farmers while operating *Arenga pinnata*.*
6. *Part Six covered on factors that were ensuring the successfulness of operating plants and farmers' recommendations to improve the operating of *Arenga pinnata*.*

Descriptive statistic was conducted to describe basic characteristics of the obtained data on current practices. Next was the principal component analysis in order to identify among the variable interdependencies. Meanwhile, the multiple regression was used to identify independent variables that influence dependent variable.

5 Result and Discussion

5.1 *Arenga pinnata* Smallholder Farmers' Planting Overview

Planting distance was advised by the Department of Agriculture (DOA) Kuala Lipis. For that, only planted palm farmers were conducting this practice rather than the wild palm farmers, with all costs supported by DOA. The planting distance as per suggested by DOA was 30 ft × 30 ft equal to 9.14 m × 9.14 m distance. For wild palms, planting distance between each palm was determined by the distance of fall fruits from parent plant, the spreading of fall seed and transferred by animals such as hogs [10].

Figure 11.3 shows that only planted palm has planting density. Planting density was advised by DOA and all costs were supported by them. The recommended planting density was 70 palms in 2.4 acres with triangular methods. However, planting density for wild palms was unable to be determined because either the palms are close to each other within one acre or only one palm is formed within one area.

Differences in planting distance and planting density have been applied in East Indonesia, where the distance was at 8 m × 8 m apart and the density was 150 palms in a hectare. In other words, there were 75 palms per acre [11]. On the other hand, practices of sugar palm farmers in Benta were similar to the oil palm practices in Malaysia, 9 m × 9 m apart. However, there was a difference at planting density of *Arenga pinnata*, as there were only 70 sugar palms in total that were being practiced. This was contradicting with the density practiced in oil palm plantations which it supposed to plant up to 143–148 palms per hectare [12].

For that, practices in sugar palm plantation can be improved by increasing the density of fully utilized palms in the provided land area. As supported by [12], the optimum planting density can provide optimum growth and economic yield production per unit area through the plant's life span. Thus, by having proper planting distance and planting density, it helps in the production system of *Arenga pinnata*.

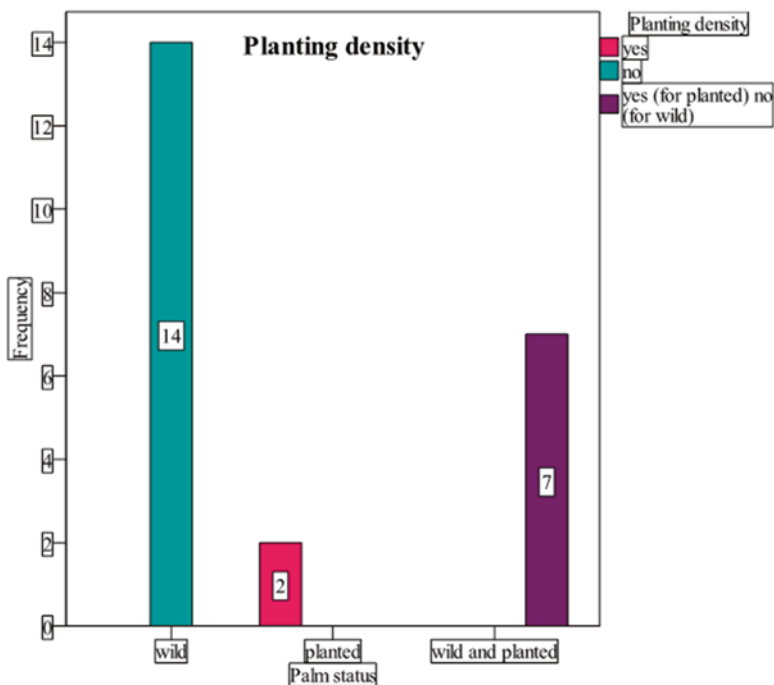


Fig. 11.3 Frequency of farmers practicing the planting density practices based on palm status

In palm plantation, intercropping practices were also conducted where planted crops were prickly pear and wild ginger. Theoretically, there were some practices of intercropping plant with triangular methods as shown in Fig. 11.2 at coconut plantation, with planting distance 8–10 m apart. The distance for each crop was 0.75–1 m apart [5]. Nevertheless, the intercropping practices can only be applied based on the availability of sunlight into the field. When the palms were growing taller and its canopy covered the sunlight from reaching the soil, intercropping was no longer suggested. 17 out of 23 farmers preferred not to do the weeding within the surrounding area of palm since most of the yield were wild species.

For fertilizer application, there was only one farmer who applied fertilizer to sugar palm; in the first three years, it was chicken dung, while the next three years onwards, it was NPK green fertilizer. Other farmers who did not apply fertilizer believed that it gave negative impact by reducing sap yield of the sugar palm. This was proven when planted palm has lower sap yield compared to wild palm. Currently, these palms were not facing any disease problem, but according to farmers, the common pest problem was apes. It is a must in field practice to clear the fiber around the palm and inflorescence by using cleaver, as this eases the preharvest and postharvest activities. Additionally, 50 % of these farmers preferred to incur cost by hiring a person for palm clearing activities, which required them to pay RM50 per inflorescence.

5.2 *Arenga pinnata* Smallholder Demographic (Table 11.1)

5.3 Utilization of Sap Yield

Based on Table 11.2, it shows that all farmers took sap as their main yield and both sugar palm and syrup can be produced from it. Palm sugar was the main selling product which contributes to farmers' incomes, but only few farmers produced syrup. Farmers who produced syrup were those who have greater amount of sap yield taken from field.

5.4 Harvest Practices of Sap

Based on Table 11.3, practices of pre- and postharvests for sap yield were shown, with farmers harvesting the yield at male inflorescence. Most of these farmers used any parts of the mangosteen tree as the preservative. Based on observation, farmers who used mangosteen as the preservative preferred young fruits or leaves. The purpose of preservative usage was to avoid the sour taste in the harvested sap. As supported by [10], the sap was then fermented and it turned sour in taste after 3 h of harvesting. This is the reason why farmers inserted preservative agent, so as to avoid the fermentation since they were going to retrieve yield once every 8 h in daytime and 16 h in nighttime. It will be placed in the catchment container before it was hung at inflorescence.

Table 11.1 Demographics of the *Arenga pinnata* farmers

Demographics	Highest frequency	Percent
Age	22–29 years old	30.43 %
Gender	Male	95.70 %
Race	Malay	91.30 %
Educational level	PMR/SRP/LCE	26.09 %
	Primary school	26.09 %
Marital status	Married	60.87 %
Family members	1–3 members	52.20 %

Table 11.2 Utilization of sap of the *Arenga pinnata* smallholders

		Products		Total
		Sugar	Sugar and syrup	
Sap yield	Yes	15	8	23

Table 11.3 Pre- and postharvest practices of sap

Pre- and postharvest practices			
Types	Categories	Frequency	Percent
Inflorescence	Male	23	100
Preservative agent	Mangosteen	14	60.9
	<i>Laru</i>	9	39.1
Number of swing	<100	2	8.7
	100	3	13
	150	2	8.7
	200	10	43.5
	300	6	26.1
Time of inflorescence knocking	<15	4	17.4
	15	12	52.2
	30	7	30.4
	>30	0	0
Knocking duration	1–2 days	2	8.7
	3–4 days	20	87
	5–6 days	1	4.3

There was no required cost for applying mangosteen's preservative as farmers planted these trees by themselves. As for farmers who used *laru* root as their preservative, the cost was RM50 per sack and it can be used up to 2 or 3 months. Depending on the number of palm produced, a higher number of palm producing yield requires higher amount of *laru* as preservative.

Before the male inflorescence is ready to harvest, there were some practices that have to be done, known as preharvest practice. The first thing was to swing the inflorescence. Most of these farmers preferred to swing the inflorescence for 200 times, followed by knocking it. Knocking time was different for each farmer, but as shown in Table 11.3, most of them did the knocking in 15 min time. As for the knocking technique, it started at the base point of the inflorescence and upwards. After knocking, the inflorescence will be swung again with similar number of the first swinging. These swing and knocking activities were carried out for a few days, and in average, most farmers preferred to do it within 3–4 days. The sap was ready to harvest when the flower turned yellowish in color, opened a bit, and had oily feature at the florescence.

The used equipment were cleaver (for slicing the inflorescence), bamboo ladder (for climbing the palm), catchment containers (such as bamboo or plastic bottles), and rope. The rope serves as a pulley to bring the sap in the catchment downwards the palm).

All farmers retrieved their yield twice a day, one in the morning and one in the evening. Mostly, they started to harvest at 7.30–8.00 am in the morning and at 4.00–4.30 pm in the evening. Since this was the main income for most farmers, these activities became their daily nature and they retrieved the harvesting yield strictly every day. Without this schedule, inflorescence could be a blockage and could reduce sap production.

5.5 Principal Component Analysis

The principal component is the analysis that analyzed the interrelationship between several variables. The variables in this study were:

- V1: Age
- V2: Gender
- V3: Race
- V4: Educational level
- V5: Experience in *Arenga pinnata* activities
- V6: Number of palm produced yield
- V7: Weeding practices
- V8: Planting density practices
- V9: Fertilizer practices
- V10: Pest and disease control practices
- V11: Number of swing practices
- V12: Time of inflorescence knocking practices
- V13: Period of knocking practices

Based on Table 11.4, it showed that the KMO and Bartlett’s test was 0.409 which is less than 0.5. This revealed that the principal component model was not suitable to be conducted in this study. Therefore, further analysis conducted was by using the multiple regression analysis.

5.6 Multiple Regression Analysis

This analysis was conducted in order to identify the variables affecting yield. For that, the model was stated as

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n \tag{11.1}$$

where

Y: Yield (sap) per palm per day

α : Intercept

Table 11.4 Factor analysis for KMO and Bartlett’s test

KMO and Bartlett’s test		
Kaiser-Meyer-Olkin measure of sampling adequacy	0.409	
Bartlett’s test of sphericity	Approx. chi-square	236.429
	Df	78
	Sig.	0.000

$\beta_1-\beta_n$: Parameters

X_1 : Age

X_2 : Gender

X_3 : Race

X_4 : Educational level

X_5 : Experience in *Arenga pinnata* activities

X_6 : Number of palm produced yield

X_7 : Weeding practices

X_8 : Planting density practices

X_9 : Fertilizer practices

X_{10} : Pest and disease control practices

X_{11} : Number of swing practices

X_{12} : Time of inflorescence knocking practices

X_{13} : Period of knocking practices

The multiple regression model was conducted in order to predict the dependent variable (yield per palm per day) from the independent variables (X_1 until X_{13}) which are also known as predictors. The result showed the F value $(13, 9) = 2.288, p < 0.05$, while R^2 was 0.768. Table 11.5 shows that the planting density practice and time of inflorescence knocking practices had positive, significant relationships. It means that the wild palm which is in scattered planting density would increase the yield compared to the palm that was in proper planting density. It was because, based on the observation, the planted palm was shorter compared to the wild palm. Consequently, it may affect the yield contribution due to different height of palm. Therefore, the higher the palm, the higher the sap yield produced. The same thing

Table 11.5 Multiple regression analysis

Variables	Coefficient	Standard error	t -value
(Constant)	2.770	2.010	1.378
Age	-0.320	0.331	-0.968
Gender	7.607	3.732	2.038
Race	-0.856*	0.246	-3.483
Education	0.278	0.208	1.341
Experience	0.153	0.099	1.54
No. of palm	0.032	0.189	0.169
Weeding	0.632	0.413	1.531
Planting density	8.558*	3.593	2.382
Fertilizer	-11.73*	4.778	-2.454
Pest and disease	-0.055	0.658	-0.083
Number of swing	-0.353	0.340	-1.041
Time of inflorescence knocking	0.899*	0.292	3.077
Knocking duration	1.065	0.513	2.078
R^2	0.768		
Adjusted R^2	0.432		

*Significant at 5 % level

applied to the time of knocking the inflorescence, where the longer knocking time will increase the yield of the production. As mentioned by the farmers, the knocking activity was demonstrated for losing the structure of the inflorescence for the easiness of flowing sap. However, the knocking must not be too rough because it can damage the inflorescence and might cause death to the inflorescence.

However, the result showed that race gave negative, significant effects. Surprisingly, the result revealed that the Indonesians performed better than the Malays. They developed because of the indigenous experience and historical perspective brought about from their mainland. Since this species originated from Sulawesi, thus, this ethnic group had experienced the process of migration and inherited different practices in the context of planting and preharvesting techniques. Moreover, the practice of fertilizer application shows negative significant impact towards yield too. This might due to the fact that most farmers did not apply fertilizer to sugar palms, since these palms usually grown within favorable environments. Even though palm only consumes natural resources from the surrounding, it can still produce high amount of yields.

The result mostly postulated on the practices either field practices or preharvest practices. Since farmers in this study were independent farmers, increasing the number of the family members in collecting yield consequently will increase the production of palm sugar. In addition, since sugar palm activities were assumed to be closely related to the indigenous knowledge, imparting the knowledge to other family members would help to increase the amount of yield obtained within the household. Besides, due to the fact that it is indigenous knowledge and most of the harvested yield came from wild palm that do not require any proper management, this might help to answer why the skill of harvesting is more important than the educational level, age, and experience in sugar palm activities.

Relevantly, since most of these farmers were conducting wild palm species, absence of field maintenance (such as weeding) did not affect the yield production at all. Nevertheless, based on the correlation result, several variables were correlated to each other.

5.7 Product Selling Concept

As being mentioned in Table 11.2, the produced products were palm sugar and syrup. However, syrup will only be produced depending on customer's order. Thus, the main selling product was the palm sugar which can be sold either directly to end users or via intermediaries. The intermediaries who contributed in these product selling activities were retailer and wholesaler. If farmers sold their products directly, it can be either sold at their homes or at markets known as *Pekan Sehari*. This market, which serves as the main contribution to the incomes for most farmers, is available once a week at Benta, and it is located approximately to the production areas. In addition, another factor that could affect the income of farmers was the uncertainty of sap yield production since the high amount of produced sap yields

would not guarantee high production of palm sugar. Moreover, it depends on the availability of particular sap yield that contains moisture and sugar content. Thus, the productions of palm sugar rely on the sugar content in sap, since the moisture in sap should be removed in order to produce palm sugar. In addition, the marketing channel of selling products also may affect the income of the farmers. As the products were sold to intermediaries, farmers have to set lower prices to the customers as the products were sold in a bulk or greater amount.

6 Conclusion

In a nutshell, most of these farmers were relying on the palm sugar products as their main sources of income. Their daily activities were mainly concentrated on the field practices, to obtain yield for sugar palm production. Findings discovered that most farmers who involved in harvesting activities were male adults, while there was an involvement of family members in postharvesting activities. As these farmers did not utilize other palm components, different parts of palm were wasted. However, there were some farmers who preferred to conduct other activities as their side incomes, such as making rubber tappers, rearing activities, and others. The prices of the products, on the other hand, were determined based on the marketing channel, in which it could contribute extra outcomes for these farmers.

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Chapter 12

Theoretical Framework on Malaysia Design Industry: Based from UK Design Research 2010

Nadiah Mohamad, Saadiah Kaspin, and Mohd Fuad Md Arif

Abstract This research aims to look and understand the design businesses in Malaysia, to see how important designers are to the business and also to the country, and to know whether the business would give impact to the economic growth in Malaysia. Due to understanding the design businesses in Malaysia, questionnaire has been given out to at least 100 different companies all around Klang Valley to identify the types of business and the numbers of designers and to see how the competitors are increased within Malaysia or over sea companies. Because of the lack of understanding by Malaysian of the importance of design and designers in a business world, this research is conducted for the purpose of looking into this matter. Since there is no existing research being done in Malaysia, this research is being conducted. The case study is also based from a research done by the UK design council on the design industry in 2010.

Keywords Design businesses • Design industry • Designers

1 Introduction

This Design Industry Research aims to look at how design businesses including in-house design teams, design consultancies, and freelance designers work across communications and in digital media, interior and exhibition, product and industrial, and fashion and service design disciplines. Design business will be asked on

N. Mohamad (✉) • M.F.Md. Arif

Fine Art Department, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

e-mail: nadiah2962@salam.uitm.edu.my; fuad9arif@gmail.com

S. Kaspin

Fine Metal Department, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

e-mail: saadiahkaspin@yahoo.com

their profile and size of their businesses, their clients and competition they face, their business practices and the education, and the training and skills of their employees. So this research will lead to looking at Malaysia in the design industry of today.

The focus is on the design business around Malaysia specifically in the Klang Valley, which includes area in Shah Alam, Kuala Lumpur, Klang, and Petaling Jaya. It seeks to explore the size and shape of the business. Since Klang Valley is a prominent area for businesses in Malaysia, this research focuses on this specific area.

The companies were all company that has a design business that are located all around Klang Valley. The list were given out by Suruhanjaya Syarikat Malaysia (SSM) in Shah Alam. All of the Design research were set out by the research assistant to walk in or interview by phone calls in understanding the design businesses.

2 Reviews on Related Literature

In today's global economic growth, business has expand more and more each day. And any company that knows the importance of designers in their business will use it to maximize their strategic marketing to increase profit margins. Hence "A response characteristic of artistic research is to analyze different media representations in a comparative study. Put briefly, nothing human is alien to artistic research: it's theoretical and empirical research objects can include the rich world sliding from art to popular culture." Furthermore "Critically analyzing art and its current trends, the object being, among other things, an understanding of the relationships between art and economic development, power relationships, etc." [1].

3 Question That Was Asked

Some research questions were put together to help in the research findings for the purpose of this survey:

1. How many design businesses are in around Klang Valley
2. How many designers are there in around Klang Valley
3. What are their threats and main competition in the design businesses whether from within Malaysia, Southeast Asia, or outside Southeast Asia.

4 Methodology

Quantitative research is required in collecting all data from the questionnaire which has been given out to the design business which includes in-house design teams, design consultancies, and freelance designers working across communications,

digital and multimedia, interior and exhibition, product and industrial, and fashion and service design disciplines [2–6]. The questionnaire is and will be the main key in finding and understanding the achieved objective. The questionnaire is divided into four main parts, that is, understanding the profile of the Malaysia Design Business, looking at the financial performance of the Malaysia Design Industry, looking at the clients of the design businesses in Malaysia, and last but not least understanding the competition for Malaysia Design Businesses.

The aim of each sections is to analyze the data based from the questionnaire that has been given out and look at the impact in the Malaysian Economic Growth.

4.1 Secondary Data

Secondary data will be part of the research.

5 Finding and Discussion

One of the key important framework from the critical art theory is from Ian Noble and Russell Bestley [7]. They have mentioned that the field of study research takes various forms, dependent on the context of the work. Market research might be appropriate to some briefs.

Another key question to consider in this research is how do we measure all of the collection data? Statistical analysis of survey and observation methods from the design business will be gathered together with a quantitative analysis of the outcome of this research. Quantitative analysis is based upon mathematical principles, in particular statistical methods of surveying and interrogating data [7] (Fig. 12.1).

Another theory that is used in this research is also by Noble and Bestley that mentioned any design brief can be broken down into three areas for specific interrogation [7]:

1. *The field of study* (where will the work be situated, and what function will it fulfill?)
2. *The project focus* (what will the specific context and function of the work be within the wider field of study already defined?)
3. *The research methodology* (how will the designer go about researching and developing the project in response to the context and intention outlined above?) (Fig. 12.2).

Apart from this two theoretical framework that are used in finding the outcome of this research, this research is also based from a UK Design Research 2010 as a case study in finding the results and comparing differences between two countries [8].

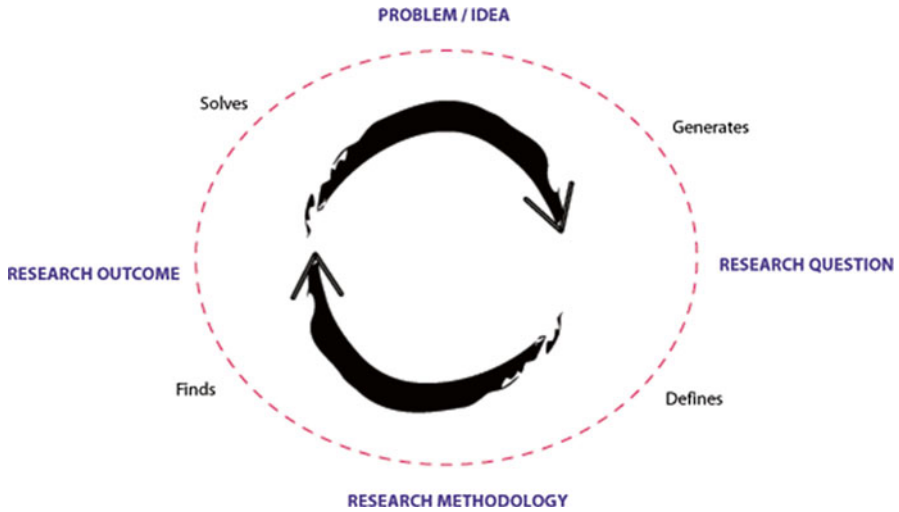
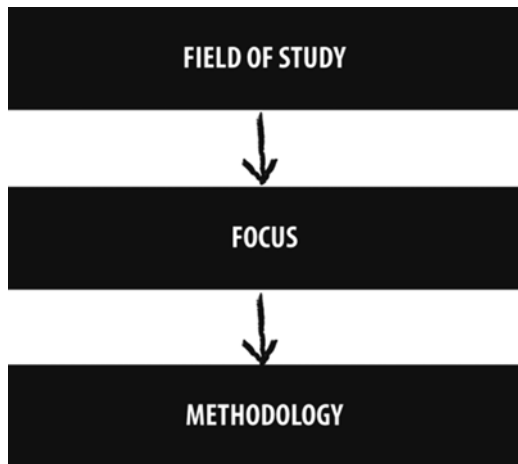


Fig. 12.1 The research process theory by Noble and Bestley [7]

Fig. 12.2 Field of study theory by Noble and Bestley [7], p. 53



6 Conclusion and Future Recommendation

At this point, the research is still in its early development. The research aims to look at how designers would convey messages through their design for the purpose of communications and businesses. All audiences have expectations with which they interrogate and interact with visual messages – the aim of innovative design is to relate to these already familiar forms and to extend the visual language used in new exciting ways [7].

Based from this survey it could give new knowledge and understanding of the Malaysia Design Industry. It would also give a bigger picture towards the businesses operation for the future economic growth for the designers in Malaysia.

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Chapter 13

A Hypothetical Methodology of Transferring Graduates' Knowledge Through Ceramic Art Entrepreneurship

Amalina Azlan, Rusmadiyah Anwar, and Amer Shakir Zainol

Abstract This research are mainly focusing on Ceramic Art Entrepreneurship: The Possibilities of Transferring Graduates as An Entrepreneur. A lot of business models have been introduced to practice the entrepreneurship understanding such as Young Entrepreneur Academy in Indonesia. It is an alternative educational institution for young people who want to learn to be an entrepreneur. The education program is a program that runs for 6 months for the trade in which 70 % of the study is practical activities and 30 % is theory. Under the direct guidance by experienced trainers, graduates will be trained to understand how to become a successful entrepreneur. Fresh graduates who are unemployed have become a problem for all over countries. Global Employment Trends Report in 2012 stated that in the population of 7 billion people, only 3 billion were employed and 205 million were unemployed (Chell E, *Entrepreneurship: globalization, innovation and development*. Thomson Learning, 2001). The objective of this study is to identify the factors that give obstacles to the graduates to be entrepreneurs. Other objectives are to explore the most challenging situation among graduates during they start their own business and to identify the achievement of knowledge transfer activity from the academia to rural residence with the involvement of fresh graduates. The methodology started with interviewing, surveying, and questionnaire. The scope of the study is entrepreneurship and graduates. The scope mostly for the art entrepreneurship and graduates scope target is focusing on how art entrepreneur model or graduates can get involved into the program with the art entrepreneurship background as well as to transfer the knowledge to rural resident as a participant for the project. As a results, graduates

A. Azlan (✉) • R. Anwar

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: amalina.azlan18@gmail.com

A.S. Zainol

Faculty of Art and Design, Universiti Teknologi MARA, 40450 Shah Alam,
Selangor Darul Ehsan, Malaysia

can enhance their entrepreneurial knowledge and could transfer knowledge and the success of the conceptual framework could be one of the opportunities for graduates to working in their own filed worked.

Keywords Art entrepreneur • Entrepreneurship • Art entrepreneurship • Graduates • Ceramic • Knowledge transfer

1 Introduction

Becoming an entrepreneur is a fundamental of business plan and needs a continuously planning process [1]. It is a process of making or creating a new perspective starting with an idea making until the end product is produced [2]. Ruth Bridgstock [3] stated that art entrepreneurship can be defined as the development of skills aligns with application, sharing, and division of creative work [3].

1.1 Entrepreneurship

The book *Entrepreneurship: A Process Perspective* by Robert A. Baron stated that entrepreneurship is a process of clarifying time and moves through distinct both useful and accuracy [4]. Mary Coulter agreed with Robert A. Baron that new venture, innovation, and creativity are processes of being an entrepreneur [5]. In Schumpeter's words, entrepreneurship is introducing new combinations [6]. Other researcher has agreed that entrepreneur must be flexible, dynamic, and risk taking.

1.2 Graduates

Referring to *Webster's New Explorer College Dictionary*, graduates can be defined as people who officially completed the requirement of an academic. As a graduate, it is easily to ask them to handle something that related to their field of work [7]. Graduates with art and design background who have several skills based on their own major and their specialization are needed to most company, for instance, the ceramic manufacture [8] that needs those skills in terms of ideation of design and experience. This is because they have learned about the elements and principals, design, and quality of a product [9–12].

In Malaysia, unemployment rate is the third highest in Southeast Asia region with 3.3 % [13]. The issue is “How can we embed our graduate from ceramic to get into the program”? *Kajian Pengesanan Graduan (KPG)* [14] reported that 24.0 % of graduates' employment status is unemployed, and from 15,196 unemployed respondents, 48 % were graduates of arts and social sciences [14] (Fig. 13.1).

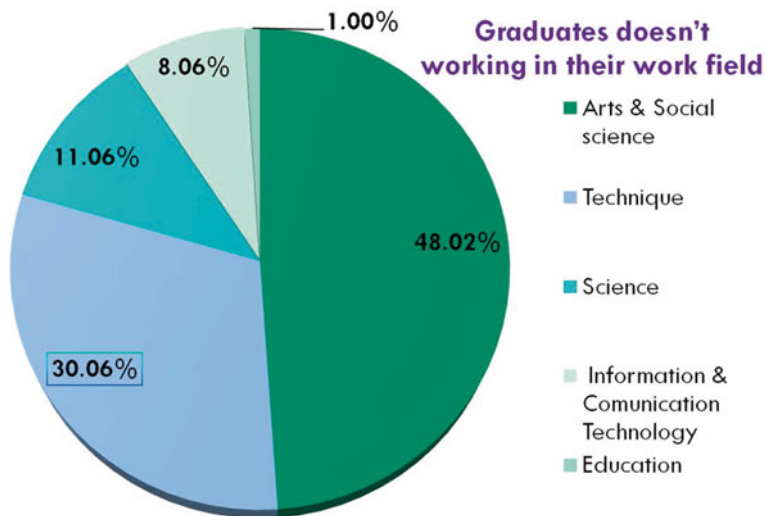


Fig. 13.1 Shows (Inti Pati Hasil Kajian Pengesanan Graduan by KPT [14])

1.3 University Program

University Technology MARA (UiTM) initiated an entrepreneurship program called MASMED to develop and to apply the values of entrepreneurship and improve the marketability and availability of jobs among graduates of UiTM. Another goal is to increase the entrepreneurial competencies of graduates in preparation of being in the business world. MASMED program also provides a platform for graduates to start their business networks and technical skills in preparing the business.

1.4 Scope and Limitation of the Study

In order to address the objectives at this study, the scope of the study is entrepreneurship and graduates. The scope mostly for the art entrepreneurship and graduates scope target is focusing on how art entrepreneur model or graduates can get involved into the program with the art entrepreneurship background as well as to transfer the knowledge to rural resident as a participant for the project. The limitation of the study will be in Sungai Besar, Sabak Bernam, Kuala Selangor, Kuala Selangor, and Pusat Kraftangan.

1.5 Significant of the Study

This research is build to increase the chances of the employability for the graduates and rural resident group in social entrepreneurship. Thus, the quality ceramic entrepreneur in Malaysia will be increased and well established.

1.6 Conceptual Framework

As an art-based graduates, training of entrepreneurship may different. Bridgstock in his statement says, as for the artist, the practice of entrepreneurship is multilayered and qualitatively different from the practice of entrepreneurship in the traditional business sense [3].

In order to accomplish the study, a conceptual framework is added. A framework is useful to help and structure thoughts and navigates around the different strategies and the needs analysis of external and internal environments in the industry and helps to overcome the decision-making methods that will come up to the business strategy formulation (Priandita and Toha [15]). One of the methods used is interviewing and has been described by Janesick [16] as two persons exchanging data with questions and responses through communication about a particular topic [16] (Fig. 13.2).

2 Research Methodology

Methodology is a systematic, theoretical analysis of the method applied to a research study. In order to achieve the result, the proper strategy is indeed. This study is a based on descriptive study and empirical research through entrepreneurial activities.

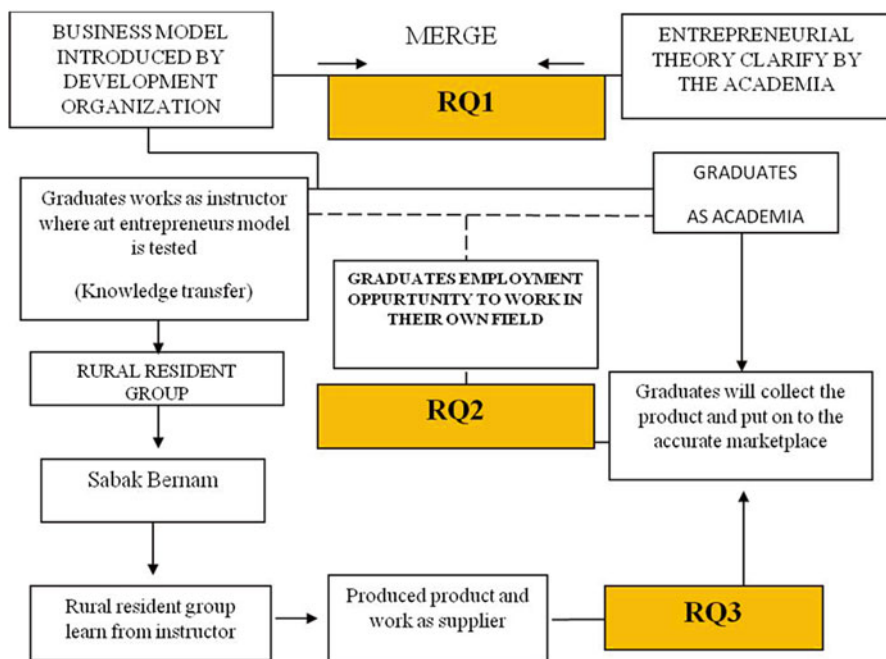


Fig. 13.2 Shows a conceptual framework

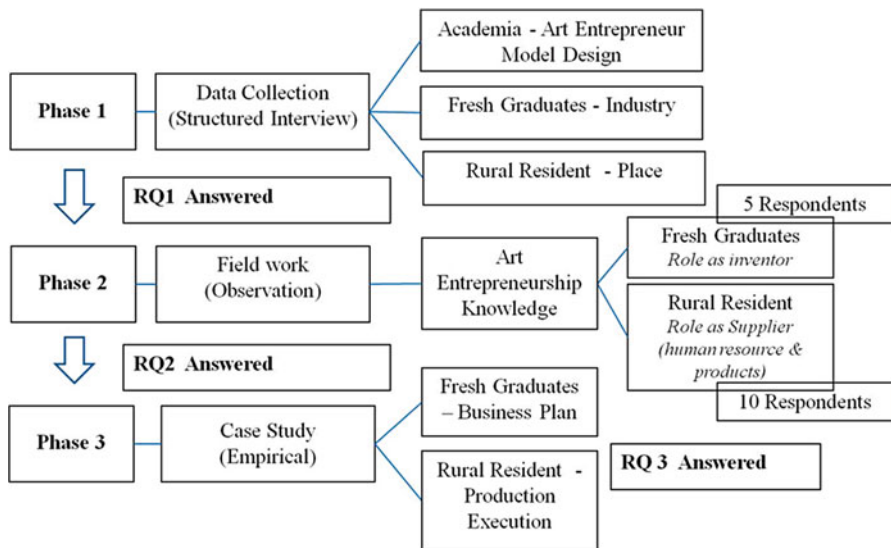


Fig. 13.3 Shows a research method for the study

It seeks answers to questions, which were formulated on literature reviews and on what is often practiced by graduates in focusing on three elements involved between professional, resident, and rural society, especially the understanding of business practice (Graduates) (Fig. 13.3).

3 Discussion

The data from interviewing, surveying, and questionnaire are collected from structured focus group in Sabak Bernam. Most of the questions will be based from ceramics and entrepreneur. This research will be carried out in a form of both qualitative inquiry and quantitative inquiry. For the qualitative inquiry, the sample size depends on what was deemed to be required (Patton [17], Stake [18], Yin [19] and Adelman). Patton [20] states the purpose, use, credibility, and available resources also dictated this size [18, 21, 22].

The observation will be based on resident group who came from rural thinking about metaphorical business activities through real-life production activities. Multiple-choice questions and open-ended questionnaires will be distributed to the respondents to get a clue about the nature of entrepreneur and the characteristics of business problems [23].

4 Conclusion

As a conclusion, what did I expected from this research is that graduates can transfer their knowledge to the rural resident group completely and can be a successful entrepreneur. Moreover, the success of the projects could be one of the opportunities for graduates to working in their own field. Lastly, the graduates are able to enhance their entrepreneurial knowledge to become one of the successful entrepreneurs.

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Chapter 14

The Role of Digital Educational Game Design Learning Environment: An Empirical Study

Nurdalilah Mohd Rani, Mohd Fairus Yusoff, Fatimah Zaharah Ros Azman, and Muhamad Fairus Kamaruzaman

Abstract According to the National Key Result Areas (NKRA), education is one of the essential areas which have been highlighted in rising international educational standards and qualities among Malaysian students for the needs of the twenty-first century in terms of their educational performance. However, most students are still facing issues in performing well in this area especially the young learners. For example, the level of illiteracy and innumeracy in Malaysia is growing from time to time. This is due to the lack of creativity and effectiveness in teaching that particular subject, and then students do not feel motivated and attracted in the learning environment. Therefore, this research proposes digital educational games to be used as the most relevant approach in cultivating students' motivation in the learning environment as it is capable to attract the player to be actively immersed in the game play. The main purpose of this research is to cultivate motivation in improving students' achievement in the learning environment especially young learners by modeling and identifying the most suitable digital game approach. In order to foster the interest in the learning environment, it should be started in early education as in preschool level. Hence, the method that will be applied to design and develop the games is the digital game-based learning (DGBL) model. The data from the study will be collected and analyzed by using pre- and post-experiment through tests and

N.M. Rani

Formgiving Design Research Group, Design and Creativity Communities of Research, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

M.F. Yusoff • F.Z.R. Azman

Faculty of Art and Design, Universiti Teknologi MARA, 40450 Shah Alam, Selangor Darul Ehsan, Malaysia

M.F. Kamaruzaman (✉)

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
e-mail: fairuskamaruzaman@ieee.org

observation on the two groups of preschool students which represent each of the digital educational games. The investigation will display the findings from the said experiment and determine the appropriate digital educational games in cultivating students' motivation to improve students' performance in the educational area.

Keywords Digital technology • Game design • Learning • Motivation

1 Introduction

The emergence of assistive technology and the influence of embedded learning technology are seen as the natural evolution of educational game design learning environment. Digital educational game design learning is the central theme at which assistive learning coincides to emit at anytime and anyplace of learning practice [1]. In an extensive review of the use of assistive learning technology such as tablet and smartphone in learning and teaching [2], identified aspects of education are relevant to academic use of assistive learning in both formal and informal learning contexts. In order to facilitate the scholar to assess the most significant applications of digital game design learning environment in education, they classified these aspects into four areas, which are functioning, composing, and collaborative. As well as the sophistication and affordability of embedded technologies and their applications, it also offers a virtuous impression on the educational ecosystem. Previous research findings show a total development toward integrated assistive learning technology and other devices to enhance the efficiency and eminence of learning via embedded technology [2]. Assistive learning technology is getting trendy for the role as a new learning tool as it acknowledges the conventional learning approach. It is also believed that there are still a huge number of schools and educational institutions that do not use the existing technologies even though those schools are equipped with high-end technology equipments to sustain the new learning approach. Teaching and learning in Malaysia have faced many defying factors especially in primary and secondary school. The obstacles mainly dwell around the contemporary learning environments, which are too stiff, that edge the students' potential in their learning development. Turgut and Irgin [4] believed that with solid technology infrastructures, effective and meaningful information communication technologies' (ICT) integration in and outside the classrooms will be achievable. Most of the educator and instructor still need more time to access the new knowledge and how to incorporate information technologies tools in their lesson in class. Therefore, in order to nurture the motivation and improve the students' performance toward the educational learning environment, digital educational game is the most preferred approach as it brings beneficial results in the teaching and learning environment which is often overlooked [20].

2 Literature Review

2.1 Education in Malaysia

Since decades ago, educational area has been introduced and provided to people in Malaysia in order to produce the educated generation. In Malaysia, education is categorized in varied levels of education such as preschool, primary school, secondary school, postsecondary school, and tertiary education.

2.2 National Key Result Areas (NKRA)

Education is one of the essential areas which have been highlighted in the National Key Result Areas (NKRA) in Malaysia by the Ministry of Education. It plays an important role in rising international educational standards and qualities among Malaysian students for the needs of the twenty-first century in terms of their educational performance and also for the global industry and economic competition. Malaysia's government has decided to make the transformation program on educational area as to produce highly educated workforces to ensure that Malaysia can achieve its target of becoming a high-income nation.

2.3 Definition of Game

A game is a system in which players take part in a simulated conflict that is defined by rules and effects in quantifiable outcome [1]. For Salen and Zimmerman [2], a game is an enjoyable activity in virtual environment which encompasses the participant to participate, fully focus, and compete with other players to reach the goal and the rules that are provided in the game play. Games allow the player to immerse in virtual surroundings that provide chances of finding talents that can be used in the real world. In the game, the player does not have to worry if doing mistakes because it is in virtual world not in real world [3]. A game is the series of moments of immersion that induce the player to play to the next level continuously and force them to be addicted to that particular game [4]. Motivation, effects, and attitudes in learning will be enhanced and increased when a game is used as a learning tool [5].

2.4 Fundamental Elements of Game

According to Huang et al. [6], the elements of game consist of play, pretending, goal, and rules. Play is a participatory form of entertainment, and it is different with books, films, and theater which are presentational forms. Every time the game is

played, different choices and experience can be made and obtained. Play eventually includes the freedom to act and the freedom to choose how to act. Even though this freedom is not unlimited, the choices must be controlled by the rules. Hence, this requires the player to be clever, imaginative, or skillful in the play. The other element of a game is pretending which is the act of constructing a theoretical realism in the mind, which is one element of our definition of a game. The other name of pretended reality is magical circle. The magic circle is associated to the concept of imaginary worlds in fiction and drama, ceremonial, spiritual, legal, and other activities [6]. Next essential element of a game is a goal. Huang et al. [6] stated that every game must have a goal or more than one goal. The goal of the game is defined by the rules and is random because the game designers can outline it in any way they like. In trying to reach a game's goal, there must be some challenges involved. However, different players perceive different difficulties of a challenge. Besides goal, rules are also the essential element of game. Rules are instructions that the players agree to take for the period of the game. Every game has rules, even if these rules are unwritten or taken for granted. Rules also create a contextual framework that allows the players to know which activities are acceptable and to estimate which course of action is the most helpful in achieving the goal [6].

2.5 Planning for a Game

There are several things to consider in conceptualizing game development which are the following: high concept statement that states on what the game is about in one or two sentences, genre selection of the game that includes a statement on the type of game being used or hybrid of genres, game play which is a simple explanation on what the player will do when playing the game, features or the list of special equipment that is included in the game, description on setting of the game world or environment, story of the game that consists of synopsis and plot, target audience of the game, and hardware or platforms that are going to be used [6].

2.6 Game and Children

Playing computer games is an extremely popular activity for children. They spend almost all of their time by playing games [7]. According to a recent UK survey, 98 % of 6–15-year-old children play video games than doing other activities such as watching movies, calling a friend, reading a book or magazine, or listening to music. It seems that children prefer more digital game than the traditional game that is nonelectronic [8].

2.7 *Kindergarten Education*

Commonly, students of kindergarten education are ranging from age 4 to 6. The education of kindergarten is aimed to prepare a formal education to young children before enrolling to primary schools. It is a preschool educational approach base that includes playing, singing, practical activities, and social interaction as part of activities in school. Besides, kindergarten students are being exposed to the early social skills learning, early reading, writing, and language skills in preparing the primary school's learning environment [9].

2.8 *Children Motivation*

“When people are intrinsically motivated to learn, they not only learn more, they also have a more positive experience” [10]. Based on the statement above, it is explained that the development of intrinsic motivation in people will bring good impact as people are willing to learn more and gain a lot of experience from it. Intrinsic motivation is an inner motivation that makes people to have a desire to fulfill something [11]. In order to motivate learners to be well engaged to the learning environment, an incentive should be provided [12]. Children are attracted and motivated with an interactive and active learning environment as they have an intrinsic motivation toward the act of gaining knowledge. The interactive learning includes instructional or educational courseware, educational games, and other exciting educational activities. Children with intrinsic motivation displayed intellectual curiosity, enjoyable feeling in learning, and exciting feeling in seeking knowledge out from what they have known [12]. Games are considered as a great medium in creating an immersive learning experience toward the learner especially the young learner [12]. This is because it brings an internal desire which is considered as an intrinsic motivation in a player or learner to achieve the goal and win the game [11]. The motivation can be briefly explained by the ARCS Model of Motivational Design by John M. Keller from Florida State University. It comprises of four strategy components:

1. Attention: Strategies in which curiosity and interest need to be aroused and sustained
2. Relevance: Strategies that can connect learners' interest, motives, and goal
3. Confidence: Strategies that help in building positive expectation to be successful
4. Satisfaction: Strategies that provide intrinsic and extrinsic reward from the efforts that have been made

2.9 Behavior and Emotion

According to Paras and Bizzocchi [13], children learn specific behaviors from strengthening investigation and exercise. Emotions are abstracted as core internal monitoring and control systems, designed to consider events and encourage human action [14, 19].

2.10 Technology Awareness in Children

Children nowadays have used software technologies in their daily lives such as cellular phone, computer games for their entertainment, and educational technologies for learning. Children are formerly emerging as users of technology [15, 19]. The worlds of children are different from those of adults'. That is why for some reasons, adults may not understand what children want because they live in a different world [16].

2.11 Why Use Game for Children Learning

Majority of children today are living in the digital world. They are living in the digital environment, and technology around them makes their ways of thinking different. For them, computer game is part of their lives and that is a common daily activity. In education, the educator believes that children can learn better when it is fun. While playing, humans can obtain new skills without them knowing it. Computer games are based on playing and entertainment. It also can be edutainment by adding learning materials in games [17, 18].

3 Methodology

Digital game-based learning (DGBL) model is an instructional method that incorporates educational content into video games with the goal of engaging learners. Digital game-based learning (DGBL) consists of five phases which are analysis, design, development, quality assurance, and implementation and evaluation [11]. Each phase has its own tasks and preprocessing is involved.

3.1 Research Activities Analysis

In the analysis phase, the research title is formed and later confirmed as "Modeling Educational Games Design Learning Environment." The research is about to model and develop two different types of educational game approaches that will be

developed later. The two game approaches are board game and puzzle game. The research is targeted to kindergarten students. At the end of this research paper, the two game approaches will be evaluated in order to determine the most effective game approach in the learning environment for kindergarten students. The analysis phase includes the process of determining the goal and objectives to be achieved. The problem faced by the kindergarten student to be motivated by using other approaches was also determined in this phase.

3.2 Design

In the design phase, the game design will be defined based on the content of academic curriculum for kindergarten students. The storyboard for the game-based story will be created, and the type of multimedia elements which are text, graphic, audio, and animation will be determined for every game's screen. These two game approaches will have the different setting and game rules for each but both containing similar content. In addition, the features of game design also need to be designed and determined in this phase. Each game approach needs to be designed well from the beginning until the end of the game. The language that will be used in the game approach will be fully English that is simple and easier to understand by the kindergarten students. For each of the game approaches, the content will be the same since it comprises with a kindergarten school lesson. However, the strategy and the game play will be different in both games.

3.3 Development

In the development phase, the technology used in game making will be determined. The game props can be modeled by using Adobe Illustrator or Adobe Photoshop software. The phase continues with the development of the game approach by using Macromedia Flash software. Before developing the prototype, the technicalities and functionalities of the game approaches must be assessed. At the end of the phase, the two game approaches will be evaluated if it has a complete prototype with functionality.

3.4 Quality Assurance

During the quality assurance phase, the game approach prototype will be tested and the quality will be checked before proceeding to the implementation phase. The prototype will be tested via the functionality testing by the developers. This checking is a must to ensure that the two game approaches will have no error regarding

the function of its features when using it. Besides, if there are some errors inside the game features, the developer will solve it and again check the quality assurance. Through this, it will improve the quality of the games [20, 21].

3.5 Implementation and Evaluation

In the implementation phase, the two prototypes of puzzle and board games will be distributed to the kindergarten students by using a compact disk or CD-ROM. It will be tested to the target users with the help of their teachers and being observed by the researcher. The target users which consist of kindergarten students will be divided into two distinct groups. The first group will be tested on their engagement on the puzzle game, while the other group will be evaluated on their engagement on the board game. The evaluation method that will be used in order to evaluate the students' engagement is by using pre- and post-experiment from the before- and after-design method through their performance result [20]. The students' performance will be measured by identifying the difference between the pre- and posttest through observation [22] and a simple grammar test that is being conducted on both experimental groups by the researcher with the help of teachers.

Firstly, the pretest will be conducted on both groups when they are learning in class before they experience the games. During the pretest, the researcher will observe the students' attitude and motivation when they are learning in class before the use of the games. At the end of class, both groups of kindergarten students will be evaluated by giving a simple quiz to test their prior knowledge on the kindergarten students' learning. The result retrieved from the pretest will be documented and analyzed. On the next day, the posttest will be conducted on both experimental groups in which each group represents each game, puzzle and board games, after they have experienced the games. In this phase, similar observation procedure and simple quiz based on what they have learned from the games at the end of the session will be conducted on both groups. Result retrieved from the posttest will also be documented and analyzed. Next, the data collected from the grammar test on the pre- and posttest from both groups will be analyzed by calculating the difference in the number of correct answers between the pre- and posttest in each group. This procedure will be conducted to measure the percentage of students' performance in each of the two different groups before and after using the games. Then, the group with the highest percentage of students' performance that represents the particular game will be determined. The data collected from the observation will also be analyzed to observe the students' attitude and motivation when engaging with the two games. Therefore, based on the result attained, the most suitable game that can motivate kindergarten students in the learning environment will be determined by the percentage of students' performance and observation result.

4 Significance of Study

The most significant contribution of this paper is definitely to the students' academic performance. The development of games as mediums in the learning environment will be a brilliant idea in reducing the illiteracy and innumeracy level in Malaysia which is one of the worrying issues faced recently. This is because digital educational game helps children to be more motivated and learn actively as it provides interactively sensational activities and attractive multimedia technology. Besides, this research is expected to provide benefits to the teachers or educators in contributing insights and ideas on the method of teaching and collaborating with students in the learning environment. With the aid of electronic devices and technology that are provided in most schools or institution nowadays, this educational game design courseware is able to be applied by teachers and other educators to improve their teaching style in improving students' motivation and achievement rather than using the traditional method.

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Chapter 15

Graduates Employability Skills: Hard and Soft Skills Towards Employee Productivity from the Perspective of Malaysian Employers

Rudzi Munap, Muhammad Izwan Mohd. Badrillah,
and Ahmad Rais Mohamad Mokhtar

Abstract The objective of this study was to identify the employability skill that is needed in the job market and the perception of employers' and graduates' towards the skills that they possessed. Six variables that make up employability skills were examined in this study towards employee productivity. Data were collected through two different sets of questionnaire intended to measure their perceptions. The result of this study revealed that the variable of interest is significant to employees' productivity. Graduates and employers placed similar importance of employability skills. The results of this study also suggest that other variables should be considered as other skills will influence productivity of employees at the workplace.

Keywords Hard skills • Soft skills • Employability skills • Employee productivity

1 Introduction

The primary purpose of higher education is to prepare students for the world of work. The mushrooming of the public and private educational institutions in Malaysia has produced a huge pool of graduates. Based on the theory of social psychology, employability is a job but more towards the ability to do work [1]. This study is designed to examine which domain of the hard and soft skills contribute most to employee productivity. Previous study indicated that young graduates leave universities without the necessary skills and attitude that is necessary to successfully enter the world of work. Malaysia is now at the mid-point in its journey towards

R. Munap (✉) • M.I.M. Badrillah • A.R.M. Mokhtar
Faculty of Business Management, Universiti Teknologi MARA,
42300 Bandar Puncak Alam, Shah Alam, Selangor, Malaysia
e-mail: rudzim@puncakalam.uitm.edu.my

Vision 2020 and is transforming to become a developed nation during the second phase of a 15-year period [2]. Everything we see in this world today has changed tremendously in terms of technological development, and businesses operate globally in order to survive the competition which exists these days.

Graduate employability refers to the graduates' possession to the certain level of skills and attitudes, as well as including their ability to use the skills in looking for a better job [3]. For those who have various skills and possess positive attitudes are highly valued by employers and they would excel in the labour market. The Ministry of Human Resource of Malaysia has recorded that every year the number of job vacancies increased and the graduates should not find it difficult to fit themselves into the labour market. But, most of the graduates are unable to fulfil the job vacancies due to the lack of certain skills, making them unfit with the employer requirement.

2 Review of Literature

The term employability skills is used to determine a set of achievements that include skills, understanding and personal attributes that makes an individual more secured and successful in choosing a suitable job that will benefit them to the community and economy [4]. Hard skills included in this study are Information and Communication Technology (ICT) and technical and mathematical skills, and the components of soft skills are communication, interpersonal and management. Employees need to be competent on technical skills which will make them as an asset to the organization [5]. It has been found that Malaysian graduates are well trained in their areas of specialization but unfortunately lack the soft skills [6].

Malaysian employers are searching for graduates who are balanced with good academic achievement and possessing soft skills such as communication, problem solving and interpersonal [6]. These soft skills, also known as employability skills, are the important foundation in any kind of task that an employee is performing [7] (Fig. 15.1).

3 Methodology

The instrument for this study was a questionnaire which was adapted from studies of [2]. A survey was conducted on two different groups: graduates, with a working experience of between less than a year to 2 years and their immediate employer. The targeted graduates in this study are from the programs of Bachelor in Office Systems Management, Bachelor of Customer Service, Bachelor of Health Administration and Bachelor of Event Management, Faculty of Business Management, Universiti Teknologi Mara (UiTM), Puncak Alam campus. From a population of 1,480, a total 300 questionnaires were distributed to the randomly selected samples. A total of 150 questionnaires were received from both groups and that yields to 50 % response return rate.

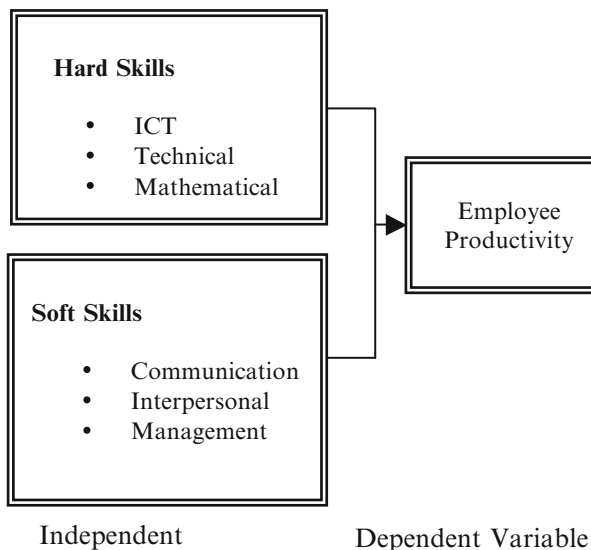


Fig. 15.1 Conceptual framework of the graduates' employability skills: hard and soft skills towards employee productivity

The questionnaire that was designed for both groups comprises of four sections. Section A captures the demographic information of the respondents. Sections B and C required them to rate their skills level with a 5-point Likert scale measuring from 1, being “Not At All Excellent” to 5, “Very Excellent”. Section D is to define the level of productivity, using a 5-point Likert scale, values ranging from 1, being “Not At All Excellent” to 5, “Very Excellent”.

For data analysis, the statistical software, Statistical Package for the Social Science (SPSS), version 20, was used to perform the Correlation and Multiple Regression Test to confirm the influence of the independent variable towards dependent variable. Besides that, mean score comparison was carried out to compare which variable most contributed to employee productivity.

4 Research Findings

Table 15.1 displays the descriptive statistics for the demographic profile of the graduates. The table shows that a total of 61.4 % of the respondents are female as opposed to 38.6 % male. In terms of age, majority of the respondents, 34.6 %, are in the age group of between 26 and 30 years old. The biggest number of graduates who participated in this study are from the Bachelor in Office Systems Management (OM221), comprising of 32.7 %. It was also found that most of the graduates, that is, 60.6 % served for the middle level management. A total of 52.0 % of them had a working experience of between 1½ years and 40.7 % of them are employees of the

Table 15.1 Demographic profile of the graduates ($n = 150$)

Graduates' profile	Classification	Frequency	Percent
Gender	Male	58	38.6
	Female	92	61.4
Age	21–25 years old	37	24.7
	26–30 years old	52	34.6
	31–35 years old	37	24.7
	>35 years old	24	16.0
Program enrolled	OM221	49	32.7
	OM222	32	21.3
	OM223	47	31.3
	OM224	22	14.7
Level of management	Top level management	22	14.7
	Middle level management	91	60.6
	Lower level management	37	24.7
Working experience	<1 year	17	11.3
	1–1½ years	55	36.7
	1½–2 years	78	52.0
Nature of company	Government agency	43	28.6
	Multinational company	46	30.7
	Private company	61	40.7
Background of industry	Manufacturing, Construction	24	16.0
	Wholesale, Retailing	37	24.7
	Finance, Insurance and service	55	36.7
	Transport and storage	31	20.6
	Others	3	2.0

private sectors. In relation to the background of the industry they are in, 36.7 % of them are in the Finance, Insurance and Service industry.

Table 15.2 represents the descriptive statistics of the demographic profile of the employers. A total of 58.7 % of the respondents are male as opposed to 41.3 % female. In terms of ethnic background of the employers, it shows that 40.7 % of them are Malay. Also, another 40.7 % of them are in the age group of between 50 years old and above. Majority of them, 46.7 % had a Master degree and 40.7 % are engaged in the private sectors. A total of 32.0 % had obtained a working experience of between 7 and 9 years and 36.7 % of them are in the Finance, Insurance and Service industry.

The mean and standard deviation of groups, graduates and employers, is shown in Table 15.3. This table explains which domain of hard skills and soft skills contributed most to employee's productivity. For hard skills, both groups agreed that ICT is the domain that contributed to employee's productivity, graduates ($M = 3.47$, $SD = .384$), employers ($M = 3.60$, $SD = .506$).

While, for soft skills, both agreed that interpersonal skills is the domain that contributed most to the productivity of employees at the workplace, graduates ($M = 3.33$, $SD = .537$), employers ($M = 3.77$, $SD = .670$).

Table 15.2 Demographic information of the employers ($n = 150$)

Employers' profile	Classification	Frequency	Percent
Gender	Male	88	58.7
	Female	62	41.3
Ethnic background	Malay	61	40.7
	Chinese	34	22.7
	Indian	47	31.3
	Others	8	5.3
Age	20–30 years old	6	4.0
	31–40 years old	24	16.0
	41–50 years old	59	39.3
	50 years old and above	61	40.7
Highest academic qualification	Doctor of Philosophy	11	7.3
	Master Degree	70	46.7
	Bachelor Degree	38	25.3
	Diploma	15	10.0
	Certificate	3	2.0
	SPM	13	8.7
Nature of company	Government agency	43	28.6
	Private company	61	40.7
	Multinational company	46	30.7
Working experience	Less than 3 years	35	23.3
	3–6 years	37	26.7
	7–9 years	48	32.0
	9 years and above	30	20.0
Background of industry	Manufacturing, Construction	24	16.0
	Wholesale, Retailing	37	24.7
	Finance, Insurance and services	55	36.7
	Transport and storage	31	20.6
	Others	3	2.0

The Cronbach's Alpha for independent variables are in the range of .602–.875. The figures indicated that the measure had high internal consistency and stability. The analyses also produced acceptable reliability coefficients for all the independent variables with Cronbach's Alpha exceeding .60. The lowest alpha was .602 (Mathematical Skill) and the highest Alpha was .875 (Technical Skill). Hence, based on the reliability analyses, the measures used in the study were reliable, thus, suggested its readiness for further analyses.

Table 15.4 shows the correlation analysis from the group of employers. The table indicated the result from employers that all variables are correlated to each other. The correlated variables indicated a significant relationship among them, from very weak relationship to very strong relationship. Mathematical and employee productivity ($r = .180$, $p < .01$) are said to have a very weak relationship, as opposed to ICT ($r = .349$, $p < .01$) and Technical ($r = .299$, $p < .01$) which indicated a weak

Table 15.3 The result of mean and standard deviation for graduates and employers

No	Variables	Group	Mean	SD
1	ICT	Graduates	3.47	.384
		Employers	3.60	.506
2	Technical	Graduates	3.24	.468
		Employers	3.23	.589
3	Mathematical	Graduates	3.00	.740
		Employers	3.02	.909
4	Communication	Graduates	2.89	.501
		Employers	3.06	.629
5	Interpersonal	Graduates	3.33	.537
		Employers	3.77	.670
6	Management	Graduates	3.32	.474
		Employers	3.53	.689
7	Emp. prod.	Graduates	3.20	.454
		Employers	3.36	.538

Table 15.4 The result of correlation analysis for employers

No	Variables	1	2	3	4	5	6	7
1	ICT	(.712)						
2	Technical	.352**	(.875)					
3	Mathematical	.458	.453**	(.602)				
4	Communication	.381**	.345**	.333**	(.769)			
5	Interpersonal	.424**	.171	-.083	.328**	(.873)		
6	Management	.262**	.221**	.129	.551**	.573**	(.843)	
7	Emp. prod.	.349**	.299**	.180*	.550**	.574**	.802**	(.833)

Cronbach's Alpha values are shown in the parentheses

*Significant at 0.05 level

**Significant at 0.01 level

relationship. Variables Communication ($r = .550, p < .01$) and Interpersonal ($r = .574, p < .01$) are said as having a moderate relationship. Management ($r = .802, p < .01$) is said to show a very strong relationship [8].

The Cronbach's Alpha for independent variables are in the range of .610–.856. The figures indicated that the measure had high internal consistency and stability. The analyses also produced acceptable reliability coefficients for all the independent variables with Cronbach's Alpha exceeding .60. The lowest alpha was .604 (Technical Skill) and the highest alpha was .856 (Interpersonal Skill).

Table 15.5 represents the results of correlation analysis from the graduates and indicated that all variables are again correlated to each other. Variables Management ($r = .565, p < .01$) and Interpersonal ($r = 0.468, p < .01$) indicated a moderate relationship to employees' productivity. Other independent variables such as ICT ($r = .373,$

Table 15.5 The result of correlation analysis for graduates

No	Variables	1	2	3	4	5	6	7
1	ICT	(.610)						
2	Technical	.393**	(.604)					
3	Mathematical	.257**	.528**	(.822)				
4	Communication	.145*	.318**	.374**	(.715)			
5	Interpersonal	.376**	.192*	.029	.341**	(.856)		
6	Management	.349**	.243**	.153*	.300**	.576**	(.790)	
7	Emp. prod.	.373**	.374**	.394**	.292**	.468**	.565**	(.839)

Cronbach's Alpha values are shown in the parentheses

*Significant at 0.05 level

**Significant at 0.01 level

Table 15.6 The result of multiple regression analysis for graduate and employer

Independent variables	Dependent variables			
	Employee productivity			
	Graduate		Employer	
	Beta values	Sig.	Beta values	Sig.
ICT	.063	.403	.065	.329
Technical	.077	.334	.054	.424
Mathematical	.288	.000	.056	.396
Communication	-.035	.643	.092	.208
Interpersonal	.225	.008	.152	.038
Management	.361	.000	.628	.000
<i>R</i>	.682 ^a		.831 ^a	
<i>R</i> ²	.465		.691	
Adjusted <i>R</i> ²	.440		.673	
<i>F</i> values	19.229		38.694	
Sig <i>F</i> values	.000		.000	
Durbin Watson	1.698		2.239	

$p < .01$), Technical ($r = .374$, $p < .01$) and Mathematical ($r = .394$, $p < .01$) are said to have a weak relationship to employees' productivity. Communication ($r = .292$, $p < .01$) indicated a very weak relationship to employee productivity [8] (Table 15.6).

The regression analysis was performed to examine the influence of hard skills and soft skills factors on the productivity of employees. The results indicated that Management is the main variable that influence the employee productivity for both groups ($\beta = .361$, $p < .05$) for graduates and ($\beta = .628$, $p < .05$) for employers. This indicated that both hard and soft skills contributed to 46.5 % of the variance to employee's productivity as said by the graduates. At the other end, the employers then said that both hard and soft skills contributed to 69.1 % of the variance to employee's productivity.

5 Conclusion

It can be concluded that both hard and soft skills have an impact on graduate's employability. Employability skills are commonly important in improving the employee productivity. Graduate's employability is a subject that has become particularly relevant in the context of the adverse employment conditions currently affecting Malaysia. There should be efforts to fulfil the market requirement with suitable skills to the graduates. This effort will minimize the gap between employers' and graduates' perceptions by providing suitable skills to the graduates. This can be done by exposing the graduates with the working in projects, assignment and providing a longer practical training duration.

From the findings of this study, it is suggested that future studies should focus more on other skills such as leadership, negotiation, critical thinking, adaptability skills, and so forth.

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Chapter 16

“Formal, Medium, and Subject Matter” from the Content Making Framework

Mohd Fuad Md Arif, Nadiah Mohamad, and Farrah ‘Aini Lugiman

Abstract This research which is the third part of four will be an extensive elaboration on the second principles which is “Formal, Medium, and Subject Matter,” newly reviewed and formed from the initial structure created in the first part of the research which was “Formal (Subject Matter), Material, and Meaning.” The elaboration was done through cross-referencing and interpreting several literatures especially that of Barrett (2011) *Making Art: Form and Meaning* and Lazzari and Schlesier (2008) *Exploring Art: A Global, Thematic Approach*. The objective of this paper was to elaborate and explicate the meaning of the second principle so that fine art students can use it as a form of conceptual construction and guideline in establishing their own understanding of formal, medium, and inquiry subject matter.

Keywords Formal • Material • Medium • Subject matter • Content making • Art-as-research • Thematic • Studio practice

1 Introduction

Dealing with art making is “also” about dealing with formal concept, medium (material), and subject matter. Every artwork needs to have and cannot escape these three aspects, even if it is dealing with a “conceptual (art)” undertaking which emphasizes “the business of creating and transmitting ideas” [1] or in this matter any form of minimalist strategy. When artist and also art student makes art, they will always take into consideration and embark on a play and working through of how

M.F.Md. Arif (✉) • N. Mohamad
Fine Art Department, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia
e-mail: fuad9arif@gmail.com

F.A. Lugiman
Graphic Department, Faculty of Art and Design, Universiti Teknologi MARA,
Puncak Alam, Malaysia

their ideas will interweave with what materials they are using, why and how subject matter are chosen, created and presented and why or how visual elements and principles are composed and form regardless if it is a part of the main conceptual or intended consideration or not.

Such enterprise is not an easy one to be engaging with especially for art students who are in their early search for ideas and in making their own art object. Thus this paper tries to explicate on what it means by working through these three aspects. In explicating each aspect will be structurally explained in three prongs, which are meaning, division, and examples.

2 Method

This research was interpretatively constructed and developed by implying to the newly developed framework and by gathering relevant concept and understanding from several related art references as an effort to expound and develop each concept in the framework. These concepts are key principles referring to the newly revised framework (Fig. 16.1) done in the first component of the research, that is, (1) *Context*; (2) *Formal, Medium, and Subject Matter*; and (3) *Meaning/Content*. But being this a specific amplification on the second concept which is “Context.” Two

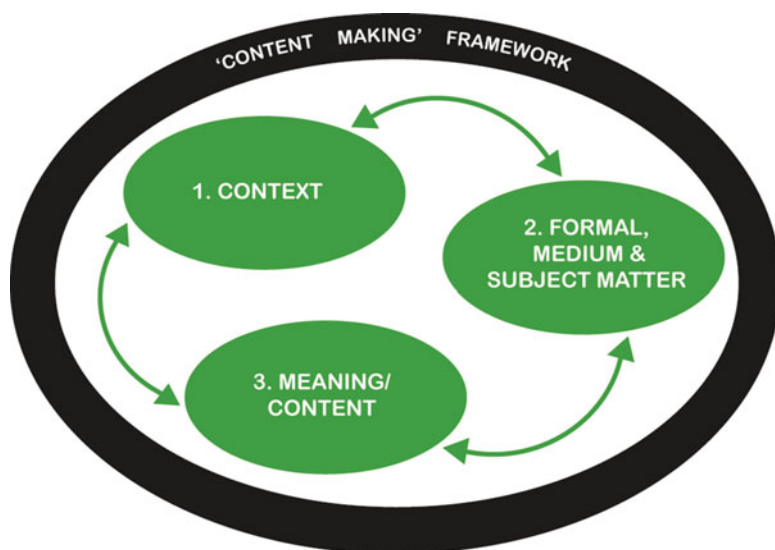


Fig. 16.1 The newly revised “content making” framework is amended from the first framework by Arif et al. (2013). In the early research the second principle was previously structured as “Formal (Subject Matter), Material, and Medium.” After reviewing the model the authors decided to change it to “Formal, Medium, and Subject Matter” due to similarity in concept

specific books that were used were Barrett (2011) *Making Art: Form and Meaning* and Lazzari and Schlesier (2008) *Exploring Art: A Global, Thematic Approach*. This paper tries to explicate on what it means by engaging with the three aspects mentioned before which are embedded in the explanation through three prongs which are (1) meaning, (2) division, and (3) examples.

3 Formal, Medium, and Subject Matter

3.1 Formal

Formal understanding does not just deal with the aspect of elements and principles of art but also takes into consideration matters such as size or dimension, time, and location, e.g., site-specific works are mainly concerned with the situation (surrounding) and condition of a given place and space which will influence the form and meaning of the work. Fundamentally formal issues are concerned with the physical appearance and character of a work. Barrett explains, “The physical structure of your work – its form – is the result of the process you use to compose your materials accordingly to your work’s intended function and expressive purpose” [2]. Typically the outlook of an artwork is comprised of visual elements such as color, shape, light, mass, texture, volume, form, and line. While the given principles are of movement, balance, rhythm, proportion and scale, emphasis, unity, and variety [3].

Principles are underlying structures that organize the elements into a given visual form by emphasizing some elements more than the others. These structures create distinction or even produce balance or harmony or repetition of, e.g., shapes, colors, and forms, which in turn produce a sense of visual movement [2]. Works done by Wassily Kandinsky, for example, illustrate such concept. In his painting titled *Unbroken Line* [9] (Fig. 16.2), there are dominant outbursts of simple shapes, colors, and lines which are composed in such a repetitive and in an assorted way, in turn exuberate and paradoxically create a combination of both harmonic (rhythmic) and chaotic visual composition, present in a single picture plane. Here the elements and the principles become the dominant figure of the painting. They are the actant and meaning of the painting.

But this condition might not be the same for other works even if there are visual evidences of these elements and principles. This is known to be true to works that deal with “conceptual” or “idea-based” art especially during the late 1960s and 1970s. As a major “movement” in the 1970s, artists engaging in such practices undergo an investigative mode which attempts to question the nature of art itself and also its societal function. Work such as *One and Three Chairs* [10] by Joseph Kosuth or *I Got Up* [11] by On Kawara (Fig. 16.3) deals with the perplexing idea of language and also life itself in a non-formalist rationale. Here the elements and principle of art do not become the principal concern in forming the visual outlook unlike works done by Kandinsky and Piet Mondrian.



Fig. 16.2 Wassily Kandinsky, Unbroken Line [9]

Thus as a condition, not all works are dealing with or making aspects of art elements and principles as the main visual purpose. But in examining this sort of works, one should understand that they are still formal issues that can be addressed analytically (or in a learning situation). As in Kosuth's *One and Three Chairs*, although formal aspect does not denote the key meaning of the work, in placing the object, i.e., the picture of the chair, the physical chair, and the blown-up definition of the word "chair," it is still arranged in a somewhat balanced and composed composition. Or even the "text" was formatted in a particular size (presented very minimal) which is not too big and not too small, thus creating a kind of intimacy to a rather bare arrangement. In art interpretation when students are required to do an analysis of a given work, formally they need to "list down" all elements which they are presently seeing in a given artifact [4] and what is also important all the information that can be known (collected), such as the name of the artist who made the work, the year the work was made, and issues of scale, dimension, or size.

But when doing an artwork, art students or even an artist should also be aware of these aspects. Most of the time is more to do with practical concern. For example, if a painter was making a large painting, will such size fit out of the door when it is going out for the intended exhibition? Installation works are even more complicated. A large piece would not work in a given space due to poor lighting or unsuitable space. Thus formally artists who are not engaged dominantly through the aspect of elements and principles do also need to take into consideration other formal issues such as what was mentioned above for "design" and practical purposes. Even art that is dealing with a more conceptual style needs to be arranged in a particular assembly to give visual impact that is needed to the whole work.



Fig. 16.3 Joseph Kosuth, *One and Three Chairs*, 1965 (*top*) and *On Kawara, I Got Up*, 1968 (*bottom*)

3.2 *Medium*

The material used to create an art object is its medium or media (plural). The usage of medium will be the first sign on how an artwork will be looked at Barrett [5]. Traditionally when referring to art material, it is usually implying a medium such as charcoal, tempera, litho ink, water color, oil, ink, stone or marble, wood, paper, mild

steel, and bronze. But through time as civilization and technology go through many transformations, major changes also happen within the medium of art. In modern and contemporary time, film, video, laser, digital imaging, Styrofoam, “plastic surgery,” robotic machinery, computer coding/programming and hardware, syntactic chemical, feces, and DNA have also become a medium that an artist works with.

These “new” media sometimes do not refer to traditional media and would be associated as media used in a nonart setting such as, for example, in a scientific laboratory, cooking, or fertilizer. Thus this sort of circumstance does create a kind of “patriarchal” distinction of material when referring to art making. Nevertheless on a “philosophical” note, regardless how we have created hierarchies towards things in this world, “no single medium is artistically superior to another” [5]. Thus as a material the most important thing is deciding and using the medium base upon the requirement of the artist’s idea and intention. Regardless whether they are television set, mud, live animals, gunpowder, or even fluorescent light. Media as material are controllable and also “have a mind” of their own. A minimal boxlike sculpture (minimal art) is controlled by the specific scale and thickness to which the artist intended. But a paint that is being splashed on a canvas is beyond the artist’s control – of how the dripping should precisely take shape.

In another consideration, according to Barrett, “medium not only refers to a material but also to an art form, a kind of expression, such as sculpture, jewelry, ceramics, computer graphic, and so forth” [5]. In one consideration working with materials is a form of labor-intense work – crafting by means of hands-on evolution through the usage of tools, e.g., brush, chisel, hammer, computer, software, camera – but in another condition, materials are also worked through within “changes,” which are based upon the craft of the artist thinking and an impulsive decision which normally happens during the process of working through a work. The artist working with this sort of means seldom has a particular medium that is favored by or resides within their practice.

Martin Creed, one good example, has been working with a diverse array of media ranging from videos, paint, musical instrument, neon, marker pen, people (running and barfing), and even dogs, cactus, and blutack (Fig. 16.3). His works and others like him, e.g., Louise Bourgeois, Bruce Nauman, and Wim Delvoye, blur the divisions of artist working within a specific area such as painting, sculpture, printmaking, and so forth.

Other artists on the other hand are best known for operating using a distinct medium throughout their profession. Jeff Wall, for example, characteristically works with photography. Wall is well recognized for his narrative photograph images inspired by the old master paintings, usually works by using large format camera which are then assembled in a large size light box configuration (Fig. 16.4).

Other than that artists such as David Salle and Gerhard Richter also work with a single medium which is painting. Thus it is incorrect to present an understanding of art as only on the bases of it being about dealing of a single practice or medium, i.e., artists are only painters or sculptors. Multiplicities not only exist in the world, in culture, habits, and ideas, but also without any doubt in the medium of art which is always being celebrated.

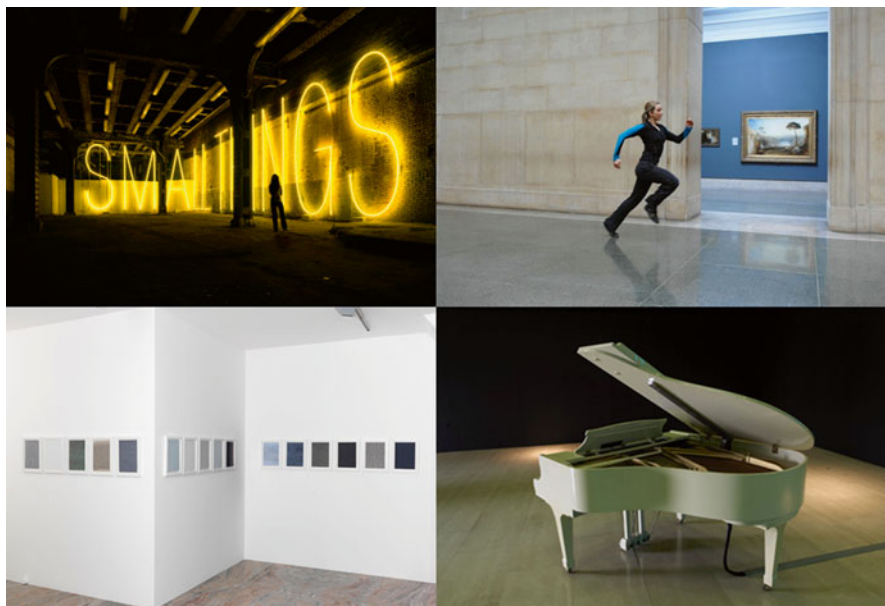


Fig. 16.4 Martin Creed, Work no. 755 (Small things) [12], neon (*top left*); Work no. 850 (an athlete running through the Tate Modern) [13], athlete running (*top right*); Work no. 865 (marker pen on paper) [14], variety of marker pen, paper (*bottom left*); and Work no. 569 (slamming piano) [15], piano installed with a mechanism which reputedly slams the piano’s lid

3.3 *Subject Matters*

All artworks have subject matter [6]. Fundamentally in subject matter, there are two major clusters, one is of representational and the other one is nonrepresentational. According to Barrett “In representation works of art, subject matter is the people, animals, plants, place, and things recognizably depicted” [7]. While for nonrepresentational subject matter they are composed of aspects that are not recognizable such as a line, a shape, a color, or a texture and words.

Sometimes in representational, the subject matter is a depiction of a real object or life form, and sometimes it is of a real object. Heather Jansch, for example, does sculpture depicting horses as her subject matter. During her early works Jansch will use real driftwood to construct a horselike form (later in her newer works, she would cast them into bronze) (Fig. 16.5). Even though her works are constructed and pieced together using driftwood, the form is done in such a way where she seems to have a personal understanding towards the essential form of a horse; thus visually, her works are easily recognized as being a depiction of a horse – and not of a sheep, chicken, or tree.

But in Damien Hirst’s 1991 signature piece, *The Physical Impossibility of Death in the Mind of Someone Living*, the work is of a different situation compared to Jansch’s works (Fig. 16.6). Here the subject matter of a shark is actually a real



Fig. 16.5 Jeff Wall, Milk [16]. Silver dye bleach transparency – Cibachrome and aluminum light box measuring about 189×245×22 cm



Fig. 16.6 Heather Jansch, Apollo [17]

(dead) tiger shark. It was not fabricated using any substitutional material. This work, which is in line with the Duchampian lineage, takes a real “used-to-be-living” animal as the subject matter in an appropriative attitude.

In nonrepresentational the subject matter is in almost all cases referring to the elements of art such as space, color and texture, and volume. Particularly in the question of line, form, and shape, it could also be divided into two distinctions, which is organic and geomantic. Subject matters which are of geometrical form such as Carl Andre’s (Fig. 16.7) and Donald Judd’s works are minimal, squarish, hard-edge, boxlike forms. As an idea, these geometric forms and material-based subject matters are about the material phenomena themselves or “of the object itself,” which is self-referential. Donald Judd’s *Untitled* series (Fig. 16.8), for example, do not depict any form of meaning outside of what is seen. In Judd’s own term, they are said to be “specific objects” [8] (Fig. 16.9).

Contrary, both Jansch and Hirst’s subject matters do not bare this “self-referential” intent but communicate more in a symbolic/metaphoric relationship. They not only represent the subject matter “shown” but also try to engage innately. For Jansch, her works connect emotionally, bonding between her love for horses and driftwoods, and for Hirst most of his pieces, e.g., *For the Love of God* (2007), *Away from the Flock* (1994), and *Mother and Child, Divided* (1993), are extremely absorbed in the idea of death and living which is related towards his lived experiences.

Thus subject matter can operate in a “self-referential” mode or even connote a symbolic/metaphoric (sign system), narrative gesture. Each situation depended on

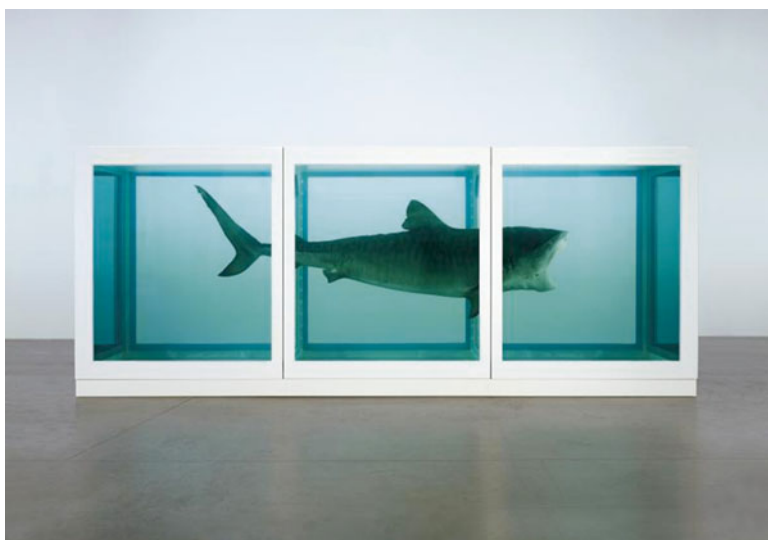


Fig. 16.7 Damien Hirst, *The Physical Impossibility of Death in the Mind of Someone Living* [18], real tiger shark enclosed in a formaldehyde solution

Fig. 16.8 Carl Andre, Equivalent VIII [19]



the artist's own intention in dealing with their work. One especially art student should also understand these differences so that they can recognize how such divisions have evolved and are constantly defined within a particular relation in art – therefore they in turn can associate, delineate, and make linkage in and towards their own artistic search and practice.

4 Conclusion

As a conclusion the meanings of any artwork depend on an understanding and constant dealing with the aspects of formal, medium, and subject matter. Dealing with formal aspects not only takes into consideration the question of elements and principles of art, but also looks into matters such as size or dimension, time, and location. In the case of medium, material(s) use in producing artworks is set within the artist's interest. Some artists work with controllable materials, and some are dealing with medium that is fluid and uncontrollable. Every artwork has a subject matter. There are two major groups in the subject matter. One is of representational and the other one is nonrepresentational. In representational, some subject matters are a depiction of a real object or life entity, and sometimes it is of a real entity, whereas for nonrepresentational they are commonly associated with unrecognizable and nonliving objects, such as a line, a shape, a color or a texture, and words. In real-life practice when artists and art students engage with these three aspects, there is actually no single accurate approach. Approaches can be of learning it theoretically and

Fig. 16.9 Donald Judd,
Untitled [20]



applying it during studio works, but they could also be through hands-on engagement, which is later dealt in a situation of reflection. Or even it is a state that is in constant crisscrossing within each other.

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Chapter 17

Photodegradation of Materials: An Overview

Siti Farhana Zakaria and Shalida Mohd Rosnan

Abstract Polymers and organic materials that are exposed to sunlight undergo photooxidation, which leads to deterioration of their physical properties. To allow adequate performance under outdoor conditions, synthetic polymers require additives such as antioxidants and UV absorbers. A major problem with optimising polymer formulations to maximise their working lifetime is that accelerated weathering tests are empirical. The conditions differ significantly from real weathering situations, and samples require lengthy irradiation times. No degradation may be apparent in the early stages of exposure, although this is when products such as hydroperoxides are formed which later cause acceleration of oxidation. A far simpler way of quantifying the number of free radicals in organic materials is by measuring chemiluminescence (CL) emission. Most polymers emit CL when they undergo oxidative degradation, and it originates from the bimolecular reaction of macroperoxy radicals which creates an excited carbonyl. The reaction has a very low quantum yield (10^{-8} – 10^{-5}), but highly sensitive photon counters make CL detection from most polymers straightforward. CL is already used extensively to study the thermal degradation of polymers, but photo-induced chemiluminescence (PICL) has been largely neglected.

Keywords Additives • Chemiluminescence • Photodegradation • Photostability

S.F. Zakaria (✉)

Department of Printing Technology, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
e-mail: farha981@salam.uitm.edu.my

S.M. Rosnan

Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

1 Introduction

Degradation of both natural and synthetic polymers occurs under the influence of environmental factors, such as light, temperature, moisture and pollutants and therefore limits their service lifetime. It is well known that light exposure is a serious threat to the degradation of polymeric materials, and damage is usually more pronounced in the ultraviolet regions than in the visible range. Photochemical reactions involving light radiation and atmospheric oxygen cause changes in chemical structure and loss of mechanical properties and lead to changes in physical properties of materials [1]. Common effects are discoloration, embrittlement, tackiness, loss of surface gloss and chalking of the surface [2]. These changes are usually undesirable. However, in the case of one-time-use polymers as plastic packaging, accelerated degradation is required to reduce environmental pollution.

The oxidative degradation of polymeric materials can be viewed on the molecular level as triggered by chemically reactive molecules such as free radicals (R^* , RO^* and ROO) and hydroperoxides ($ROOH$). The modification of the polymer properties due to exposure to sunlight or heat in the presence of atmospheric oxygen changes the chemical structure (double bond formation, chain scission and cross-linking), results in degradation of the structure and mechanical properties and leads to significant colour changes. Crucial to the study of free radicals in polymer degradation is the ability to be able to measure free radical species and the products of free radical reactions. Electron spin resonance (ESR) is one technique which can be used for the detection and identification of free radicals formed in chemical reactions. It has been widely used in the examination of free radicals in chemistry and in well-defined biochemical systems [3].

One of the constraints for using ESR is that most polymers have a glass transition (T_g) or melting (T_m) temperature close to room temperature, and free radicals produced by exposure to UV generally have very short lifetimes at room temperature due to molecular mobility of the polymer and hence are not directly observable by ESR [4]. Gerlock [5] doped polymer films with a nitroxide spin trap which resulted in the formation of more stable, long-lived radicals when the film was exposed to UV light. By varying the concentration of nitroxide in the film, the photoinitiation rate for the undoped polymer was obtained via extrapolation. Binns et al. [6] developed a low-temperature ESR technique to study free radical generated in polymer films during photolysis by UV light under nitrogen. Samples were cooled at 120 K in flowing nitrogen and exposed to a high-pressure H_g/Xe lamp with 300 nm cutoff filter for 2 h. Results of service life of polymers were obtained within 2 h.

A simple method for studying free radical reactions in synthetic and biological organic materials is by using chemiluminescence (CL). It was first observed in 1961 by Ashby [7]. Oxidation of polymer and organic materials involving atmospheric oxygen is often accompanied by a low level of visible light known as CL [7, 8]. It originates from the bimolecular reaction of macroperoxy radicals which creates an excited carbonyl. The reaction has a very low quantum yield (10^{-8} – 10^{-5}), but highly sensitive photon counters make CL detection from most polymers straightforward [9].

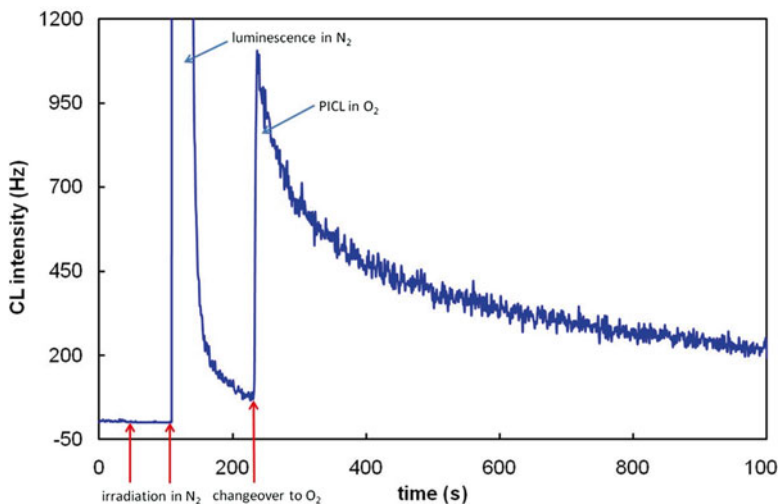


Fig. 17.1 Luminescence from polyacrylonitrile fabric at 313 K exposed to UVA radiation for 60 s in N_2 . Atmosphere changed to O_2 2 min after the end of irradiation period

The principle of the CL method is the measurement of light emitted from samples during decomposition of peroxides, and this has been developed to study polymer oxidation [10–12]. However, its application to the study of the photodegradation of materials has been very limited.

A new technique, photo-induced chemiluminescence (PICL), to study the generation and decay of free radicals formed in materials following exposure to light and oxygen has been developed by Millington [13]. This technique has been used in studies on fibrous polymers and proteins [13], photodegradation of protein fibres [14], photostability of wool keratin doped with photocatalytic TiO_2 pigment [15] and the effect of dyes on PICL emission [16]. The advantage of PICL is that it is a very simple and quick technique that can also be used to study the effectiveness of additive treatments in reducing the free radical population. Results of the effectiveness of additive performance on fabrics can be obtained within 15 min per sample [4]. Figure 17.1 shows a typical polymer luminescence against time plot, where a strong burst of PICL emission occurs when the irradiated sample is exposed to oxygen.

2 Experimental

For PICL studies a Lumipol 3 thermal CL instrument was reversibly modified to allow in situ irradiation with selected wavelengths from a medium-pressure mercury arc (Lumatec SUV-DC, Lumatech GmbH, Germany) via a liquid light pipe, as shown in Fig. 17.2.

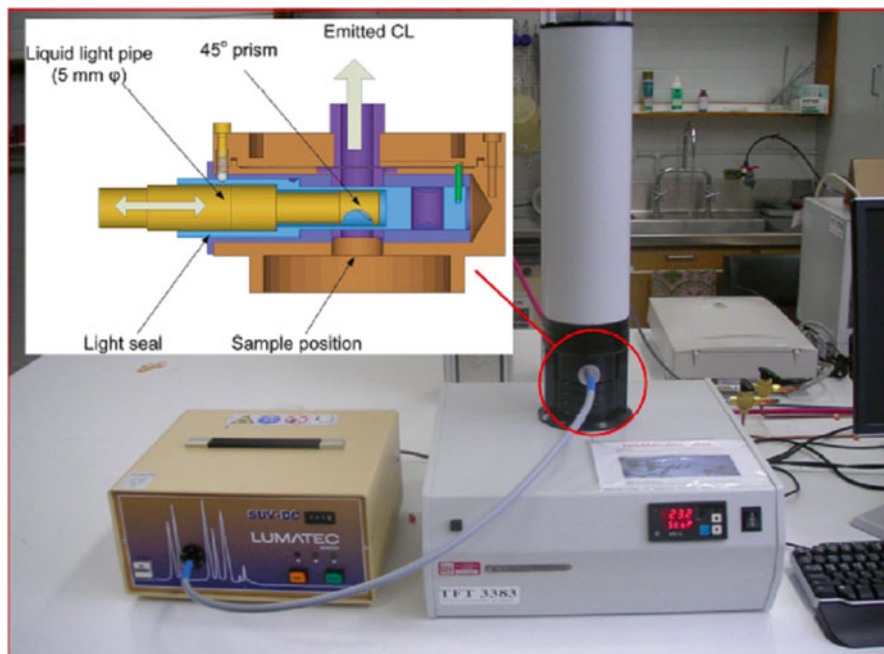


Fig. 17.2 Lumipol instrument linked to Lumatec light source for PICL studies. Inset shows the adaptor which allows samples to be irradiated in situ with wavelengths above 320 nm

Selected wavelengths in the range 320–700 nm enter the Lumipol instrument via a flexible liquid pipe (Lumatec Series 250, 5 mm diameter) and irradiate the sample via a 45° quartz prism built into the light pipe and positioned directly above the sample cavity. The wavelength setting can be set at filter 1 (400–700 nm), filter 2 (320–500 nm), filter 3 (400–500 nm), filter 4 (320–400 nm), filter 5 (415 nm) or filter 6 (440 nm).

This technique requires a very small sample (8 mm in diameter), cut using a circular cutter. The sample is placed in a small aluminium pan located directly on top of the heating element. To obtain a PICL signal on a sample, the sample is equilibrated in the instrument in a nitrogen atmosphere until a steady baseline is obtained. The sample is then exposed for a set period. A large luminescence emission is observed immediately after irradiation, which in most cases decayed very rapidly, usually in less than 30 s. One minute after cessation of irradiation, the atmosphere is switched from nitrogen to oxygen, resulting in a burst of PICL that generally decayed far more slowly than the peak observed in nitrogen. Typical luminescence intensity against time plot for silk fabric using this protocol is shown in Fig. 17.3. A spectral analysis of the Lumatec source was carried out using a Solatell Sola-Scope 2000 spectroradiometer (Solatell Ltd., Croydon, UK). Further details of the PICL instrument and the modification have been described previously [13].

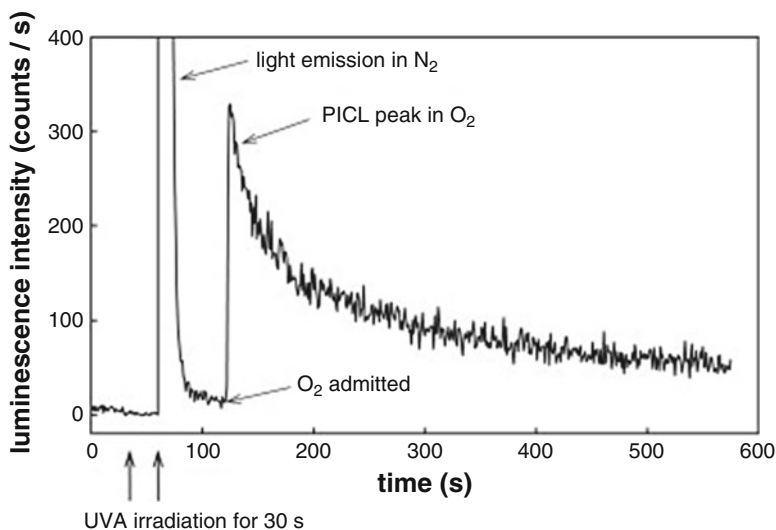


Fig. 17.3 Luminescence from silk fibroin at 40 °C exposed to UVA radiation for 30 s in N₂. One minute after conclusion of irradiation, the atmosphere was changed from N₂ to O₂ to generate PICL [13]

3 Results and Discussion

This new technique has been used to study the wool photodegradation [14], the photostability of wool keratin doped with TiO₂ pigment [15] and the influence of dyes on free radical populations [16]. The PICL technique is also used to monitor the effectiveness of additive formulations. This includes the additive's ability to promote or prevent free radical oxidation [9, 17]. This sensitive technique can also be used as an early indicator of material degradation [4]. A study on the doping of ethyl cellulose with a photoinitiator or a UV absorber used the PICL technique to demonstrate the relative populations of free radicals in irradiated polymers and the effects of different additives [9]. The PICL intensity and decay profiles for ethyl cellulose films, doped with photoinitiator or UV absorbers, are shown in Fig. 17.4.

Generally we have found that highly cross-linked polymers (e.g. polyurethane) and polymers with strong hydrogen bonding networks (gelatin and PVA) have very low PICL intensities at 40 °C. Recently we have been studying the effects of UV absorbers, antioxidants and metal chelators doped into polymer films and have found that these reduce PICL intensity. We believe that PICL may be used to optimise additive treatments in polymers to prolong their active life during sunlight exposure. In the case of short-lived packaging materials, PICL may be also used to monitor the effectiveness of additives that can promote free radical oxidation and to enable rapid photooxidation of waste polymers in the environment.

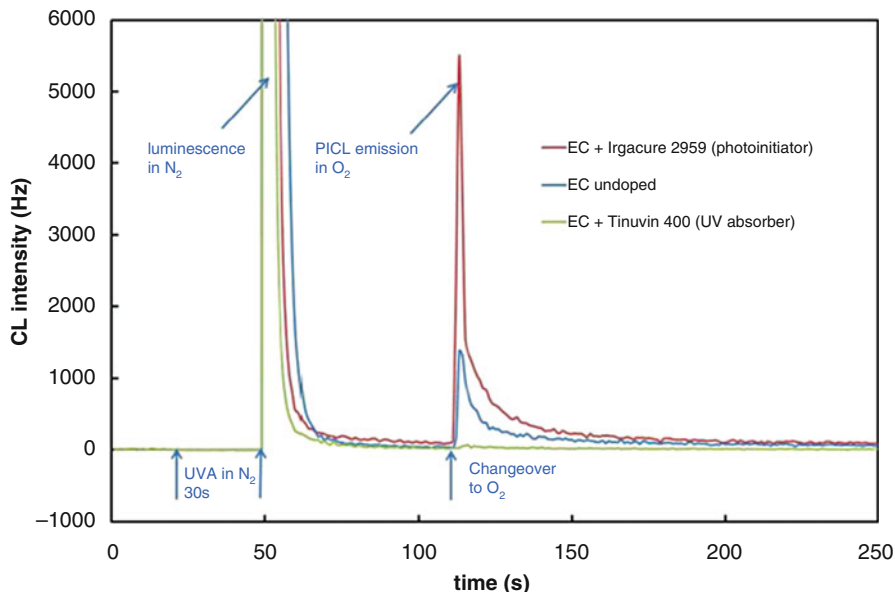


Fig. 17.4 PICL from ethyl cellulose films doped with photoinitiator or UV absorber and exposed to UVA radiation at 40 °C for 30 s in N₂ [9]

4 Conclusion

Studies in material degradation usually involve accelerated ageing experiments that measure the potential long-term serviceability of materials. The studied materials are evaluated for their resistance to environmental factors. These experiments led to the detection of deterioration of materials and from the data hypotheses about the mechanisms involved in the degradation process can be proposed. More importantly, data obtained from degradation experiments provides information for the selection of appropriate additives designed to maximise the life of materials. It has been established that the oxidative degradation of polymers is radical based, whereby the formation of carbon-centred radicals leads to hydroperoxides, resulting in degradation products. Therefore by controlling the radical population, the rate of degradation can be reduced.

The degradation of polymeric materials is caused by exposure to various factors such as heat, UV light and mechanical stress and is promoted by oxygen. The photooxidation of most polymers proceeds by a radical chain mechanism similar to that proposed by Bolland-Gee [18] and is widely applied to all types of polymeric materials. The mechanism of polymer degradation involves simultaneous formation and decomposition of hydroperoxides. The free radicals are initiation sites for subsequent reactions in polymers. Degradation processes involving free radicals can be

detected by electron spin resonance spectroscopy (ESR). However, due to high radical mobility and reactivity and rapid decay at normal temperatures, trapping techniques and low-temperature ESR are used. Chemiluminescence (CL) is another analysis technique to study polymer oxidation, and information can be directly obtained in a shorter time. Since CL is proportional to the concentration of peroxy radicals and reactive hydroperoxides present in an irradiated sample, this technique can be used to study the photochemical processes involved in material photodegradation.

The photo-induced chemiluminescence (PICL) technique has been developed to study free radicals in material photodegradation. This technique has confirmed the presence of long-lived free radicals in some materials as detected by the ESR technique. PICL is a simple technique and can be used to determine the degree of oxidation under ambient conditions. The intensity of PICL emission from an irradiated sample is correlated to the population of free radicals that is proportional to the rate of its photooxidation.

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Chapter 18

When Race Meets Technology: Examining Racial Discourse in the Social Media

Shahnon Mohamed Salleh and Abd Rasid Abd Rahman

Abstract Traditionally, communities of different racial or ethnic backgrounds interacted and socialised among one another through traditional means such as the marketplace, workplace, schools, coffee shops and other public places. However, with the rapid increase in Internet consumption as well as the rise in broadband penetration, the Internet, especially social media, has fundamentally altered and transformed the way how people of various racial groups and ethnic backgrounds communicate and socialise. This has inadvertently resulted in a new form of a ‘virtual race relation’ in the cyberspace. This paper aims to investigate the role and impact of social media towards race relations. Methodologically, a virtual ethnographic analysis is used to analyse textual contents and online discourses via postings on Facebook during a selected period of time. The findings in this research are evident that to a large extent, our multiracial society perceive and consume issues through multiple layers of cultural perspectives and racial bias, either consciously or subconsciously. While Malaysia’s digital divide is getting narrower – with more and more people getting connected online – paradoxically, racial divide is increasing.

Keywords Ethnicity • Internet • Race • Race relations • Social media

1 Introduction

The usage of social media and the Internet as a means for information seeking and socialising has grown exponentially to the extent that almost every single youth today owns at least a social media account. The availability and free access of various social media platforms has turned it into becoming the tool of choice for ordinary citizens to communicate and to share their thoughts and opinions as well

S.M. Salleh (✉) • A.R.A. Rahman
Centre for Media and Information Warfare Studies Faculty of Communication
and Media Studies, Universiti Teknologi MARA, Shah Alam, Malaysia
e-mail: shahnon@salam.uitm.edu.my

as a platform for consuming information [1]. Social media needs no introduction. To most people today, it is central to their lives and identity. Shirky [2] defined social media as a tool that ‘increases our ability to share, to co-operate with one another and to take collective action, all outside the traditional institutional institutions and organisations’. On the other hand, Meikle and Young [3] described social media as a convergence between personal communication and public media. In order to understand the impact of the social media phenomenon, it is significant to first understand the dynamics and the evolution of the latest communication technology. One of the fundamental differences that set social media apart from the other technologies is that social media is both ‘social’ and ‘media’. According to Van Dijk [4], the word ‘social’ associated with media implies that the platforms are user-centred and that they facilitate communal activities and that it can be seen as online facilitators or enhancers of human networks. In Malaysia, the number of Internet penetration today is 64.6 % [5] and is expected to reach 76.6 % in 2015, according to the Economist Intelligence Unit. In the latest report by eMarketer [6], it was forecasted that by 2014 the ranking of regions by social network users will reflect regional shares of global population. In other words, the trend in the social media is closely catching up with realities to represent the overall population [6]. Latest statistics shows that Malaysia has a total population of 13.5 million Facebook users, of which 53 % are male and 47 % are female [7]. The figures also show that while Malaysia’s digital divide is getting narrower – with more people connected online – paradoxically, racial divide is perceived by many to have gone worse. How do we explain this?

2 Race and Social Media

What is the relationship between a socially constructed idea of race and technology? How is it that a harmless neutral technological invention like the Internet could possibly have a significant impact on race and racial relations? The answer probably lies in the fact that the Internet today is probably the least regulated medium of all media platforms and channels such as the print media, broadcast or satellite networks. Moreover, the fact that it is easily accessible and widely available makes it the most preferred means of information, communication as well as socialisation. More fundamentally, how could the Internet have an impact on race and race relations? Are there any differences between real life and computer-mediated interracial discourse? To understand this, it is important to see how the Internet has altered and constructed a new form of ‘social interaction’ and ‘social network’. The Internet allows fast and effective dissemination and exchange of information in the form of text, visual or audio globally. The sociopolitical effects of this are tremendously significant, in the sense that it created a borderless global information society. Furthermore, Internet allows two-way and multiple forms of communication and interaction through tools such as e-mail, discussion forums, real-time chat, instant messaging and blogs, unlike the television or radio [8, 9]. The Internet,

particularly the social media, has opened up the proverbial floodgates of information and gives a new opportunity for researchers to study and analyse race relations among the multiethnic communities online. The role of the Internet and social media is becoming more significant especially in shaping one's thoughts, ideas, belief and attitude towards issues. The growth of social media platforms such as Facebook and Twitter has transformed how society communicate, network and interact with each other to the extent that what happens online is seen to have far greater impact than what is happening in real life [10]. Accordingly, Kang argues that the tools allow people not only to maintain their social relationship but also to enhance new relationship originally formed in the real world [9]. So in other words, the 'virtuality' of the Internet and social media will soon become the 'new reality'. Several scholars have studied and analysed race and racial identity on the Internet. In a research by Nakamura [11], she looked into the idea of race and ethnicity and how it is being shaped and reshaped by the Internet. Technological scholars had imagined the Internet being a utopian space where everything was possible, one that could transcend racism [11]. Some have argued that with the emergence of the 'virtual environments' of the Internet, it would mean an end of race and racism [11]. However, the realities today are very different. What is happening today is the total opposite. Internet did not end racism. Instead, race and racism exist online in a new manner that is unique to the Internet [12]. Things certainly did not work out as utopian as could be expected. The Internet that we use today is evolving and continues to evolve. Likewise, our society today is not the same as it were say a decade ago. In terms of time spent and consumption, Internet is fast replacing the mainstream media and becoming the 'new mainstream media'. It could be suggested that Internet is the new reality. Conceptually, we are entering into a post-reality era where there is a very thin line between reality and virtual. According to Zurawski [13], almost everything that happens in the real world or almost all experiences are often discussed or debated in the cyberspace. Among the elements of the discourse observed were that there were basically no forms of censorship, low in standards, redundant and somewhat emotional [13]. In discussing about racism on the Internet, Jesse Daniels [12] has dispels the myth' that the Internet is 'colour blind'. Using examples of white-supremacist propaganda websites, he grouped them into two broad categories: (1) overt hate website that targets individuals or groups that showcase racist propaganda and (2) cloaked website which seeks to deceive the ordinary web user [13].

3 Research Methodology

The nature of the social media offers great opportunities for new insight and new methodologies in analysing digital contents and discourses online. For instance, huge amount of information are publicly available 24 h a day, 7 days a week for researchers to study. The virtual ethnography technique is used to analyse the participants of this study due to the nature of the participants being online. One of

the pioneers of virtual ethnography, Hine [14] strongly believes that virtual ethnography is the bridge to link between ethnography and the changes of the current world scenario in a technologically driven environment. In attempting to analyse the racial discourse in the social media, textual content analysis is used as the instrument to analyse the selected Facebook discourses on the selected issue: *Tanda Putera* the movie. It is important to highlight that the focus of the study is not about the film but the discourses on the historical representation of May 13, which are mostly racial in nature, and the re-representations created and posted by social media users in an effort to study how they reflect or represent the collective identities of each racial group, particularly the Malays and the Chinese. Therefore, in doing so, a stratified sampling of 100 postings and comments from the ‘*Tanda Putera* Facebook page’ are examined and analysed according to the types of postings. In attempting to examine the level of racial discourse in the social media, this research would be able to prove or reject the following two hypotheses:

H1: A person from X ethnic group would support a film/historical representation that is perceived to be X- friendly.

H2: A person from Y ethnic group would reject a film/historical representation that is perceived as not Y- friendly.

4 Research Findings

4.1 Introduction

Tanda Putera is a controversial historical film directed by prominent Malaysian filmmaker Shuhaimi Baba in 2013 [15]. Prior to its release in theatres, the film has received nationwide attention as it revolves around Malaysia’s darkest history – the May 13 tragedy. In spite of the fact that the film actually narrated the life story of Malaysia’s second Prime Minister Tun Razak Hussein and his Deputy Tun Dr Ismail Abdul Rahman, it was the racial riot scenes involving Malays and Chinese which made the film controversial. To the filmmaker Shuhaimi Baba, the film is based on her solid historical research, but there are others who disagree with the facts and interpretations of her story. For decades, the issue of the May 13 tragedy is widely considered as a national taboo and a sensitive issue, something that is not supposed to be discussed openly. However, the nature of the free flow of information on the Internet and in the social media would mean that nothing is ‘sensitive’ anymore. There is virtually nothing that could not be posted or discussed online. The proverbial information floodgates have been forced opened onto us. For the first time ever, possibly since 1969, Malaysians are beginning to argue, debate and critically question their own history publicly online, all thanks to the social media.

4.2 *Quantifying the Racial Discourse*

Quantitatively, the social media users sampled in the chosen Facebook page are somewhat representative to the actual Malaysian population. From the analysis, 53 % are Malays, 28 % Chinese, 18 % Indians and 1 % from other ethnic groups. Upon grouping the types of postings among the social media users (across all three major ethnic groups), three major themes were identified and established.

Forty-one per cent of postings and discourses were supportive of the film and/or think that it can promote unity:

1. Thirty per cent were against the historical representations and/or feel that the film is politically motivated.
2. Twenty-two per cent of postings were very racial and/or abusive in nature.
3. Seven per cent of other miscellaneous postings

Generally, the Chinese are more critical towards what they perceive as a historical misrepresentation in the film. An overwhelming majority of 82 % of Chinese were found to be critical towards the (mis)representation of the Chinese and the perceived inaccuracies of historical facts in the film. Likewise, a resounding majority of 79 % of Malays adopted either a pro-Tanda Putera or a strong pro-establishment view. Clearly there is very little middle ground in respect to this controversial issue. It has gone to the extent where Chinese actors in the film were ridiculed, abused and accused as traitors by fellow Chinese Facebook users for acting in such film. The majority of Malays, on the other hand, have taken a more defensive stance in defending the official version of the history. While some were more emotional and abusive in their postings, it was also observed that some Malays who are anti-establishment are more inclined towards criticising the official version of May 13 and the perceived UMNO role in the May 13 tragedy.

4.3 *May 13: The Malay and Chinese Narratives*

Two clear and distinctive narratives of the historical representations from the social media were observed from the Malays and the Chinese respectively. Objectively, while it should be clear that both Malays and Chinese were victims of the racial riot, yet analysing both the narratives in comments posted by Malays and Chinese, the idea of 'victim mentality' was featured prominently. For instance, the Malays accused the Chinese-dominated opposition parties of provoking the Malays, while the Chinese accused the anti-Tunku Abdul Rahman factions of manufacturing and exploiting the tragedy to seize political power. What is clear from the comments is that majority of the Malays tend to support the film and defend the official version of May 13, which is often based on the government's 'May 13 Tragedy Report' and Tunku Abdul Rahman's 'May 13: Before and After'. On the other hand, views and theories of May 13 advocated by the Chinese were sourced directly and indirectly

from Dr. Kua Kia Soong's book *May 13*. The findings here point clearly towards a worrying trend of a racially polarised and divided Malaysian society particularly among the Internet savvy younger generation. A similar trend was observed in all the comments posted. Emotional opinions, in what appear to sound like a rational argument, were in fact laced with racially bias comments posted on Facebook. To a significant extent, the study has succeeded in proving the hypothesis in the sense that the division of ideas and views between the Malays and Chinese was very obvious. The majority of Malays sampled in the social media were supportive of the film while an overwhelming majority of the Chinese rejected the historical interpretations projected in the film. Furthermore, many Chinese felt that the film was very political in nature. In contrast, there are more Malays who felt that the film could achieve its objective in promoting racial unity and harmony by understanding history. The racial discourse surrounding the controversial film is just one of the many examples of virtual clashes between Malaysia's different racial groups that are happening online. Analysing the discourses in Facebook, it was apparent that the arguments and postings went beyond approving or rejecting the storyline or the plot of the film, but rather, it was about questioning the fundamentals of Malaysia's history. The democratic nature of social media and the near absolute freedom that comes with social media platforms such as Facebook allow our society to recreate, reconstruct and challenge even the fundamentals of the nation.

5 Conclusion

Admittedly managing a complex plural society is never an easy task. There were many ideas and proposals in the past. However, with new communication and social technologies, it requires new solution. One may appear to practise restraint, tolerance and respect towards 'the other' in real life, but the anonymity features online make it easier for anybody to spew racist or hate comments online. How do we bridge racial divide online if the society is already divided in the real life? The key point here is that if the same tool is used to divide, the exact same tool too could be used to mitigate conflicts and narrow down the racial divide, like a double-edged sword. The challenge today and in the future is that social media is slowly becoming the new reality – where issues and events that are taking place in the social media are becoming more important than events in the real world. The lines between the real and the image of the real are going to get blurrier in the future. As a matter of fact, we are already at the initial stage of the post-reality era, with social media as the major catalytic platform for change. Therefore, given the present scenarios and environment, what are the opportunities for unity? Is unity achievable? The examples given are evidence that there is a great portion of our multiracial society that looks into issue not as it is but as layered through various layers of perspectives and racial perspectivism, either consciously or subconsciously. Educating the society is an ongoing effort. The same tool – the Internet and social media – could and should be used to unite and bring back the people and the society together.

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Chapter 19

The Implications of E-Book on Print-Book Industry: *Will Printers Survive?*

Shalida Mohd Rosnan, Siti Farhana Zakaria, and Muhammad Yusuf Masod

Abstract This paper discussed the implications of e-books on print-book industry. The discussion was based on various sources of secondary data. The prominence of e-books has prompted publishers to reconsider their distribution channels. Although print books will probably remain to exist in book industry, publishers and printers need to understand the current market changes and adapt the best way to deliver the content to readers.

Keywords Print book • e-Book • Book industry • Digital publishing • Print on demand

1 Introduction

The aim of this paper is to discuss the implications of e-books on print-book industry. It focused on the e-book preference and how it implicates the printed book. An electronic book (e-book) is the digital version of print book. It is also known as digital book [1]. The e-book can be read using e-book reader, tablet, smartphone, and personal computer. The content of e-book is available in ePub, PDF, plain text, and html format [2]. The flexibility of e-book gave another option to readers in getting information [3]. The e-book became the real boom in 2007 when Amazon launched its e-book reader called Kindle [2]. In 2012, e-book sales were reported to have overtaken the print sales of Amazon [4]. The battle of the print books in the

S.M. Rosnan (✉)

Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
e-mail: shalida.rosnan.my@ieec.org

M.Y. Masod

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

S.F. Zakaria

Department of Printing Technology, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

Table 19.1 Use of the Internet by age category in 2011

Age category	%
Under 15	11
15–19	8.6
20–24	16.5
25–29	17.5
30–34	15.7
35–39	10.4
40–44	7.1
45–49	5.8
50 and above	7.4

Malaysia Communications and Multimedia Commission (MCMC)

market seems clear enough as the technological change created the new condition in distributing content to the readers [5].

The e-book application increased the usage of the Internet and gadgets (such as smartphone, tablet, and e-reader) to access and download information by readers [6]. According to a survey made by Malaysia Communications and Multimedia Commission (MCMC), 68.8 % of smartphone owners used their phone to access the Internet [7]. Based on the other survey conducted by Malaysia Communications and Multimedia Commission (MCMC), the young generation is the largest consumer of the Internet [8] (Table 19.1).

Publishers use this opportunity as their marketing strategy to promote their e-books. The application of e-book changed the way society reads a reading material and changed the mainstream print publishing industry [9]. The e-book is available to many levels of society. The medium used varies from personal computers, notebooks, tablets, smartphones, and e-book reading devices such as Kindle, Nook, and others [2, 10]. Readers find that the flexibility of e-book content is more interesting than the printed version [3]. The existence and application of e-book in the market changed the way readers get information and read books [9]. For a number of years, there is a perception that the availability of e-books will decrease the demand for print books as most of material is available in digital form [5]. The perception has led to the discussion about the implications of e-books on print-book industry.

2 Implications of e-Book upon Print Book

The e-book has advantages over print books in terms of creation and access control [11]. Publishers are now shifting the print book to e-book. They claimed that e-book is replacing the print book. Some experts predicted that e-books will replace 50 % of trade book sales by 2015 [12]. However, some claims that e-book is just another supplementary option for print book, and both can live side by side [1].

The application of e-book in the library is affecting the usage of printed version of textbooks and references. The libraries are providing the online databases that offer so many e-books, e-journals, and digital references that are published by academic publishers [4]. Students prefer the digital version of textbooks as it saves their money and time to go from library to other library for searching information. The e-books can be accessed online from a distance through library online database system [13]. Students also preferred the digital textbooks as they always want to refer to the up-to-date information. The application of e-book helps them obtain current editions as the e-books can be easily revised and distributed to readers [9]. The application of e-books among students is getting more significant since most libraries offer a platform to get digital books and reference materials. The online databases subscribed thousands of journals and e-books from various fields of study. This helps students get resources in their study easier and faster [14].

Since society is getting more familiar with e-books, the implications on print book can be seen in some countries. The demand of print books is already shrunk due to good acceptance of e-book. In Japan and China, the booming e-book market started to have an implication to print book since 2002 until 2009. In China, a survey showed that e-book market is worth US\$49 million in 2009. The number of readers grew to 101 million [3]. Chao and Lu (2012) had identified the reasons why readers preferred e-books and the factors that help the booming of e-book sales. The study showed that e-books are preferred because of its instant availability without traveling to any bookstores [15]. The e-book is also preferred because it is cheaper than printed version. The e-books are easy to be kept by readers as it can be saved in gadgets and reading devices. The other factor that influenced readers to choose e-books is its searching function that can help readers to find specific word and jump to certain chapters easily [13].

The booksellers' business strategy changes according to the reaction of market. It depends on how good or bad is the consumers' acceptance of any products [2]. Nowadays, society is influenced by the application of e-books. Booksellers such as Barnes & Noble offer more and more e-book titles and launched its own e-book reader called Nook since 2009. Sony also had launched its own brand of e-book reader called Reader. In 2010, Apple also launched its own gadget called iPad tablet that is created to cater e-book market [2]. The various offers of e-book titles and reading devices had affected the print-book industry. In 2011, Amazon had launched its own reader called Kindle and reported that they succeed to selling 105 e-books for every 100 printed books [2].

The other implication of e-book to print publishing is paperless usage. There is less requirement of printing on paper. This is a challenge to the printing, pulp, and paper industry. The consumption of the printed products had decreased [15]. According to Malaysia Investment Development Authority, it was reported that new investment in pulp and paper industry was decreased from RM50.7 million to RM41.6 million in 2012 [16].

The presence of e-books in the market influenced consumers and gave an option to them whether to choose digital or printed version. The acceptance of any e-book titles is always be a matter to be considered by publishers to decide what is optimum

print volume to be printed. Overprinted materials will bring to storage issue. Nowadays, publishers need to decide whether each title needs a long-run print volume or just need print on demand. A wise plan is always needed in estimating print volume [2].

The digital version of school textbooks gave more interesting experience in learning process by delivering more dynamic and interactive contents. These interesting contents can be accessed through many kinds of devices and platforms.

Students' acceptance of digital materials will lead to growing sales of e-books, and the printed version will no longer be significant to students in schools [17]. The Malaysia Ministry of Education in partnership with YTL Communications initiated a virtual learning platform that involved 10,000 primary and secondary public schools in Malaysia. Students will be equipped with the Internet-based virtual learning environment called Frog VLE [18]. The application of digital textbooks in schools will influence the demand of printed books in the future. Embong, A. M. et al. (2012) cited that the first state in Malaysia that started to replace printed textbooks with e-textbooks is Terengganu. In 2010, the Terengganu state government spent USD15 million for 50,000 e-book readers and students [19]. The printed version of textbooks is no longer the main option for students as e-books help them in reducing the burden of carrying conventional textbooks. For healthy purposes, students are no longer required to bring heavy books [19].

In the digital age, the high print demands were affected and high print volume is no longer needed. Print on demand will be a major option to get any books in single copy or low print volume. MyCopy is a pilot project that is initiated by Springer. This system offers to print a single copy of e-book and gave readers the option which way they prefer to digest the information. End users can choose the format of print or electronic [10]. Springer e-book customers are allowed to order softcover copy for their personal use through MyCopy system. The printed version will be printed using print-on-demand technology. Since 2009, a small number of selected research institutions and library in the USA and Canada took part in this initial project. Springer is still looking for the possibility to take this pilot project to worldwide implementation [10].

3 Methodology

3.1 Document Review and Analysis

The source of secondary data that have been chosen and reviewed for this paper was government computerized database that is accessed through the online service system. The statistics and survey results were retrieved from the official website of Malaysian Investment Development Authority (MIDA), Malaysian Communications and Multimedia Commission (MCMC), and Ministry of Education (MOE). Document review and analysis is used as an approach to get data for this paper [20].

Another source of secondary data used was published articles and journals that are collected from online databases including IEEE Xplore, Scopus, Emerald Insight, Science Direct, Sage, and Google Scholar.

4 Summary and Suggestion

This paper discussion is based on various sources of secondary data. It showed that there are implications of e-books on print-book industry. Different countries face different timeline of e-book prominence depending on how fast the readers embrace the technology of the digital books in that country. There is a lack of information on how far e-books affect the local print-book industry. A further research would be a benefit to the industry as this paper gives rise to questions about the implications of e-books on print book in local market context.

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Chapter 20

Comparison Between Technical Training and Induction Programme Using Human Bioenergy Field Analysis (Aura)

Mohammad Reeza Bustami, Marlina Tanty Ramli,
Muhamad Firdaus Muhammad, and Fazreen Shazlyn Mohd Adzhar

Abstract This is a preliminary study to investigate training effectiveness based on training competency, training objective, individual learning factor and trainer competency using triangulation method involving questionnaires and Resonant Field Imaging (RFI) system. The study was conducted at two sites comparing the effectiveness of technical training programme and induction programme. For the first study, a total of 30 employees of Petronas Chemicals MTBE Sdn Bhd that are participating in a 1-day technical training programme were selected as respondents. The second study involves 30 newly appointed employees of the SME Bank undergoing a 2-day induction programme. Questionnaires were distributed and answered by each respondent after the training programme. RFI measurements focusing on the left side of the physiological level were taken before and after the training programme. The RFI data were analysed using aura interpretation of the Human Body software by converting the frequencies detected by RFI into colours. The results demonstrated that RFI is able to verify and substantiate the training effectiveness in both cases. RFI tool could identify the different colours of auras between the two types of training programme with the possible justification put forth.

Keywords Training effectiveness • Training competency • Training objective • Individual learning • Trainer competency • Chakra • Aura • Resonant Field Imaging (RFI) • Technical training • Induction programme

M.R. Bustami (✉) • M.F. Muhammad • F.S.M. Adzhar
Faculty of Business, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
e-mail: reeza@salam.uitm.edu.my

M.T. Ramli
Faculty of Medicine, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

1 Introduction

Gaining effectiveness in training and development in both technical skills and soft skills has always been paramount to companies worldwide. Denby [1] states that training should be more than simply teaching staff new skills or guiding them on how to do things better. It should be seen as an ongoing process with set goals and outcomes, which are monitored, refreshed and enhanced. Money spent on training, retraining and education does not show on the balance sheet; it does not increase the tangible net worth of the company.

1.1 *Training Effectiveness*

Effectiveness is generally thought of as (1) the degree to which the training achieved the stated behavioural objective and (2) the ratio of the cost of the training to the return also known as return on investment. It is important to understand that these two components are distinct and not necessarily related. In order to obtain a return on investment and prevent wastage of resources, i.e. time and money, there should be some measure of the effectiveness of any given training programme. There must be some behavioural objective associated with the training to begin with. Studies [2–4] have demonstrated that trainee characteristics such as self-efficacy, prior experience with the task and workplace characteristics such as managerial support and workload turned are the most powerful predictors for training effectiveness. The authors developed a model, based on an extensive review of literature, wherein they distinguished three clusters of factors that impact the effectiveness of training: the trainee, the training and the workplace.

1.2 *Training Competency*

Competency is a cluster of related knowledge, skills, and attitude that affects a major part of one's job (a role or responsibility), that correlates with performance on the job, that can be measured against well-accepted standards and that can be improved via training and development. Bedinham [5] states that the real driving force for training would be whether the training makes an individual or a group more productive, efficient or useful to an organisation. Competence, much more than knowledge, constitutes real power. True training occurs when skills that can be measurably defined are enhanced until the competence level is visibly enhanced. The desire to change behaviour in a positive direction is, in and of itself, an admirable goal. But for behaviour change to be permanent, it must be linked to the acquisition of new competences. When employees learn new skills, their behaviour inevitably changes. Behaviour change is best realised as a by-product of other forms

of training [6]. Over the last 20 years, as employers began to realise the impact of staff competences on organisational productivity, there has been a significant rise in the level of resources being allocated to support the wide range of employees' development methodologies, which are now being utilised by training departments [7].

1.3 Training Objective

Objective is the specific knowledge, skills or attitudes that needed to be obtained from a training activity. An objective is usually measurable. According to Chaston [7], a standard procedure at the start of the first training session is to brief the participants on the objectives of the programme. Assuming that the training need analysis has correctly identified the employees' performance gap and the most appropriate training methodology is being utilised, the trainer can reasonably expect the specified objectives to be achievable.

Another study suggests that manager's primary responsibility involves justification of employee training initiatives. To substantiate the effectiveness of a training programme in relation to the resources that it requires, several areas must be addressed. First, it is imperative that the goals of training are in line with the company's strategic plan [6]. In addition, Tennant et al. [8] concluded that to be effective, training must have specific objectives and outcomes, which directly lead to business benefits and produce 'hidden' assets.

1.4 Individual Learning

Individual learning is a process whereby knowledge is created through the transformation of experience. Training provides individuals with greater control over work performance. The focus is on individuals and the process is one that encourages them to learn something useful. Training can be efficient in its objectives; however, it cannot be effective if attended by the wrong individuals [9]. Allison Smith [10] stated that trainees would have particular feeling about being selected for training, will compare themselves with their colleagues and assess the relevance of the training with the point of their career. This will influence their behaviour, learning, performance and the knowledge transfer. This is an area largely untouched by traditional research.

1.5 Trainer Competency

Trainer's evaluation is also one of the crucial aspects in measuring training effectiveness. Without a credible trainer, evaluation of trainee's involvement and understanding can be inaccurate. Trainer's competencies are associated with effective

(cross-cultural) orientation, training and education [11]. Qualifications, competencies and experience contribute to trainer's effectiveness [12]. A credible trainer can respond to ad hoc questions with confidence and provide examples to clarify concepts without hesitation [13].

1.6 Resonance Field Imaging (RFI)

RFI is a tool for electromagnetic feedback and imaging process. It provides information and interpretation for auras and bioenergy fields and identifies the type and function of all bioenergies present in specific regions of the human body. The *RFI* will identify and interpret 15 colours of auras. It uses a tool which is a hand-held frequency meter with an antenna that measures the frequency in megahertz at various points and distances (Fig. 20.1). It gives a true real-time reading of the aura frequencies in its natural state when. Each frequency will correspond to 15 colours that are subsequently interpreted by the computer software programme accompanying the *RFI* system [14].

Bioenergy field or aura is the electromagnetic field that surrounds an object (Fig. 20.2). Aura denotes various states of a person including physical, emotional, mental and spiritual states. The colours of the aura are red, burgundy, orange, yellow, green, blue, purple, rose, gold, cyan, black, navy, orchid, silver and white.

Aura interpretations analysis includes the health level, the psychological level, the chakra, the endocrine system and the brain system.

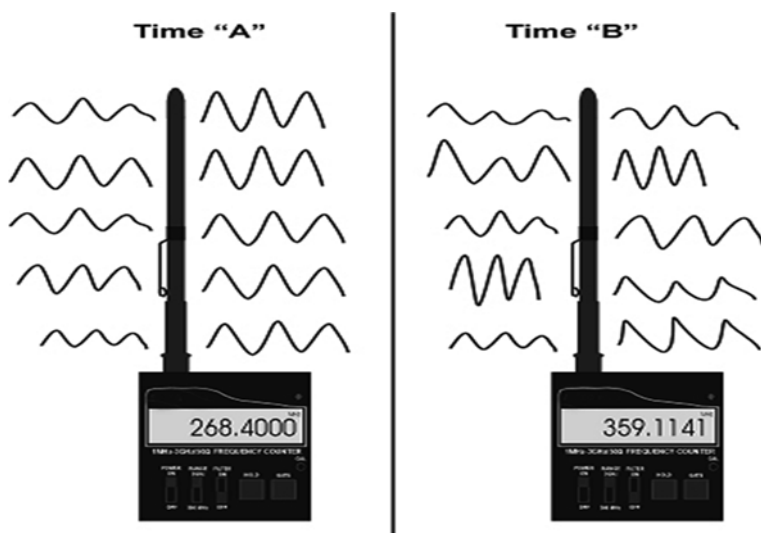


Fig. 20.1 RFI tool

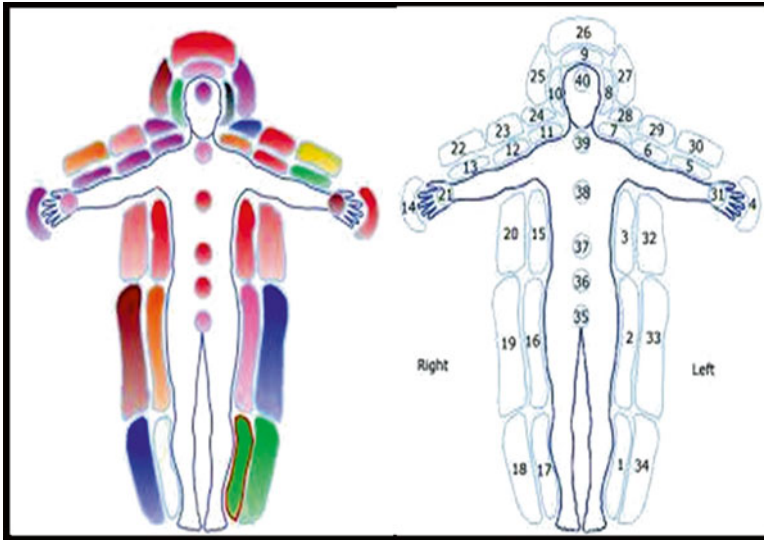


Fig. 20.2 Region of aura and chakra

This study will focus on the psychological level. The psychological level is measured at 4–18 in. from the body and constitutes seven regions, i.e. lower leg, upper leg, right torso, hand (palm), lower arm, upper right arm and the side of neck. The psychological level comprises the Left Body Bioenergy Analysis and Right Body Bioenergy Analysis. The right side shows the behavioural pattern of the individual where the energies of the subject are projected into the environment, whilst the left side shows the influence of the environment onto the subject. In this study, we concentrated on the left side of the psychological level. Table 20.1 indicates the RFI colours and its corresponding psychological interpretation.

1.7 Application of RFI to Date

The previous RFI research [15] that evaluated the human body aura of smokers and non-smokers demonstrated that non-smokers have higher energy field score compared to smokers, thus demonstrating that non-smokers are generally healthier than the smokers. Other scientific RFI researches also include a study that looked into the correlation between BMI and human physical condition [16] and gender recognition based on body radiation [17]. RFI was used for the first time in social science context where a study was conducted on EQ and SQ and reward of job performance [18]. Another social science study was conducted to look into the entrepreneurial success using RFI [19]. This study is a sequel of two studies that looked into the effectiveness of technical training [20] and induction training [21] based on RFI.

Table 20.1 Course description and differences

Induction course (IN)	Technical course – boiler (BO)
Corporate on-boarding programme is an introductory course	Steam Boiler System Training is a technical training
Focuses on issue related to financial system and operation of organisation, inclusive customer service in SME Bank	Training related to plant operation in Petronas Chemicals MTBE Sdn Bhd that uses a combination of interactive discussion, presentation and exercises
All the participants were newly appointed and fresh in working field, having less than 3 years of working experience	Majority of participants were seniors in their technical sector
Mix gender	Male only
2 days	1 day

2 Methodology

The first study was conducted in Petronas Chemicals MTBE Sdn Bhd from 8 August till 14 December 2012. Thirty employees that are participating in a 1-day technical training programme were selected as respondents. Steam Boiler System Training is a technical training related to plant operation in Petronas Chemicals MTBE Sdn Bhd. The training uses a combination of interactive discussion, presentation and exercises. The training will provide participants with the knowledge necessary to make judgment on operation, inspection and maintenance of boilers. The 30 respondents involved in the course have never been in this training before. Hence, it is easier to measure how the training influenced them.

The second study was conducted in SME Bank from 4 February until 21 June 2013. Thirty newly appointed employees that are participating in a 2-day induction and orientation programme were selected as respondents. The welcome programme is a platform where the management team will communicate the organisational visions, missions, objectives and functions together with corporate SME Bank value to the staff. It also focuses on issues related to financial and banking systems, to ensure that the new employees understand the entire SME Bank's business functions.

The differences between the two courses are as outlined in Table 20.1. The questionnaires focus on four areas, i.e. training and trainer competency, training objective and individual learning were distributed and answered by each respondent after completion of training. Each question has a score from 1 (very low) to 5 (very high). RFI measurements were taken before and after the training programme. RFI data were collected by reading the frequencies at the left side of physiological level. All frequency measurements were taken at a distance of 4–18 in. above the body. The frequencies were recorded ten times at each point to ensure the accuracy of measurements. The data from the RFI and questionnaires of each respondent were evaluated and analysed.

3 Results and Discussions

3.1 Results of Induction Training (Tables 20.2 and 20.3)

Table 20.2 Aura before and after training

Rank	Colour	Before	After	+/-	%
1	Yellow	13	55	42	17.5
2	Navy	10	48	38	15.8
3	Orchid	21	19	10	4.2
4	Red	8	9	1	0.4
5	Burgundy	7	7	NC	0
6	Rose	2	2	NC	0
7	White	2	0	(2)	(0.8)
8	Silver	6	3	(3)	(1.3)
9	Green	37	34	(3)	(1.3)
10	Blue	27	22	(5)	(2.1)
11	Black	10	2	(8)	(3.3)
12	Gold	27	16	(11)	(4.6)
13	Cyan	17	3	(14)	(5.8)
14	Purple	27	12	(15)	(6.3)
15	Orange	40	9	31	(12.9)

Table 20.3 Aura interpretation of colours

Colour (rank)	RFI definition	Finding/interpretation (possible)
1. Yellow	Happiness and well-being, with a healthy measure of balanced caution. Subjects are within a festive, joyous and exuberant environment	Increase by 17.5 %, 42 regions
		As this was induction course, subject feels very happy to be welcomed on board With balanced cautions due to the content, such as the bank requirement which warned the subjects to be on guard as it is a financial institution
2. Navy	Leadership, expression of intellectual ideas (intelligence) which involve or influence material or social situations	Increase by 15.8 %, 38 regions
		Subjects are cautioned regarding how they will be evaluated through KPI by performance that will measure bonus
		Subjects are empowered with the new knowledge and the purpose of being in the organisations Relevant skills pertaining to KPI and evaluation are imparted

(continued)

Table 20.3 (continued)

Colour (rank)	RFI definition	Finding/interpretation (possible)
3. Orchid	Clarity of thoughts, understanding of truth. Subject may be currently participating in energy information exchange. Such environments are conducive to psychic work and creativity	Increase by 4.2 %, 10 regions
		Subjects could see where they fit in the organisation and know what contribution they should give to the organisation
		Subjects can outline their creativity (strategy) to obtain the objective/KPI
4. Red	Receive energy from others or environment that is characterised by material focus or desire	Increase by 0.4 %, 1 region
		Before course, subjects were receiving energies and thoughts from environment pertaining to issues other than the subject matter of the course such material and human desire
		This could be work related or non-work related
		After course, few still focus on human desire
5. Burgundy	Indicates mental activity related to survival issues, money, material objects and immediate physical environment	Unchanged, 7 regions remained
		Similar to red
6. Rose	Sexual energy, romance. Indicates physical and sensual desires or preoccupation related to physical pleasures, sexual attraction, emotional and romantic fulfilment or fun and entertainment	Unchanged, remain 2 region
		Since majority of the subjects are young, only few were exposed or engaged to sensual matters. This means that majority of subjects are fully focused onto the course – not fidgeting or in communication with ‘loved ones’
7. Orange	Emotional healing and mental activity is related to resolving emotional issues, recovering from intense life experiences and overcoming obstacles. Energies characterised by comfort, healing and vitality	Decrease by 12.9 %, 31 regions
		Subjects feel more obligation, responsibility and accountability
		Due to subjects did not clearly know their direction (emotional concern)
8. Purple	Intellectual energy, clarity of thought, academic ability	Decrease by 6.3 %, 15 regions
		Since majority of the subjects were fresh graduates who had no experience in banking industry
		Knowledge is all theory and academic
		By attending the course they know practically what to do and how to implement it in real workplace
9. Cyan	People in environment is reaching through non-verbal communication generally through emotional responses	Decrease by 5.8 %, 14 regions
		Similar to red. Prior to course, subjects will be receiving non-verbal communication from environment
		Subjects are more focused

(continued)

Table 20.3 (continued)

Colour (rank)	RFI definition	Finding/interpretation (possible)
10. Gold	People in the environment is giving uninhibited healing energies	Decrease by 4.6 %, 11 regions Subjects are more focused on human needs and desires after the course
11. Black	Passion, obsession, hatred, intense negative or destructive emotions	Decrease by 3.3 %, 8 regions The dark aura has been replaced by positive aura
12. Blue	Communication, perspective of reality, search for and expression of truth	Decrease by 2.1 %, 5 regions Specifically relates to trainer competency Since the subjects are fresh, few did not understand the banking procedures and so forth
13. Green	Subjects receiving emotional positive energies from others	Decrease by 1.3 %, 3 regions
14. Silver	Protection, shielding from destructive energies, emotional balance, peacefulness and stability	Decrease by 1.3 %, 3 regions Similar to Cyan
15. White	Indicates a discharge of bioenergy/emotional release. Mental or emotional state focused on life force energies, purity and truth	Decrease by 0.8 %, 2 regions Similar to orange above Subjects are having feelings of uncertainty

3.2 Results of Technical (bo) Training (Tables 20.4 and 20.5)

Table 20.4 Aura before and after training

Rank	Colour	Before	After	+/-	%
1	Purple	50	59	9	3.8
2	Navy	42	47	5	2,1
3	Orange	9	14	5	2
4	Orchid	21	25	4	1.6
5	White	8	11	3	1.3
6	Blue	37	39	2	0.9
7	Yellow	10	12	2	0.8
8	Silver	3	4	1	0.4
9	Black	5	4	(1)	(0.4)
10	Green	12	8	(4)	(1.7)
11	Cyan	12	8	(4)	(1.7)
12	Gold	8	3	(5)	(2)
13	Red	10	2	(8)	(3.3)
14	Burgundy	13	4	(9)	(3.3)

Table 20.5 Aura interpretation of colours

Colour (rank)	RFI definition	Finding/interpretation (possible)
1. Purple	Intellectual energy, clarity of thought, academic ability	Increase by 3.8 %, 9 regions Subject generally has clear thoughts to solve the problem
2. Navy	Leadership, expression of intellectual ideas which involve or influence material or social situations	Increase by 2.1 %, 5 regions Subjects are empowered by the new-found knowledge to be implemented
3. Orange	Emotional healing and mental activity is related to resolving emotional issues, recovering from intense life experiences and overcoming obstacles	Increase by 2.1 %, 5 regions Subjects feel relieved with the knowledge imparted. To overcome possible obstacles related to the steam boiler in plant
4. Orchid	Clarity of thoughts, understanding of truth. Subject may be currently participating in energy information exchange	Increase by 1.6 %, 4 regions Subjects are clearer on how to operate the steam boiler in plant
5. White	Pure, high-frequency electro field energy is projecting from this part of the body. Indicates a discharge of bioenergy, usually in the form of emotional release. May also indicate a mental or emotional state focused on life force energies, purity and truth	Increase by 1.3 %, 3 regions Similar to orange above Subjects are relieved of the uncertainties surrounding boiler system
6. Blue	Communication, perspective of reality, search for an expression of truth. Open-minded communication with good intentions	Increase by 0.9 %, 2 regions. Specifically relates to trainer competency. Indicates trainer is imparting know-how of boiler system
7. Yellow	Happiness and well-being, with a healthy measure of balanced caution	Increase by 0.8 %, 2 regions, a slight increase in regions Subjects are happy and satisfied with boiler system course
8. Silver	Protection, shielding from destructive energies, emotional balance, peacefulness and stability	Increase by 0.4 %, 1 region. Subjects felt secured and 'protected', armed with new knowledge
9. Black	Passion, obsession, hatred, intense negative or destructive emotions	Decrease by 0.4 %, 1 region. The dark aura has been replaced by positive aura
10. Green	Emotional energy, love and caring, can also be negative emotion or trauma. Subject is experiencing some emotional event or situation	Decrease by 1.7 %, 4 regions. Similar to cyan. Prior to course, subjects will be receiving non-verbal communication from environment

11. Cyan	Emotional energy. Subject exhibits empathy and sensitivity to emotions of others and is likely to be communicating or expressing their own emotions, either consciously or subconsciously	Similar to red. Prior to course, subjects will be receiving non-verbal communication from environment
12. Gold	Healing energy. Subject has abundance of healing bioenergy that is not burdened or inhibited by any personal emotional issues. This excess of healing energy projects outward to contribute healthy and healing energy to the environment and other people, animals, plants and objects which come into contact with this bioenergy	Similar to red Subjects' acquaintances projecting healing energy prior to the course – possibly Salam salutation
13. Burgundy	Material and physical focus. Indicates mental activity related to survival issues, money, material objects and the immediate physical environment. Related to instincts, basic human needs and desires	Similar to red
14. Red	Material and physical focus. Indicates mental activity related to material self-gratification, accomplishment of material goals and ambitions. Subject's thoughts may involve power and status, desire for attention and acceptance from others, indulgence or luxury items	Prior to the course, subjects were receiving energies and thoughts from environment pertaining to issues other than subject matter of the course This could be work related or non-work related The course has somewhat refocused subjects to the subject matter of the course, hence the decrease in red colour This indicates trainer has been successful to gauge the subjects
15. Rose	Sexual energy, romance. Indicates physical and sensual desires or preoccupations, related to physical pleasures, sexual attraction, emotional and romantic fulfilment or fun and entertainment	There were no rose before, during or after the course This is a purely technical course. So, the subjects were not exposed or engaged to sensual matters. This means that subjects are fully focused onto the course – not fidgeting or in communication with 'loved ones'

3.3 Comparison of the Two Training

Colour (rank)	Induction course (IN)	Boiler course (BO)	Remarks
1. Yellow	Increase by 17.5 %, 42 regions	Increase by 0.8 %, 2 regions	Placing 1st at IN, 7th at BO
	As this is an induction course, subject feels very happy to be welcome on board	Subjects are happy and satisfied with boiler system course	At IN subjects are more excited to be welcome on board with caution of the highly regulated procedures
	With balanced cautions due to the content, such as the bank requirement which warned the subjects to be on guard as it is a financial institution		At BO, the sense of happiness is not relevant; more towards problem solving, project aura to the relevant colour such as purple, navy, etc.
2. Navy	Increase by 15.8 %, 38 regions	Increase by 2.1 %, 5 regions	The two project as second however IN increase by 38 region compared to BO by 5 region
	Subjects are cautioned regarding how they will be evaluated through KPI by performance that will measure bonus	Subjects are empowered by the new-found knowledge to be implemented	Since IN group is newly employed, the spirit of motivation is high
	Subjects are empowered with the new knowledge and the purpose of being in the organisations		The senior subjects in BO also increase but not as much as in IN. Added to the subjects is grounded experience
	Relevant skills pertaining to KPI and evaluation are imparted		
3. Orchid	Increase by 4.2 %, 10 regions	Increase by 1.6 %, 4 regions	Placing 3rd at IN, 4th at BO
	Subjects could see where they fit in the organisation and know what contribution they should give to the organisation	Subjects are clearer on how to operate the steam boiler in plant	The same principle applies since subjects are newly employed at IN; therefore, more region has increase as compared to BO because the subjects are season
	Subjects can outline their creativity (strategy) to obtain the objective/KPI		

(continued)

Colour (rank)	Induction course (IN)	Boiler course (BO)	Remarks
4. Red	Increase by 0.4 %, 1 region	Decrease by 3.3 %, 8 regions	Placing 4th at IN, 14th at BO
	Before the course, subjects were receiving energies and thoughts from environment pertaining to issues other than the subject matter of the course such as material and human desires	Prior to the course, subjects were receiving energies and thoughts from environment pertaining to issues other than subject matter of the course	IN subjects focus on material and human desires as they are excited to perform well to be evaluated in KPI for increment and bonus purposes; therefore, the job focus has decreased
	This could be work related or non-work related	This could be work or non-work related	In BO, since the course was fully technical, subject is more focused on the subject matter
	After course, few still focus on human desire	The course has somewhat refocused subjects to the subject matter of the course, hence the decrease in red colour	
		This indicates trainer has been successful in gauging the subjects	
5. Burgundy	Unchanged, 7 regions remained	Decrease by 3.3 %, 9 regions	Placing 5th at IN, 13th at BO
	Similar to red	Similar to red	In IN, subject still focuses on material desire due to content of the course such as bonus and increment In BO, content of the course is not related to material focus but related to job focus
6. Rose	Unchanged, 2 regions remained	There were no rose before, during or after the course	Placing 6th at IN, no rose at BO
	Since the majority of the subjects are young, some were exposed or engaged in sensual matters. This means that majority of subjects are fully focused onto the course – not fidgeting or in communication with ‘loved ones’	This is a purely technical course	In IN, majority of the subjects are excited with life; only a few subjects are more focused in career
The subjects were not exposed to or engaged in sensual matters. This means that subjects are fully focused onto the course		In BO, majority of the subjects were senior, not excited much and more focused on the technical course	

(continued)

Colour (rank)	Induction course (IN)	Boiler course (BO)	Remarks
7. Orange	Decrease by 12.9 %, 31 regions	Increase by 2.1 %, 5 regions	Placing last at IN, 3rd at BO
	Subjects feel more sense of obligation, responsibility and accountability	Subjects were relieved with the knowledge imparted that is needed to overcome possible	In IN, subjects resolve their emotional issues
	Subjects are more confident of their role and more at ease compared to before the course	obstacles related to the steam boiler in plant	In BO, which is not related to emotional issues, subjects feel relief with the knowledge imparted, by overcoming obstacles related to steam boiler
8. Cyan	Decrease by 5.8 %, 14 regions	Decrease by 1.7 %, 4 regions	Placing 13th at IN, 11th at BO
	Similar to red. Prior to course, subjects will be receiving non-verbal communication from environment	Similar to red. Prior to course, subjects will be receiving non-verbal communication from environment	Consistent that cyan colour is actual noise from environment, has reduce in both cases
	Subjects are more focused		Since IN is new to subjects, they are more focused compared to those in BO
9. Gold	Decrease by 4.6 %, 11 regions	Decrease by 2 %, 5 regions	Both at same placing
	Subjects are more focused on human needs and desires after the course	Subjects' acquaintances projecting healing energy prior to the course – possibly Salam salutation	
10. Black	Decrease by 3.3 %, 8 regions	Decrease by 0.4 %, 1 region	Placing 11th at IN, 9th at BO
	The dark aura has been replaced by positive aura	The dark aura has been replaced by positive aura	
11. Blue	Decrease by 2.1 %, 5 regions	Increase 0.9 %, 2 regions	Placing 10th at IN, 6th at BO
	Specifically relates to trainer competency	Specifically relates to trainer competency	In IN, trainer communication is clear in terms of concept; subject understands well the whole banking system
	Since the subjects are fresh, few did not understand the banking procedures and so forth	Indicates trainer is imparting know-how of boiler system	Those in BO know what to ask since they are more experienced

(continued)

Colour (rank)	Induction course (IN)	Boiler course (BO)	Remarks
12. Green	Decrease by 1.3 %, 3 regions	Decrease by 1.7 %, 4 regions	Placing 8th at IN, 10th at BO
	Similar to cyan	Similar to cyan	Consistent; trainer has done a good job Meet training objective
13. Silver	Decrease by 1.3 %, 3 regions	Increase by 0.4 %, 1 region	Placing 9th at IN, 8th at BO
	Few subjects felt unsecured with too many procedures, rules and responsibilities	Subjects felt secured and 'protected', armed with new knowledge	IN, more responsibility, regulations (caution) BO, more secure with new knowledge to solve problem
14. White	Decrease by 0.8 %, 2 regions	Increase by 1.3 %, 3 regions	Placing 7th at IN, 5th at BO
	Similar to orange – subjects are having feelings of uncertainty	Similar to orange above Subjects are relieved of the uncertainties surrounding boiler system	Similar to orange

Colours related to training competency are yellow, navy, orchid, orange, purple, silver and white
 Colours related to the training objective are similar but without navy and purple with the addition of red, rose and blue
 Colours related to individual learning are yellow, navy, orchid, orange, purple, cyan and white
 Colours related to trainer competency are red, burgundy, rose, cyan, black, blue and green

4 Conclusion

In the induction programme, yellow appeared fifty-five (55) times which indicated that the respondents are 'happy' and pleased with the outcome of the course. There is also a tinge of weariness as they are being exposed to and are overwhelmed to be associated with a highly regulated organisation. At the same time, they feel empowered with the new-found knowledge and are aware of their purpose in the organisation (navy – forty-eight (48) times).

For the Steam Boiler System workshop, purple appeared nine (9) times which indicated that the respondents have acquired the knowledge to maintain and solve problem related to boiler. The respondents are also empowered by the new knowledge and have the confidence to implement what they have learned from the course (navy – five (5) times). The respondents were found to be more focused during the course (red and burgundy – eight (8) and nine (9) times, respectively) indicating the effectiveness of the training programme.

The differences observed between the two groups are due to the nature of the courses and the participants. In the induction course, the respondents are mixed gender and are fresh graduates with 2–3 years of working experience. On the other

hand, the respondents of the steamed boiler system course are all male technicians with long working experience in the field.

It is amazing to note that there are consistent colours that relate to the four areas. Most of the time, in any training courses, respondents will answer favourably in evaluation questionnaires. Human body aura analysis and interpretation using RFI will substantiate and verify these findings. Previous published RFI studies were of pure science in nature (15–17). This study encroaches into the realm of social science. It is a pioneering preliminary study in the field of management using aura to verify training effectiveness. The findings may have an impact and influence on companies and organisations in their training and development investment.

The potential of RFI is limitless. Among the areas that could be considered are:

- Recruitment and staffing
- Selection of high-profile/high-risk jobs – treasurers, head of department, chief executive officers and ministers
- Suitability of candidate for a particular position
- Productivity of persons, organisations and teams
- Compatibility of teams and organisations
- Career guidance

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Chapter 21

The Potential of Local Clay as Alternative Body for Ceramic Craft: A Case Study in Sabak Bernam

Mohd Tazul Akmal Mohd Talib, Rusmadiyah Anwar, Verly Veto Vermol, Oskar Hasdinor Hassan, and Abdul Rahim Jalil

Abstract Clay is the main material in ceramic manufacturing and is an integral raw material for some refractories. The specialty of character in clay body, the entire world made it an important commodity. Ceramic manufacturing is one of the largest industries in Malaysia. This is related to the amount of ceramic raw materials itself that supports the development of the industry. Moreover, the contribution of artist and researcher is one of the factors of this improvement. The development of clay was enhanced by ceramic production whether by large- or small-scale industries. Through appropriate study in conducting research and development on clay will enable ceramic artist, academician, and university students to embark new sources of clay for ceramic production. Sabak Bernam is one of the areas that is currently active in making ceramic craft. There have abundant sources of materials at their area but has not been studied the usage and potential of the clay for ceramics. The objective of this research is to study the potential of clay at Sabak Bernam for craft production. The methodology of this research is a comparison study between clay at Sabak Bernam and Sayong clay. It started with collecting materials in a specific area in Sabak Bernam. Through appropriate study on laboratory experiment will determined the physical characteristic of clay. Therefore, clay study will through the ceramic fabricating which is press mold technique is to determine the performance of the clay. A result of the development of clay at Sabak Bernam will enhance the ceramic craft production specifically in that area. Hence, the Sabak Bernam clay will be commercial such as Sayong clay in Malaysia.

Keywords Clay • Ceramic • Craft • Sabak Bernam

M.T.A.M.Talib (✉) • R. Anwar • V.V. Vermol • O.H. Hassan • A.R. Jalil
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: tazulakmaltalib@gmail.com

1 Introduction

Ceramic is one of the popular sectors in Malaysia whether large or small scale. Ceramic craft in Malaysia started more than 80 years ago, and the famous Kuala Kangsar ceramic product is Labu Sayong [1]. Moreover, ceramic products from Mambong Kelantan, Termin Pahang, and Kuala Selangor are starting to rise topping the current ceramic products in the market where is collaborative with Pusat Kraftangan Malaysia. Through these years, researchers have noticed that some of the ceramic entrepreneurs have developed their business around the areas of Sabak Bernam. Therefore, this research aims to discover the local clay of Sabak Bernam to be experimented as clay to be used by Malaysian ceramic entrepreneurs [2]. This research focused on small entrepreneur ceramic craft products such as key chain, plaque, and fridge magnet. These products are basically made through a press mold technique which is simple and easy for mass production. Clay is an important material in ceramic production, is the main material in ceramic manufacturing, and is an integral raw material for some refractories. Clay generally refers to the mineral group, a sedimentary deposit or rock, or grain size less than 2 μm [3]. The characteristics of clay such as plasticity, durability, low cost, and ubiquity in virtually the entire world made it an important commodity. Generally, clay consists of water, oxygen, alumina, and silica. The composition of pure clay is $\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$. Clay is distinguished by its composition, plasticity, shrinkage, color, absorption performance, and firing characteristics. Clay's special and unique characteristic is plasticity. This makes clay easy to form in any shape and size, depending on the technique and making process [4]. At present, Malaysia is one of the countries rich in pure clay materials such as kaolin, terra cotta, ball clay, and others. For example, in Sayong, Kuala Kangsar, they used their own clay that was taken from the riverbanks of Kuala Kangsar river [5]. Currently, ceramic craft in Kuala Kangsar was enhanced their ceramic craft and clay to the entire Malaysia. According to this situation, Sabak Bernam or other ceramic craft areas can develop their own clay to be successful as well as Sayong, Kuala Kangsar. Sabak Bernam is famous as a center of agriculture and fisheries in Malaysia (Sabak Bernam Museum 2012). Therefore, from the observation of this study in Kuala Selangor and Sabak Bernam, the researcher found four ceramic craft entrepreneurs that are currently active in their businesses. According to Pusat Kraftangan Malaysia, currently, Sabak Bernam has developed new ceramic entrepreneurs to enhance the ceramic craft production in Malaysia. The possibility of Sabak Bernam clay to be used in ceramic craft production is high. The history of ceramic craft in Selangor showed that they used local clay for ceramic production before World War II earlier in their business [6].

2 Method

To achieve the objective, the research method to be used is a comparison study between Sabak Bernam clay and Sayong clay. Its derived from the design research methodology which introduced by Anwar which, apart of the process flow taken out

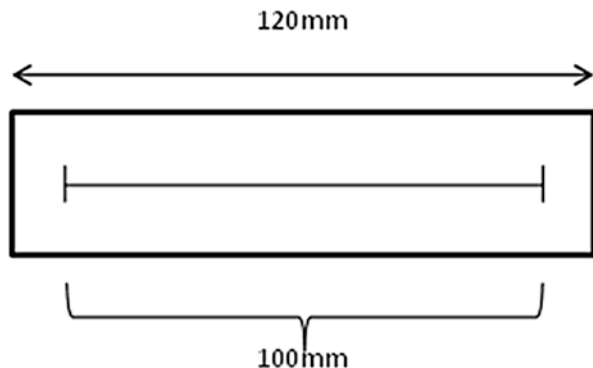
to be develop as experimentation material studies through empirical framework before the execution of laboratory studies [7]. It starts with collecting the raw materials from Sabak Bernam, Selangor. The clay area was selected randomly. The selected area is a ceramic business area. The researcher has taken out the clay three feet under the surface because it is the best level of pure clay [8]. The experiment is conducted in the ceramic department’s laboratory under UiTM Shah Alam. The pure Sabak Bernam clay will some process same as process of Sayong clay in Kuala Kangsar. The process started with the clay mixture in water before sieving to become slip. The slip of the Sabak Bernam clay will go through a drying process to become clay. This process aims to remove the organic or waste materials in the clay body. By using the press mold technique, clay is applied into a test bar for laboratory experiment. The test bar is used for implementing the physical test on the body. The physical test aims to determine its strength and water absorption (porosity) capacity. By using the press mold technique, the test bar will be constructed with different parameters. The standard size for the test bar is $120 \times 40 \times 4 \text{ mm}^3$. The total test bar surface is 100 mm for easier measuring process after being fired. The entire test bar will be tested and studied. The MOR test will be conducted to measure the test bar performance and potential in water absorption test will tested the number of porosity [9, 10]. Figure 21.1 below shows a standard test bar dimension for physical test procedure.

The porosity and shrinkage rates are studied through measuring the water absorption capacity of the test bar. Immersing it in water for 24 h is a method to determine the water absorption percentage. After 24 h, the test bars should be removed from the water, taken out and wiped off with a dry cloth, and weighed [11]. The water absorption percentage was calculated using a specific formula. Source was taken from standard water absorption ASTM D570 below shows the standard formula of water absorption.

$$W(\%) = [(W_w - D_w) / D_w]100$$

Modulus of rupture (MOR) is a method to identify the physical strength. MOR procedure is conducted to measure the necessary force to break a given substance across a test bar [12]. MOR has calculation formula to determine the number of strength. Formulation is average test bar length (b), average test bar thickness (h),

Fig. 21.1 Standard test bar dimension



original line length (L), and force of rupture (F). The standard MOR formula is shown below. Every specimen used a similar test and approach but produced a different result. The paper clay strength of the fired test bar was determined on a 3-point bending test. The cross-head speed in flexural test normally varies within the range 0.004–0.4 in./min (0.1–10 mm/min). Speeds 1 mm/min and 0.1"/min (2.54 mm/min) are mostly used in the tests [13].

$$\text{MOR} = (3FL) / 2bh^2$$

The final product will be fabricated using press mold techniques. This material applied to the real product is to observe the capability Sabak Bernam clay performs as Sayong Clay. The final product will be compared with the Sayong clay in green and fired body.

Figure 21.2 shows that the test bar was fired at 1,000 °C. By using press mold techniques in test bar fabricating the result will evaluate in this stage. A comparison method will be used to compare the existed clay (Sayong). Fired clay bodies will go through a physical properties experiment to investigate its physical performance as compared with Sayong clay.

2.1 Shrinkage and Water Absorption of Sabak Bernam Clay

Table 21.1 shows the analysis of shrinkage and water absorption test. All the test bars were measured in green ware and fired condition to evaluate the shrinkage percentage. The firing temperature was set at 1,000 °C. This temperature was



Fig. 21.2 The fired test bar

Table 21.1 Shrinkage and water absorption

Test bar	Table shrinkage dried (%)	Shrinkage fired (%)	Water absorption (%)
1	11	14	9.14
2	13	17	9.51
3	12	13	23.41
4	13	17	7.67
5	10	13	18.74
Sayong	6	10	19.95

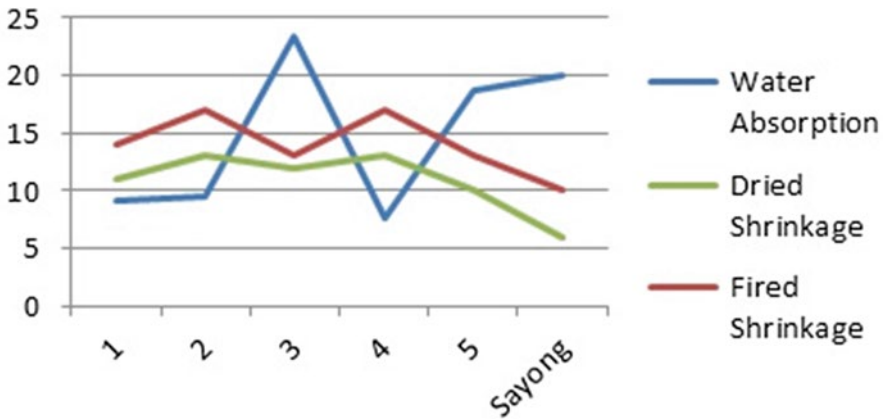


Fig. 21.3 The relationship of shrinkage and water absorption of the test bars

defined as suitable for small craft product which reached the low glaze temperature. At this stage, the researcher observes that the clay of Sabak Bernam has shrunk about 13–17 % which is considerably different from that of Sayong clay. However, the water absorptions show the positive result. There are two clays considered suitable with Sayong clay percentage. The possible explanation of this result is due to the mineral contained in the clay body and the different between Sabak Bernam clay is about the agricultures factor of that areas (Fig. 21.3).

2.2 Unit of Modulus of Rupture

Table 21.2 shows the analysis result of data evaluation for the MOR test which is investigated on the Sabak Bernam clay test bar. From the result showed in Table 21.2, it proved that the strength of the Sabak Bernam clay is equivalent to Sayong clay. However, there has specimen that results are higher than Sayong clay and has the lowest value in strength which is less than 10 N/mm² (Fig. 21.4).

Table 21.2 shows the strength comparison between the Sabak Bernam clay and Sayong clay fired body. From the water absorption result, the porous body has the weakest strength. Test bar 3 has the highest number in water absorption (23.41 %);

Table 21.2 MOR strength result of the fired body

Test bar	MOR (N/mm ²)
1	23.40
2	19.20
3	6.60
4	22.74
5	14.64
Sayong	19.26

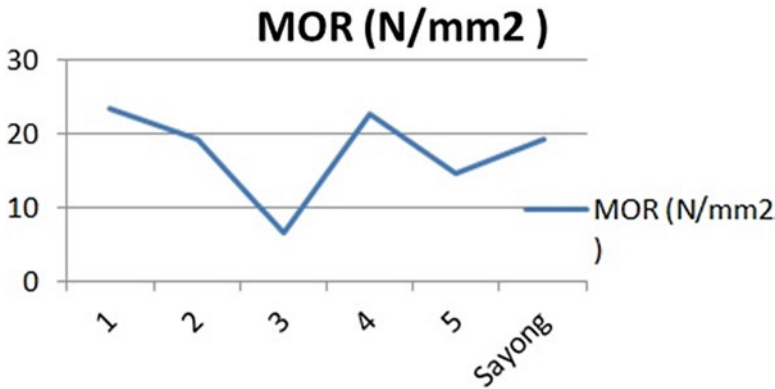


Fig. 21.4 Modulus of rupture graph of the fired bodies

however, it has the weakest strength (6.60 N/mm²). Moreover, test bar 5 showed that the results in all tests are definitely equal to that of the existing Sayong clay. From this MOR test result that test bar contained black core inside the body in several Sabak Bernam clays. A defect in the black core occurred with large numbers of organic substances in the clay body. This result makes difficult to obtain the sintered ceramic product with low water adsorption [13]. The slates cannot be oxidized easily during firing because of the amount of organic substances present. The defects shown in Fig. 21.5 are probably caused during firing by reducing atmosphere around the test bar due to a large content of organic substances in the clay [14, 15]. Due to this result, the substances and iron in the ceramic body increase the strength of the test bar as a result of test bar 1.

3 Conclusion

From the experiment result and clay practice, it shows that the Sabak Bernam clay can be used for ceramic craft production. This study proved the capability of Sabak Bernam clay using the press mold technique in producing ceramic crafts. The results are shown in Fig. 21.6. The experiment result shows that clay number 5 showed the performance that is definitely equivalent to the benchmark (Sayong clay).



Fig. 21.5 Black core defect in Sabak Bernam clay



Fig. 21.6 Final product using Sabak Bernam clay no. 5 by press mold techniques

This result can help the ceramic entrepreneurs in Sabak Bernam area to enhance their product by using minimum cost. However, from the result of physical properties test several of the Sabak Bernam clay still have to develop for equivalent with existed materials Sayong clay. Some of the Sabak Bernam clay need additive materials to enhance the physical properties' performance. For example, test bar 1 has

defect in the black core inside their body [16]. To improve the clay body from black core defect is to additional the raw materials and also work out the suitable firing setting for improve oxidation while firing [2].

Acknowledgment We would like to acknowledge the generous participation of the interaction designers in the research. This study was conducted in Formgiving Design Research Lab established by Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to Malaysia Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 22

Hydroxyapatite Material Study for Synthetic Skull Design Construction for Slip Casting Method

Norhidayah Md. Zainuddin, Abdul Manan Mohd Johan, Rusmadiyah Anwar, and Oskar Hasdinor Hassan

Abstract Hydroxyapatite could be obtained in various methods. In this paper, hydroxyapatite (HA) is obtained from the synthesis method. The sample was tested in XRD to confirm the HA phase. The obtained HA powder will be utilized in a proposed conventional method of ceramic slip casting for a simple manufacturing purpose. Thus, prior to that HA powders obtained were also analysed on its thermogravimetric (TGA) and differential scanning calorimetry. Results show that HA powder obtained may face some changes and is stable after 800 °C and remained until 900 °C. This suited with the intended sintering temperature of the future procedure of slip casting. The density of respective prepared HA was also measured and found to have slightly less density compared to the commercial HA.

Keywords HA • Slip casting • TGA • DSC • XRD

1 Introduction

Hydroxyapatite (HA) is widely used in clinical application especially in bone reproduction or replacement. The similarity of HA $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$, with natural bone that enables hard tissue regeneration, is among the contributing factors for the material to perform biocompatibility in the human body and facilitate natural bone ingrowth [1–3]. Hydroxyapatite was first used in 1981 for periodontal wound sealing. The usage then broadened into other medical purposes as solid blocks, solid elements, granules and coating in dental implants [4]. It also may suit into varieties of specific application such as dental, orthopaedic, ear and facial surgery [5, 6].

N.Md. Zainuddin (✉) • A.M.M. Johan • R. Anwar • O.H. Hassan
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: norhidayahmz@yahoo.com

Hydroxyapatite has been manipulated to be utilized as replacement in bone grafts or hard tissue scaffolding. Although it is observed in fracture cases that bone tissue is highly potential in self-reconstruction, bone grafts are sometimes required for large bone defects and in circumstances of poor bone healing [7]. Porosity size and distribution plays an important role especially for medical such as bone graft applications. Different porosity dimension character has certain ability, as small surface pores may limit body fluid to flow and reduce the bioperformance [8]. To facilitate surrounding bone regeneration including the blood supply, the minimum requirement is between 100 and 150 μm for macropores, while 50 μm pores are acceptable for osteoconduction [9].

In this work, synthesized HA powders are analysed for its thermogravimetric (TGA) and differential scanning calorimetry (DSC) for material characterization. Prior to that, the obtained synthesized HA phase was confirmed through the XRD pattern. The HA synthesized powder density was also measured to be compared with the commercial HA. This is essential before the material proceeds to the next procedure, which is slip casting.

2 Method

2.1 Preparation of HA Powder

In this study, calcium carbonate (CaCO_3) is calcined and extracted into calcium oxide (CaO) together with diammonium phosphate (DAP). Ammonia was used to achieve an alkali state. All the reagents used as starting materials are obtained from R&M Chemicals. To dissolve the powder materials into solutions, distilled water was employed. As mentioned in [10], this process needs to be performed carefully to ensure unnecessary phase changes.

2.2 Preparation of HA Powder

For this purpose, CaCO_3 was used and calcined in order to eliminate the carbonate and extracted into calcium oxide (CaO). CaO is then diluted and then mixed with the solution of diammonium phosphate (DAP) using a hot-plate stirrer. Ammonia liquid was added dropwise into the solution, while stirring, until it achieves the intended pH reading, in this work, set at pH 9.75. Then, the solution is synthesized in a microwave oven with 1,100 W for 30 min. Once the process is completed, the solution is left to precipitate.

Once precipitation is obtained, the solution is rinsed with distilled water to remove excessive ammonia remaining in the solution, known as hydroxyapatite

(HA) solution. The precipitated HA is then frozen at 24 °C for 12 h (one night) in the centrifuge tube. After that, it will be dried in the freeze dryer under the temperature of -52 °C for 48–72 h (2–3 days) in order to let the water in the frozen HA vaporize. The process will obtain HA in powder form.

3 Material Characterization

Two tests were conducted in identifying and obtaining the HA material characterization. In addition, each of the starting material reagents, together with the obtained HA powder density reading, was examined to be compared with the commercial HA.

3.1 XRD Test

The hydroxyapatite powder obtained from the synthesis process was further sent for few tests to ensure that there were no phase changes in transition from the powder to slip casting stage. Right after the synthesis process, the powder was sent for XRD test to confirm the HA phase. The XRD spectrum shown in Fig. 22.1 below indicated the HA properties achieved. The HA phase was confirmed based on the spectrum pattern as shown. It is vital to confirm the HA phase before the study proceeds to the next process in this research.

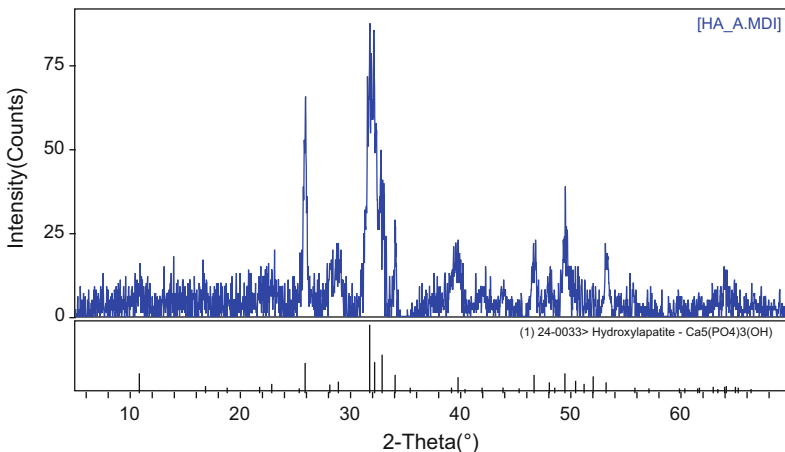


Fig. 22.1 The XRD spectrum of the synthesized HA

3.2 Thermogravimetric Analyses

Before the HA powders are used in the slip casting, it is important to examine beforehand that the material will not face any major changes during sintering. This is because, after the slip casting process, the casted HA will be sintered in order to provide heat treatment activity that improves the properties and bonding of the green bodies [10].

Thermogravimetric analysis was performed using Mettler TA4000 System in air from room temperature up to 900 °C. It was observed that there were two noticeable stages of decomposition as shown in Fig. 22.2. The first decomposition was observed at the temperature between 23.57 and 96.57 °C due to the loss of adsorbed water, as the heating approaches the boiling temperature. The decomposition is equal to 3.1716 % or 0.6343 mg weight loss of the HA sample. This leaves the sample weight to 19.3750 mg.

Decomposition once again recorded occurred between 527.40 and 673.88 °C. However, there was not much change in the weight. There are two categories of water in hydroxyapatite structure content, which consist of the adsorbed and frame water. Adsorbed water normally vapours between 25 and 200 °C and comprises the reversibility effect. It faces weight loss without any effect on lattice parameters. On the other hand, lattice water is irreversibly lost at the temperature of 200–400 °C [11].

3.3 Differential Scanning Calorimetry (DSC)

The DSC analysis of the HA powder was carried out using the Mettler TA3000 system from room temperature up to 900 °C in heating air. About 20 mg of the sample was used in the analysis. It was observed that there is an endothermic weight

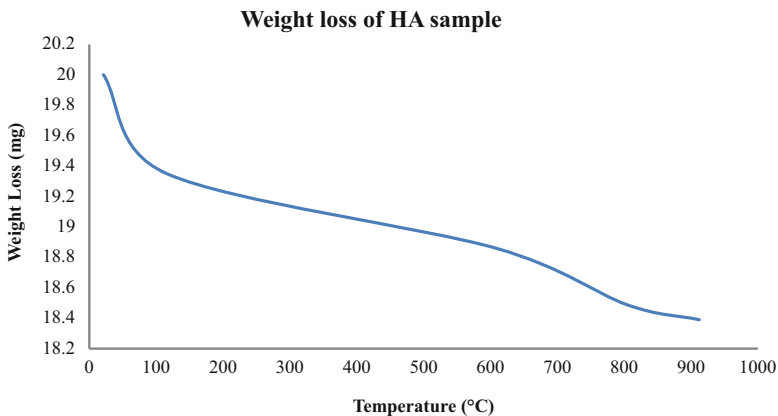


Fig. 22.2 TGA curve of the synthesized HA

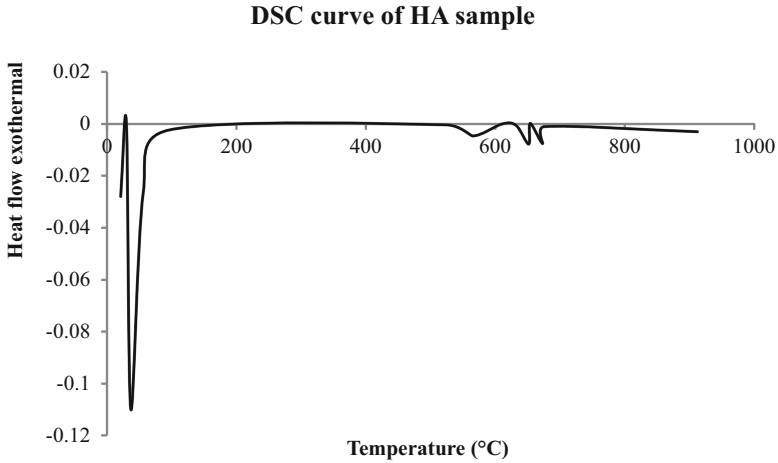


Fig. 22.3 DSC curve of the HA sample

loss below 96.57 °C due to desorption of water. There is another occurrence of endothermic weight loss at 527–673 °C. This can be observed from the DSC curve in Fig. 22.3.

3.4 Density Test

Even though porous HA has the ability to promote bone reconstruction more quickly, dense HA has the capability and advantage for load-bearing application. Therefore, a good understanding of the synthesis methods is essential to develop the HA intensity in order to suit varieties of implants [12]. The HA obtained in this study is proposed to be applied for damage skull reconstruction; thus, load bearing is not in the research parameter.

The raw material of the obtained HA was measured using a pycnometer (AccuPyc II 1340 V105, Micromeritics). These involved ammonia (NH₃), distilled water (H₂O), calcium oxide (CaO) and diammonium phosphate (NH₄)₂HPO₄. Table 22.1 below is the average density reading of the materials.

The obtained HA and commercial HA densities are also measured with the same method and instrument. Table 22.2 below is the density comparison between synthesized HA and commercial HA powders. It can be observed that there is a difference of 0.0156 g/cm³ on the density reading.

Table 22.1 Average density reading for the HA raw material

Material	Density reading (g/cm ³)
Ammonia	0.0073
Distilled water	0.9977
Calcium oxide	2.4479
Diammonium phosphate	1.6149

Table 22.2 Average density readings for commercial HA and synthesized HA (g/cm³)

Commercial HA	Synthesized HA
2.8968	2.8812

4 Conclusion

Based on the current work, the obtained HA phase was obtained as shown on the XRD spectrum. The obtained HA powder exhibits a slightly less density compared to commercial HA powder. This could indicate that the synthesized HA powder is less dense compared to the commercial HA.

Based on the TGA test, a total of 1.7234 mg of the HA sample was decomposed indicating water molecule losses. The endothermic weight loss that occurs at 527–673 °C will need to be further tested shall there is any phase changes as it may bring unintended result for the next work, during the sintering after the slip casting process.

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Chapter 23

Product Design Blueprint in ‘Look East Policy 2.0’

Natrina M.P. Toyong, Erwin Rezasyah, and Zakiyah Hasan

Abstract The research focuses on product design perspective of the old and new ‘Look East Policy’ (LEP) as a foundation for a National Product Design blueprint. Unlike the old LEP introduced in 1982 by then premier Tun Dr Mahathir Mohamad, the second wave Look East Policy 2.0 focuses on six key areas beyond just training and education. One new emphasis which is highly relevant to the role of design is enabling high-growth potential amongst SMEs by adding values. To achieve this, the management of design activities at a national level can take the centre stage by charting out a path that is in line with this move. The current advocates of national design and innovation activities, namely, Malaysia Design Council, PEREKA, MIMOS or SIRIM, are desperate in their efforts. The objective of the research is to provide a blueprint for a national product design direction which will emulate some of the good practices which have brought many Asian product brands up the value chain. It will also draw a compromise of the current practices and provide solutions that are unique to the nation by understanding the problem-solving exercises as well as governance of design practices that are enforced in Japan. The investigation will be conducted as a qualitative research comprising of interviews with management level design-related bodies, focus group with design educators and practitioners as well as basic historical research on national level design milestones. The outcome of the research will be presented as a published guideline to chart the direction of a national design blueprint and later foundations for further comparative study on different perspectives of product design champions, namely, Korea and Taiwan. The blueprint will be able to align the incongruent aim and objectives of all the product design practices at a national level.

Keywords Design management • Product design • Design research • Design method • Look East Policy

N.M.P. Toyong (✉) • E. Rezasyah • Z. Hasan
Industrial Design Department, Universiti Teknologi MARA, Shah Alam, Malaysia
e-mail: natrinatoy@salam.uitm.edu.my

1 Introduction

There is disparity in the direction of product design activities and effort at a national level by its major stakeholders. At the same time, the 'Look East Policy 2.0', with its new focus on high-growth potential amongst SMEs through added value, is seen as a potential for greater design intervention. The gap provides valuable ground for research findings where the possible overlap of these two factors, (1) extraction of Product Design blueprint from the policy and (2) product design as the value-added proposition within the policy, has yet to be done. A National Product Design blueprint can be drafted by realigning the gap in the Look East Policy 2.0 with current product design landscape: (1) to investigate national product design milestone from a historical perspective (2), to assess product design directions based on the Look East Policy 2.0 and (3) to chart an implementable Product Design blueprint at a national level based on the context of current and future practices.

2 Literature Review

2.1 *Look East Policy*

A review of the original Look East Policy [1] introduced by Dato Seri Dr. Mahathir Mohamad shows how it was in line and initiated to provide a boost to the New Economic Plan. Stafford [2] explains that despite the ethnic preference of the NEP policy, an outward-looking strategy in the form of the Look East Policy is able to ensure a level of success in expanding the nation's economy. The original Look East Policy had its focus on training and education, focusing efforts in creating competent human resource based on the template of Japan's growing industrial direction.

A study on the first Look East Policy by Ohno [3] outlined how, during the period of the policy, Malaysia found success in increasing foreign direct investments, for a short time, becoming one of the world's major electronic exporters. However, one key thing to be noted is that this success was not attributed to the policy alone; instead it was coincidental with the appreciation of the yen currency which started in 1985. The report suggests that moving forward, Malaysia needs to find measures in overcoming a new challenge of transition from 'quantity' to 'quality' manufacturing, similar to what is faced by Thailand.

This finding is further corroborated by looking back at the three categories of the original 1982 policy which saw a focus on (1) change in structure, (2) change in behaviour and (3) change in training and improvement. According to a report outlined by the Socio-Economic Research Centre [4], this focused effort has resulted in higher efficiency and productivity through the introduction of knowledge acquisition and good work ethics and culture. This goes to show that the foundation for a progressive role of industrial management and development is already in place. In fact, as early as the year 2000, Japan International Cooperation Agency (JICA)

has published a Third Party Evaluation Report, assessing Singapore's Productivity Development Project (PDP) which spans from June 1983 to June 1990. The PDP is Singapore's equivalent to Malaysia's Look East Policy. In their evaluation, the PDP was a success in terms of setting up the foundation for a High-Performing Asian Economy (HPAE) [5] that they are today. For further development, Page [5] also concluded that 'export orientation' is a factor that can be adopted by developing economies such as Malaysia, as it has pushed Japan and Korea to become HPAEs. Moving forward, a predicted path by Sivalingam [6] in an overview of the reintroduced Look East Policy suggests that further development for an upper middle-income industrialized country like Malaysia requires strengthening of domestic capability and moving into more value-creating activities.

2.2 *Template for a New Creative Economy*

National level efforts such as the Malaysian 10th Development Plan, which was introduced in 2011 in line with the announcement of 2010 as the Year of Innovation, were drafted to transform the nation into a hub of creativity and innovation by 2015. This move however proved to have met some exertion as the foundation for a creative economy was not yet in place as simple issues such as lack of proprietorship and data ownership of advanced technology amongst Malaysian players [7]. Macdonald and Turpin [8] have also acknowledged this factor through a larger case study of the Association of Southeast Asian Nations (ASEAN). In their study, it was found that ASEAN SMEs are facing pressure to comply with Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement.

This innovation chasing game is slowly becoming burdensome for SMEs which ends up focusing instead on everyday operational requirement. It is therefore unfair for SMEs to be pushed towards a direction for IP-driven Innovative Economy. A more liable solution would be to identify other creative directions that would suit the template of the individual nation specific to the local landscape. In fact, the concepts of Creative Economy (CE) in Malaysia, as suggested in certain studies, are more highly linked to a more traditional sector in Malaysia such as the tourism and culture industry [9].

Malaysia's consistent emphasis on generating added value in the SME sector is evident in a lot of its recent national policies. In line with the focus on SME, the prime minister in his 2013 budget speech introduced five key thrusts in which the first being 'Invigorating Economic Activity' [10]. The premier followed this by an announcement of a proposed allocation of RM120mil for an integrated package to increase growth in that sector. Localized solution may be put in place by looking at the reintroduction of the 'Look East Policy' to compare the effectiveness of the previous effort and realigning it to fit the agenda of adding value to SMEs but in a less westward direction of IP dependencies.

3 Research Methodology

The study will primarily seek to understand the problem by looking at (1) the context of Look East Policy 2.0 that is pertinent to product design as an added value to industry practice especially in a Malaysian viewpoint, (2) Malaysian product design milestone from a historical standpoint to evaluate existing national design landscape and (3) solution space for an integrated national product design plan.

A flowchart of the research framework can be seen in Fig. 23.1. The data will be collected in three phases of studies as described below.

3.1 Phase 1: Literature Review

The literature review will be conducted on formal published materials which include journals, official documents deriving from the state or private sources as well as unpublished materials in the form of mass media output and virtual outputs. The review will be based on the early theoretical framework developed to guide the flow of the research (See Fig. 23.2). The stage is aimed at identifying and understanding terms of definition, issues and problem with regard to the research title and to gain as much as possible information and a knowledge gap from previous studies. The readings will also focus on deconstructing the 'Look East Policy 2.0' and its focus area, specifically sections where product design and manufacturing is a concern. At this stage, the research team will simultaneously conduct a qualitative content analysis with an application of some historical research method to define an overview of Malaysian product design milestone and timeline.

3.2 Phase 2: Expert Interviews

This research will be carried out in a form of qualitative inquiry. The target respondents will focus on two representatives from each of the nation's key stakeholders and advocates of design-related activity. The five main organizations include National Design Council (MRM), PEREKA and National Design Centre (NDC), sponsors and lobbyist of design as a professional body, and MIMOS and SIRIM government-affiliated organization bodies. The targeted respondents will come from an equal number of both top management and high-level design practitioners. Their industry and policy knowledge will provide the best feedback to further inform the product design milestone and timeline that were identified through literature review. The findings will also be able to map out a comprehensive view on current product design landscape with special attention to future directions of the different bodies involved.

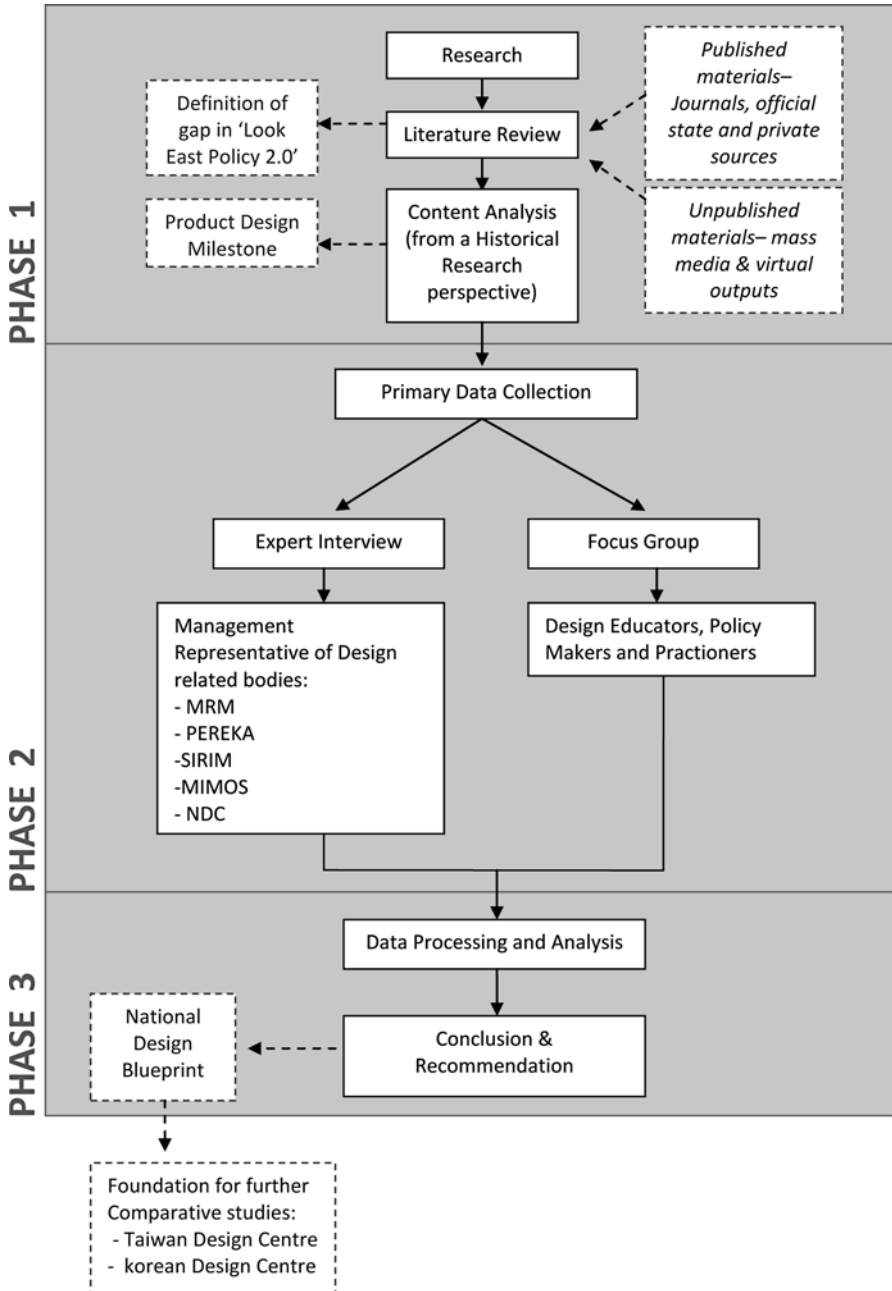


Fig. 23.1 Research framework

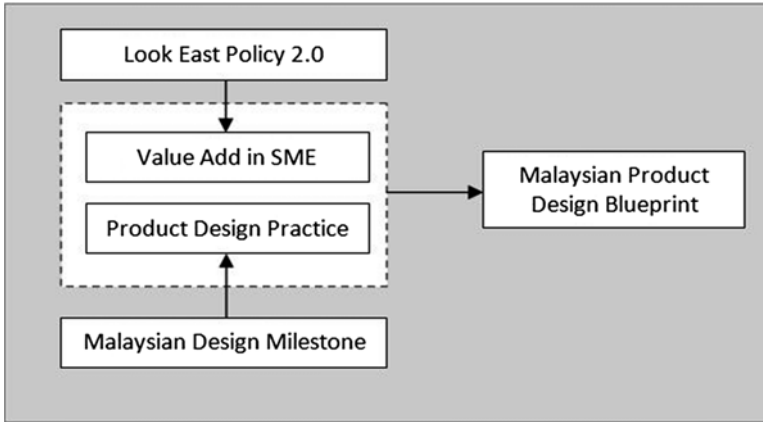


Fig. 23.2 Conceptual framework

10 Respondents for Expert Interviews

No	Organization	Respondent	Total
1	MRM	1 x CEO/ Director/ Manager/ 1 x Senior Designer	10
2	PEREKA	1 x CEO/ Director/ Manager/ 1 x Senior Designer	
3	SIRIM	1 x CEO/ Director/ Manager/ 1 x Senior Designer	
4	MIMOS	1 x CEO/ Director/ Manager/ 1 x Senior Designer	
5	NDC	1 x CEO/ Director/ Manager/ 1 x Senior Designer	

Fig. 23.3 Expert interview respondents

The details of this study are presented as follows: Ten experts will be involved as respondents for the expert interview (see Fig. 23.3).

3.3 Phase 2: Focus Group

With a clearly defined scenario of current product design landscape acquired through phase 1, a focus group will be conducted to convene participants representing key stakeholders involved in decision-making, implementation or practising activities which will shape the future direction in design. Discussion documentation for the focus group will be prepared in a form of template which highlights the

Twenty Five Participants for Focus Group

<i>No</i>	<i>Category</i>	<i>Respondent</i>	<i>Total</i>
1	Design Practitioners	5	
2	Policy Makers	5	
3	Design Educators	5	25
4	Product Industry Representative	5	
5	Japanese Contingent	5	

Fig. 23.4 Focus group participants

product design gap identified in the 'Look East Policy 2.0' as well as the current design landscape aimed at generating detailed discussion for an implementable blueprint draft for future product design.

Twenty-five subjects will be involved in the focus group, each group comprising of four representatives from key local stakeholders and one representative from the Japanese contingent who will offer discussion from the point of view of 'Look East Policy 2.0' [11] (see Fig. 23.4).

3.4 Phase 3: Data Processing and Analysis

The final phase of the research will focus on producing a blueprint in the form of documentation for implementation at various levels of the product design industry. At the same time, the blueprint will also serve as a living document for future studies for comparison against two other countries, Korea and Taiwan, which National Design Centres have well-established roles in directing their national design activities. Setting up this foundation for future optional studies will help strengthen the national blueprint as a dynamic plan befitting the nature of the vibrant design industry.

4 Expected Outcome

The National Product Design blueprint can set the aims and objectives of design practices in SMEs towards providing the required value-added products and services. On top of that, it can set the foundation for future comparative studies on the blueprint against national product design directions of Korea and Taiwan. Better design management at a national level will ensure better governance of design activities which in turn enables added value and more job creations for SMEs as prescribed by the Look East Policy 2.0 efforts [12].

Acknowledgement The research will be made possible through the management system by the Research Management Institute of UiTM and grant awarded by Look East Policy Research and Commercialization Fund granted by the Ministry of Education Malaysia.

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Chapter 24

Local Ceramic Stoneware Body Exploration as Alternative Artificial Walet Swiftlets' Nest

Syaza Abdul Rahim, Rusmadiyah Anwar, Abdul Rahim Jalil,
Zuraidy Abd Rahim, and Oskar Hasdinor Hassan

Abstract Recently, the Walet industry used artificial template nest which is made of plastic. It happens to be a new production method to increase the production of swiftlets' nest. Unfortunately, those materials gave negative effect to the nest. Plastic materials can irritate the respiratory system, aggravate asthma and lung diseases, cause permanent lung damage, and affect the immune system. Because of that, natural resources based on the composition of ceramic materials such as stoneware incorporated with limestone (calcium carbonate) will be used to substitute these artificial materials. The objective of this research is to get the appropriate stoneware composition based on its physical properties such as shrinkage, strength, and water absorption. In laboratory test, stoneware was divided into five groups which were differentiated by the firing temperature: 700, 800, 900, 1,000, and 1,200 °C. All test pieces were prepared as a test bar using a press mould technique due to the production application suggested. The physical reaction shows a significant result where the strength and water absorption of the stoneware were reduced due to the increasing firing temperature. The production flow does not show any defect, crack, or break while drying or firing was implemented. Those results became a major guideline in producing a new artificial nest based on natural material from stoneware body. These results will be derived into the actual design of Walet nest template.

Keywords Swiftlets • Template nest • Stoneware • Calcium carbonate

1 Introduction

Aerodramus fuciphagus or also known as Walet in Southeast Asia region produces the bird's nests that contain 90–95 % of saliva and 5–10 % of feathers and purities [1]. The bird's nest is a healthy food and gives good effects for curing tuberculosis

S.A. Rahim (✉) • R. Anwar • A.R. Jalil • Z.A. Rahim • O.H. Hassan
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: syaza9526@salam.uitm.edu.my

and dry coughs, alleviating asthma and stomach ulcer, and relieving gastric troubles and general weakness due to bronchial ailments. Consuming bird's nest regularly can give a person exuberant physical and mental strength as well as restore one's youthfulness. The bird's nest is assumed to improve skin complexion and act as an antiaging [2].

Recently, the industry used several methods to attract *Walet* to build the nest. One of the methods by using a template nest. In the market, there are various template nests made from different types of materials such as plastic, silicone, rubber, metal, and paper. Figure 24.1 shows one of the favorite materials that have been used to make a template nest which is plastic. However, these plastic materials will give negative effects to the *Walet* nest. Plastic materials can irritate the respiratory system, causing asthma, lung diseases, and permanent lung damage, and affect the human immune system [3].

This research will use the stoneware body as a main material because of its strength and it can be fired at very high temperatures of 1,200–1,300 °C (2,192–2,372°F) (Atkin 2005). Salehi et al. also stated that the ceramist used the stoneware body as a material in their artwork because of its strength [4]. Through a similar research done by R. Anwar et al., it can be that the ceramic materials have been used to replace the other materials to increase the structure of the material composition [5]. The stoneware body will be mixed together with calcium carbonate (limestone) to attract *Walet* to build the nest because limestone are taken from limestone caves, the natural habitat of *Walet*. It can reduce odors and neutralize acid [6]. Other studies have proven that the strength of the stoneware body increased by adding the flux. It can achieve the highest percentage of modulus of rupture and low rate of water absorption [7].

The main objective of this research is to obtain the best composition of stoneware body which will be use to produce *Walet* template nest. The stoneware will be mixed



Fig. 24.1 Template nest made of plastic

with different ratios of calcium carbonate because it is based on natural materials from the Walet habitat (cave). Furthermore, calcium carbonate also has its own characteristics such as it reduces odors and neutralizes acid. The composition was chosen based on the low rate of water absorption and high strength of the body. The shrinkage result will be the guideline to get the accurate size when producing the model of ceramic template nest.

2 Methods

The materials that have been used are stoneware body and calcium carbonate (limestone). The stoneware body was mixed with calcium carbonate with different ratios of composition, which are 0 % of calcium carbonate, 30 % of calcium carbonate, 50 % of calcium carbonate, and 70 % of calcium carbonate. Those two materials were sieved to get the same particle size which is 1,200 μ . Then, all the materials were mixed together with a specific amount of water. After that, the mixture was shaped into a dough. Then, the test bars with a dimension of 100 mm \times 100 mm were produced by using the press mould technique and drying at room temperature for 3 days. The dried test bars were fired in an electrical kiln at different range of temperatures which are 800, 900, 1,000, 1,100, and 1,200 $^{\circ}$ C. The fired test bars were measured to determine the shrinkage from dried body to the fired body [8]. Water absorptions of the test bars were determined by Archimedes method where the measurements required the test bars being immersed in the cold water for 24 h [9]. The mechanical strength or modulus of rupture of the fired test bar was determined via a three-point bending test. The stress applied on the bars is determined by modulus of rupture (MOR). The formula is stated below:

$$\sigma = \frac{3FL}{2bd^2}$$

where σ (N/mm^2) is the stress required to rupture the bars, F is the load (N) at the fracture point, L (mm) is the length of the support span, b (mm) is the width, and d (mm) is the thickness [5].

3 Results and Discussion

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3.1 Shrinkage

The dry shrinkage observed is related to the plasticity of the body slip or its water content [10]. Reported in Table 24.1 is the shrinkage result of the calcium carbonate percentage added into the stoneware body. The lowest shrinkage values were recorded for 70 % of calcium carbonate followed by 50 % of calcium carbonate.

The flow curves of shrinkage are reported in Fig. 24.2. It can be seen that the shrinkage decreased when sequenced with additional percentages of calcium carbonate, and at a temperature of 800 °C, it shows the lowest percentage of shrinkage. This result indicates that the presence of calcium carbonate in the stoneware body decreased the shrinkage of the composition.

Table 24.1 Shrinkage, temperature, and percentage of calcium carbonate added into the stoneware

Temperature (°C)	Percentage of calcium carbonate (%)			
	0	30	50	70
800	4.60	0.00	0.00	0.00
900	5.20	2.60	0.00	0.00
1,000	5.60	2.40	1.60	0.00
1,100	8.00	1.00	0.00	0.00
1,200	12.60	9.20	1.60	0.00

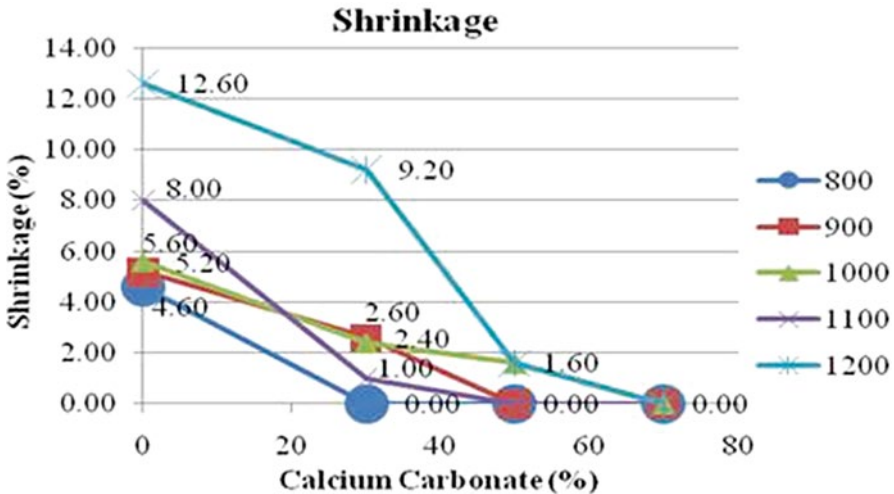


Fig. 24.2 Shrinkage vs. percentage of calcium carbonate at different range of temperatures

3.2 Modulus of Rupture (MOR)

The modulus of rupture, temperature, and percentage of calcium carbonate added into the stoneware are summarized in Table 24.2. At a temperature of 1,200 °C, the highest percentage of modulus of rupture was recorded, the same as the 30 % and 50 % of calcium carbonate.

Reported in Fig. 24.3 is the behavior of the modulus of rupture as a function of percentage of calcium carbonate, for the different range of temperatures. The strength of the test bars decreased slightly with the additional percentage of calcium carbonate on temperatures of 800 and 900 °C. Nevertheless, the strength increased rapidly at temperatures starting from 1,000 to 1,200 °C. From the result, it can be concluded that the stoneware body will lose its strength when mixed together with calcium carbonate. One hundred percent of stoneware body achieved the highest result of strength test which is 18.3 N/mm² with the temperature of 1,200 °C.

Table 24.2 Modulus of rupture, temperature, and percentage of calcium carbonate added into the stoneware

Temperature (°C)	Percentage of calcium carbonate (%)			
	0	30	50	70
800	0.04	0.00	0.00	0.00
900	1.49	0.69	0.00	0.00
1,000	9.37	4.81	4.39	0.00
1,100	11.61	8.36	7.33	0.00
1,200	18.31	14.75	9.36	0.00

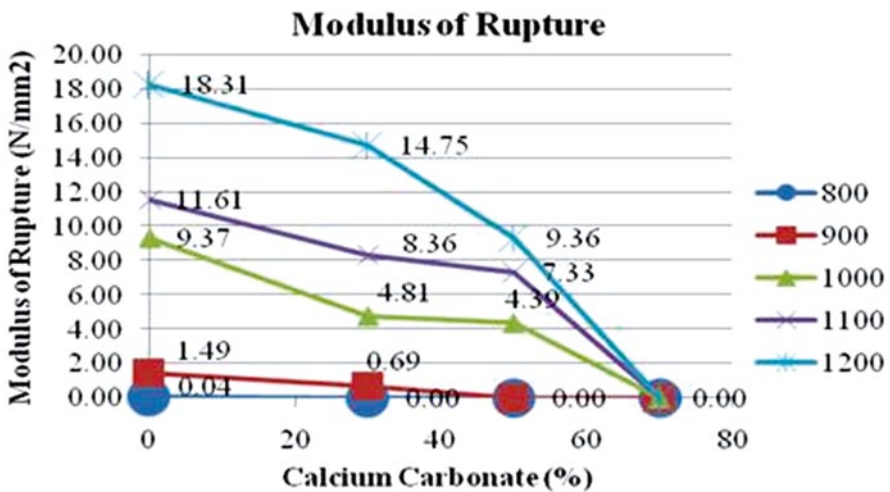


Fig. 24.3 Modulus of rupture vs. percentage of calcium carbonate at different range of temperatures

3.3 Water Absorption

Table 24.3 collects the water absorption, temperature, and percentage of calcium carbonate added into the stoneware. The low percentage of water absorption was recorded at 800 °C in all the composition.

In Fig. 24.4, the water absorption values of the percentage of calcium carbonate fired with different range of temperatures are shown above. It can be seen that 100 % of stoneware body reached the lowest percentage of water absorption at the firing temperature of 1,200 °C. It can be concluded that at low temperatures such as 800, 900, and 1,000 °C, stoneware bodies have wide pores and absorbed a lot of water. The water absorption decreased with a declined percentage of calcium carbonate.

Table 24.3 Water absorption, temperature, and percentage of calcium carbonate added into the stoneware

Temperature (°C)	Percentage of calcium carbonate (%)			
	0	30	50	70
800	0.04	0.00	0.00	0.00
900	1.49	0.69	0.00	0.00
1,000	9.37	4.81	4.39	0.00
1,100	11.61	8.36	7.33	0.00
1,200	18.31	14.75	9.36	0.00

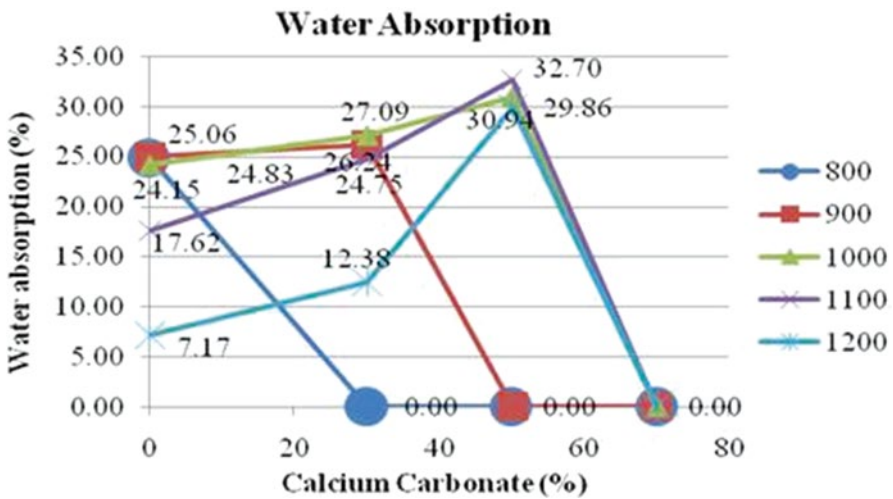


Fig. 24.4 Water absorption, temperature, and percentage of calcium carbonate added into the stoneware

4 Conclusion

In sum, the stoneware body was proved to have the highest percentage of modulus of rupture (MOR) which is 18.31 N/mm². The stoneware template nest should have high strength because it will attach on the wood in the Walet house and will support the weight of the swiftlet. Unfortunately, these bodies have high percentage of shrinkage which is 12.60 %. The researcher will calculate the shrinkage percentage before producing the model to get the accurate size after the firing process. Due to the high temperature of firing which is 1,200 °C, the stoneware body achieved the lowest percentage of water absorption among other compositions which is 7.17 %. Hence, the stoneware template nest will not absorb the nest's nutrition, and the nest will be easy to remove from the template. This finding will endow the needed physical reaction and character of ceramic stoneware body which can allow the bird's nest to develop naturally [11]. For future work, this successful material development will be enhanced by the structure of design development. A CSWD research methodology will be brought into practice to test the connection between the bird's needs and agreed standard artificial nest [12]. It is to make sure the designers can peel and achieve the required design and the structure of the final design.

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Chapter 25

Impact of Fibre Wall Raku Kiln Design in Execution of Reduction Firing

Adibah Ali, Mohd Tazul Akmal Mohd Talib, Rusmadiyah Anwar, Abdul Rahim Jalil, and Masaaki Shibata

Abstract Raku kiln has a variety of design since it can be constructed manually using a material that can withstand high temperature. This particular firing proposes a different method of applying the combustible material to the fired product which takes place inside the kiln rather than outside where the fired products are maintained at a standstill position throughout the whole firing process. Therefore the problem of statement would be the kiln's characteristics to resist post-firing reduction particularly during the insertion of combustible material into the kiln. This experimentation was conducted to test on a fibre wall raku kiln's capability to perform reduction within the kiln in order to achieve a standardized bronze colour effect of the glaze as a more economic way. In this research, the fibre wall raku kiln was tested to identify its capability to assist with reduction within the kiln itself.

Keywords Ceramic • Firing • Kiln • Reduction • Raku

1 Introduction

Raku kiln is a very practical mechanism to conduct ceramic firing as it features a variety of diverse materials that can be assembled to construct it [1]. Reduction firing can be executed by using gas kiln. The reduction process is achieved by sealing all holes at the kiln to avoid further oxygen input from entering the chamber. Raku kiln can be a more economical mechanism that can be used to fire ceramic. During firing, the burners ignite strong pressured fire; therefore, even though constructing a raku kiln manually is doable, it needs accuracy as the strength of the whole kiln depends on each other to support its structure.

A. Ali (✉) • M.T.A.M. Talib • R. Anwar • A.R. Jalil • M. Shibata
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: adeeeba6@gmail.com

For this research, a raku kiln was built by using fibre cloth and metal net as the wall and insulating bricks with metal frame as the kiln base. The kiln was built on a smaller scale to cater test piece glaze firing experimentation.

The basic feature of a raku kiln is to have burner holes and damper and to take into consideration the method of inserting the combustible material in the kiln. The fibre wall raku kiln's characteristic will measure the kiln's capability as well as practicality for the firing process to take place. During the firing experimentation, the flaw of the kiln will be detected and then perfected.

The objective of this experimentation is to test the fibre cloth raku kiln's capability by firing a set of test pieces that have been applied with glaze which through reduction firing will achieve a bronze shade.

This research was done as an alternative glaze firing method which would benefit artists and students who wish to conduct glaze firing for their ceramic pieces with a more economic and practical way [2]. Significantly a standardized glaze effect is expected in this experimentation from an even smoke distribution during reduction process in the kiln to the fired product [3].

2 Material

2.1 Test Pieces

Each firing experimentation conducted includes five test pieces by the size of 6 cm (length) × 4 cm (width) × 1 cm (thickness). The materials for the test pieces are recycled stoneware and bisque fired at the temperature of 900 °C using a front loader electric kiln.

2.2 Glaze Composition

The chosen glaze effect would be a bronze shade that could be achieved through reduction firing by the glaze composition as shown at Table 25.1 that was used for this experimentation. However through oxidation firing, copper oxide will produce a greenish effect [3]. Through these materials, borax was used in the glaze composition as a material which lowers the melting point of the glaze firing temperature. This particular recipe was already tested in numerous colours; however, the

Table 25.1 Glaze composition

Material	Percentage (%)
<i>Borax</i>	80
<i>Potash feldspar</i>	10
<i>Zinc oxide</i>	10
<i>Copper oxide</i>	3

researcher has chosen copper oxide as the colour source due to its characteristic that is able to achieve the bronze effect. There is no particular reason in obtaining a bronze effect through the glaze mixture; however, the differences between the changes of the glaze effect through reduction firing where the smoke is applied to the product are very much unlike; hence, it is easier to determine the successfulness of the firing.

3 Kiln Design

For this particular raku kiln as shown in Fig. 25.1, it is a type of updraft kiln which the body is divided into two parts, the base and the chamber. This kiln was constructed in two parts which it is opened by lifting the chamber from the base. The base was constructed by using 30 insulating bricks amounting to the size of 23×23 in. with the height of 7.5 in. The insulating bricks were held together by using a welded metal frame which secured all the edges. The top part of the kiln which is the chamber was made generally out of fibre cloth and wire mesh. Fibre cloth is a type of material that is considered affordable and can resist high temperature up to more than 1,000 °C [4]. On top of that, it is a material that is light and easy to work with and an excellent insulator; however, if not taken care properly, it becomes worn out and releases dust [1].

Altogether, with the length and width of 17.5 in. and height of 23 in., the inside volume of the kiln is 7,043.75 in³.

Fig. 25.1 Fibre wall raku kiln



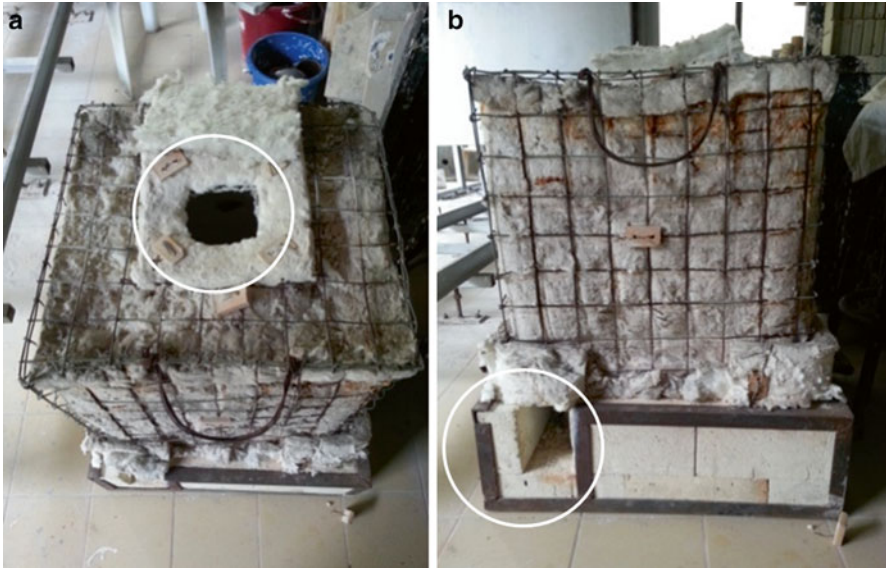


Fig. 25.2 (a) Damper, (b) burner hole

There are features that are compulsory for kiln which are a damper as shown at Fig. 25.2a and a burner hole as shown in Fig. 25.2b. The top part of the chamber is where the damper is with the size of 16 in^2 , and there are two burner holes that are located at the kiln's base with the size of 17.5 in^2 .

4 Reduction Firing

A ceramic is complete altogether when it goes through the glaze firing process. There are two types of ceramic firing in general which are bisque firing and, as the researcher mentioned earlier, glaze firing. Glaze firing is a very important firing as it perfects the ceramic for it to be a functional product however depending on the product function and on the glaze composition on top of that. Several glaze compositions that are lead based such as frit and borax are not suitable as they are one of the poisonous materials hence used to manufacture alloy [5]. However lead tends to be an important material for metal, glazes and glass [6].

There are two kinds of glaze firing which are oxidation and reduction firing. This research focuses on reduction firing that is conducted in a fibre wall raku kiln via the method of inserting a combustible material. Through this method, the researcher is trying to obtain a bronze effect of the glaze.

Glaze colours are affected by the firing atmosphere. An oxidizing atmosphere required the presence of oxygen; however, a reduction atmosphere is otherwise.

By decreasing the amount of oxygen to the kiln during a reduction firing, chemical changes to the clay body and glaze are forced to occur [7].

5 Methodology

This research was mainly conducted through experimentation, particularly five firing experimentations to test the fibre wall raku kiln's capability. However, the information regarding the experimentation was obtained through journals and books. Five test pieces that were applied with the same glaze composition were fired each time for every experiment. The temperature was set at 900 °C for a firing period of 2.5 h including soaking of 30 min at 900 °C. The researcher has decided to start the experiment on 900 °C as firing temperature due to the borax material in the glaze composition that will help lower the glaze maturing temperature. As shown in Fig. 25.3, to fire the items compulsory would be a lighter, gas and burners which are used to supply for the fire along with a thermocouple to measure the temperature.

Additionally, the researcher used a combustible material that was inserted during the firing in which the researcher used dried leaves and dried paddy to provide smoke inside the kiln. The combustible material produces smoke as oxygen was blocked, and it releases unburnt carbon particles that are black in colour [7]. The black carbon is applied to the fired ware in the kiln, hence changing the chemical composition of the glaze [8]. Combustible materials are inserted after the firing has reached its temperature and cools down to a temperature between 300 and 700 °C.

These are experiments that fall under gas firing in which, during the experimentation, the firing temperature is recorded every 30 min and is controlled by primary

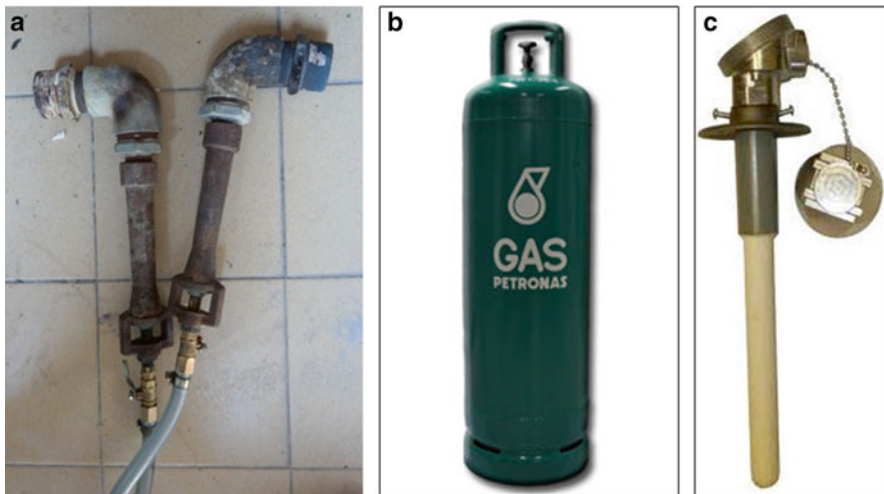


Fig. 25.3 (a) Atmospheric burner, (b) gas, (c) thermocouple

Fig. 25.4 Shutter control area



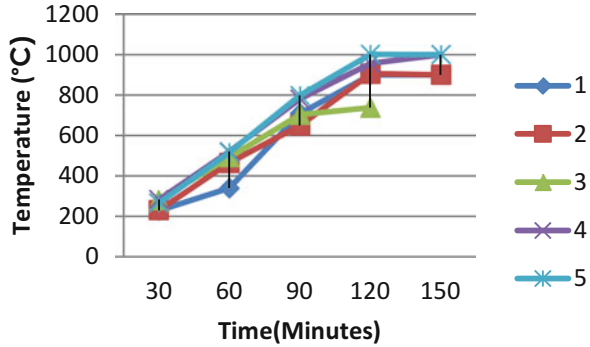
and secondary air to increase and lower the temperature. Primary air is controlled by loosening and tightening the shutter. Secondary air is all the air that mixes with the gas after ignition [9]. Secondary air is controlled by adjusting the shutter as shown in Fig. 25.4.

For safety precautions, during the experimentation it is advised to use gloves to protect our arms from the heat and to handle the kiln as well as a mask to prevent from inhaling smoke as well as chemical directly [10]. Each experimentation was recorded cautiously to obtain a more reliable data so that each of the experimentation can be improvised accordingly. The firing temperature was recorded by using a thermocouple that is placed at the damper and is in variable of ± 5 °C.

6 Results and Discussion

The above chart as shown at Fig. 25.5 is the combination of the five experiments' temperature control throughout the firing that was conducted. Experiments 1 and 2 were conducted to fire for temperature 900 °C; however, after two experiments have been executed, the firing temperature was increased to 1,000 °C. Experiment 1 was a good start off since the glaze had matured properly; however, the reduction atmosphere did not manage to transform the glaze effect accordingly as intended.

Fig. 25.5 Firing temperature for five experiments conducted



During the insertion of 150 g dried leaves in the kiln at 500 °C, clouds of smoke appeared for approximately 10 min; however, most of the smoke escaped through the damper. It is concluded that the kiln was not sealed properly, and inserting the dried leaves through the damper resulted to the smoke rising up faster without even affecting the test pieces. In support of the next experimentation, the researcher decided to adjust the insertion of increased amount of dried leaves through the burner hole instead.

Through experiment 2, the test pieces fired show that the glaze has not matured at 900 °C. The borax material in the glaze composition has not been cooperative in decreasing the maturing temperature of the glaze. At 500 °C, 200 g of dried leaves was inserted through one of the burner holes, while another access is sealed. After a while, no smoke appeared as the dried leaves were burnt resulting to another negative result. Therefore the researcher recommends the insertion of the dried leaves should be done at a lower temperature and increase the firing temperature to a safe temperature, 1,000 °C, which will have a higher possibility to mature the glaze.

Experiment 3 is fired at 1,000 °C for the same 2.5 h though experiment 3 was a failed experiment due to temperature decrease at the peak of 737 °C. The thermocouple could not detect the temperature due to wiring problems.

Through experiment 4, the researcher is still following the lead from experiment 2. At the temperature of 350 °C, 200 g dried leaves was inserted. There was a temperature increase of approximately 100 °C as some of the dried leaves were burnt resulting to a small amount of smoke. The glaze at this point still did not mature; however, some smoke was applied to the test pieces as the unglazed parts were darkened. The researcher recommends increasing the amount of combustible material yet again to lengthen the smoking process furthermore changing to a different combustible material that is easier to insert through the burner hole.

The last experimentation was conducted using 400 g of hay as the combustible material due to its flexibility and easier characteristic to go through the burner hole. Hay was inserted at 375 °C, and a lot of smoke appeared for approximately 40 min. Through experiment 5, the researcher managed to sustain a longer phase of smoke but however was still unable to affect the glaze. There is still an immense amount of

smoke that escaped through the damper even when it was securely closed. On top of that, the glaze still did not mature at the temperature of 1,000 °C (Figs. 25.6, 25.7, 25.8, 25.9, and 25.10).

Through the experiments that have been conducted, it can be concluded that the kiln is proven to be incapable of altering the glaze effect during smoke application. The main material that was used to construct the kiln is fibre cloth which has

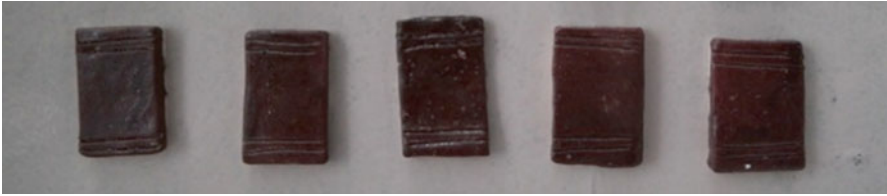


Fig. 25.6 Test pieces from experiment 1



Fig. 25.7 Test pieces from experiment 2



Fig. 25.8 Test pieces from experiment 3



Fig. 25.9 Test pieces from experiment 4



Fig. 25.10 Test pieces from experiment 5

ultimately led to an elevated amount of smoke leak through the chimney. The whole kiln is also not suitable for reduction whereby fibre is a material that is not airtight to block oxygen from entering the kiln. It is opposite with the reduction concept that is to block and hence reduce oxygen amount in the chamber. As a recommendation for the flaws of this research, the researcher recommends modifying the material that is used to build the raku kiln in order to block oxygen from entering the kiln [11]. The kiln should be a material easier to seal and consequently easier to construct.

7 Conclusion

Through the experiments that have been conducted, it can be concluded that the kiln is proven to be incapable of altering the glaze effect during smoke application in the kiln. The main material that was used to construct the kiln is fibre cloth which has ultimately led to an elevated amount of smoke leak through the chimney. The whole kiln is also not suitable for reduction whereby fibre is a material that is not airtight to block oxygen from entering the kiln. It is opposite with the reduction concept that is to block and hence reduce oxygen amount in the chamber. As a recommendation for the flaws of this research, the researcher recommends modifying the material that is used to build the raku kiln in order to block oxygen from entering the kiln. The kiln should be an easier material to construct and seal consequently. In achievements of the result, this research should investigate the implementation of the ceramic designer or artist in order to develop a new design [12]. This future work required a control experiment to be able to replicate raku firing as a new design method for ceramic surface treatments.

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Chapter 26

Malaysian Intercultural Pattern Structure on Ceramic Tea Caddy Design Framework

Amalina Azlan, Rusmadiyah Anwar, Verly Veto Vermol,
and Amer Shakir Zainol

Abstract This paper discusses about the influenced pattern on ceramic tea caddy through three main indigenous ethnics which are Malay, Chinese, and Indian in Malaysian culture. Derived from China, Malaysia also used tea caddy as storage for tea. As China has become the earliest creator of tea caddy, most of the popular tea caddy was made by ceramics. Nowadays, the concept has been enhanced to become an artware for exclusive corporate giveaways and souvenirs. We proposed tea caddy as a platform to combine Malaysian culture because of the acceptance designs as universal product with no predisposition to any races. The objective of this study is to identify the origin of the Malaysian pattern based on three main races to be used as ceramic tea caddy surface pattern design. The methodology started by analyzing the three main core races in Malaysia. The analysis of the pattern used on famous craftwork and textile will be compared in order to understand the pattern structure. The comparison study shows significant data where these three races applied the same pattern design. However, it clearly shows contradiction of the color management, subject matter chosen for the flora or fauna, as well as pattern composition. As a result, the combination of elements includes the relation between the pattern design and color composition of three cultures constructed as a surface pattern design framework. It is proposed that it should be affixed on ceramic tea caddy series to highlight and promote the uniqueness of Malaysian culture as well as to promote the “taste of Malaysia.”

Keywords Malaysian cultures • Craftwork • Pattern • Tea caddy

A. Azlan (✉) • R. Anwar • V.V. Vermol
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: amalina.azlan18@gmail.com

A.S. Zainol
Faculty of Art and Design, Universiti Teknologi MARA, 40450 Shah Alam,
Selangor Darul Ehsan, Malaysia

1 Introduction

1.1 Malaysian Cultural Influenced Tourism Promotes

Tourism industries in Malaysia developed every year where the Office of Melaka Head of Minister in 2006 reported the increasing data 400,000–600,000 every year (see Table 26.1). This demand shows the trend of tourist who came to visit this country because of the availability of intercultural practices. In other views, Sarman (2007) overcomes the study with a finding that the trend of these tourists in selecting a souvenir is mostly because of travel issues [1]. Based on Table 26.2, there were ten top categories and types of products becomes the most chosen products as significance memories. The top three items are leather, pewter, and ceramics. At the same time, the most useful with easy carriage includes with traditional touch will also remain as important elements.

Based on the increasing tourist demand, the demand for souvenir items in Malaysia will probably increase. It automatically gives a space for tourism business growth. For these reasons, the new style and identity of Malaysian culture will become more serious. The time has come to initiate an intercultural product based on three cultural domains in Malaysia to highlight these traditions for tourists [2]. The intercultural existed in Malaysia will differentiate the cultural from other

Table 26.1 Statistics of tourists who came to Melaka, Malaysia

Year	Domestic tourist		International tourist		Total
2005	3,719,292	79.2 %	976,470	20.8 %	4,695,762
2004	2,987,310	74.6 %	1,017,728	25.4 %	4,005,038
2003	2,860,336	79.4 %	742,612	20.6 %	3,602,948

Source: bahagian pemasaran pelancongan jabatan ketua menteri Melaka 2006

Table 26.2 Top ten product categories and product types ranked by tourists in Malaysia (Sarman [1])

Rank	Product categories based on respondents	Type of product selected by respondents
1	Leather	Trouble-free to bring
2	Pewter	Lots of utilization
3	Ceramic	Traditional
4	Wood carving	Originality
5	Artistic products	Cherished
6	Antique products	Interesting form of design
7	Craft works	High quality
8	Collector’s items	Interesting pattern
9	Destination picture t-shirts	Acceptable prize
10	Silver products	Unique/limited edition

countries. The design should represent the cultural without ignoring product ergonomics to sustain the product segment [3–5].

Maintaining the Integrity of the Specifications Similarity of Pattern Based on Culture

There are plenty of patterns that can be explored. The patterns show every cultural identity, for instance, artwork from wood carving. Ismail Ibrahim (1986) says that pattern also can be described as a visual element which in an orderly manner covers a similar area [6]. Classical Malay history art is well known with wood carving. The analysis of the pattern used on famous craftwork and textile will be compared in order to understand the pattern structure [7]. Malay culture visualizes wood carving on boats, weapons, tombs, monuments, musical instrument, and utensils by using flora, calligraphy, geometry, and cosmic feature motifs. The art form is seen as an act of devotion of the craftsmen to the creator and a gift to his fellowmen. The wood carving art is mainly contributed due to the abundance of timber on the Malay Archipelago and through the skillfulness of the wood carvers that have allowed the Malays to improve skilled wood carving as a craft [8]. The natural tropical such as flora and fauna and cosmic forces are abundant has inspired the motives to be depicted in abstract from into the timber/wood board. In Islam, geometric and Islamic calligraphy were also introduced in wood carving (Fig. 26.1).

A typical Malay traditional house and mosque has been adorned with more than 20 carved on the wall and the function as well to allow the air breeze to circulate effectively in and out and let the sunlight luminosity the interior structure. Another function is to create a beautiful shadow on the floor based on motifs. In Malay wood carving, each piece of carved wood, for instance, the flora pattern, has plenty of implicit meanings. The Malay wood carvings can be described as infinity. Thus, the carved component performed both functional and esthetic purposes. Chinese culture has long been in Malaysia [9]. Chinese wood carvers mostly carved in the temple, and one of the desired carvings was a dragon which was a legendary creature for Chinese culture. Based on Artistic Chinese Creations, in the Chinese culture, the fish symbolizes prosperity and wealth. Lotus symbolizes purity, joy, and

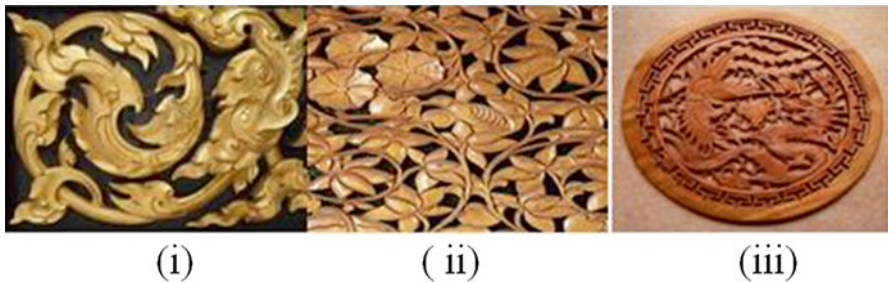


Fig. 26.1 The different wood carving patterns by Malay (i), Indian (ii), and Chinese (iii)

perfection. As for the Indian race, Hindu, Buddhist, and Chinese culture are influences from Malay art, culture, and architecture during the nineteenth century [10]. In the Indian culture, they use Paisley (design) as the origin to show the culture. Based on Sandra Dallas (1996), Paisley or Paisley pattern is a droplet-shaped vegetable motif of Persian and Indian origin [11]. The pattern is sometimes called “Persian pickles” by American traditionalists, especially quilt makers.

Elements of Color Composition Represent Race Interest

Based from the data collected, the researcher has been focusing on color comparison in textile through the three ethnics of Malay, Chinese, and Indian culture. The image shows the differences of the element of pattern, color, and pattern composition. According to Haralick (1985), to achieve the goal of segmentation is to decompose an image into parts which should be significant to certain applications [12]. In Malay culture, the patterns mostly are repeated and infinite. The color composition for Malay culture has been soft and mostly brown and cream. In Indian culture, the pattern is more detailed and crowded. The color composition in Indian culture is striking and has a variety of color. In Chinese culture, the pattern is more on ornamental and fauna. The color composition in Chinese culture is mostly gold and red, symbolizing prosperity (Fig. 26.2).

Tea Caddy

Tea caddy is used to store tea. It is also known as tea canisters, and it has a variety of designs and made up a variety of materials such as wood, copper, silver, porcelain ceramic, etc. William (1876) states that he created a new invention/improvement of tea caddy with a painted cover [13]. The Malay culture has a variety of teas, and sometimes we do not even notice where the tea comes from. For this project/paper, tea caddy is used as a medium for applying the multicultural design pattern of Malaysian history. Tea caddy has been chosen because it is related to Malaysian culture where all people drink tea in many occasions such as breakfast, lunch,



Fig. 26.2 (i), (ii), (iii) show the different color elements and compositions based on three cultures



Fig. 26.3 Examples of tea caddy

hi-tea, dinner, or even supper and tea caddy is an important thing to store tea. The form of the tea caddy was minimalist in design. Mainer (1875) created a convenient, easy-to-handle storage of tea (Fig. 26.3) [14].

2 Research Methodology

2.1 Procedure

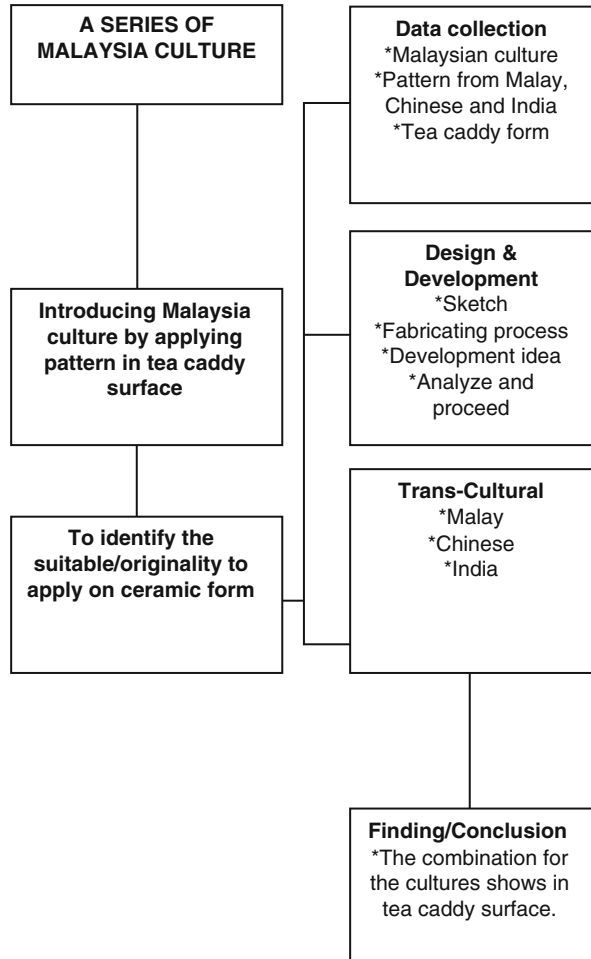
To produce a ceramic artware by representing tea caddy as medium to identify differentiates between the main multicultural series which is Malay, Chinese and India on tea caddy surface product.

- Tea caddy is used as a subject matter/medium. The medium is for to align the element and relation between the tea (taste of Malaysia) and design pattern.
- The pattern on the ceramic surface represents the multicultural design pattern of Malaysia.

2.2 Design of the Research Methodology

The design of the research methodology was based on the CSWD design method introduced by Anwar. A rational CSWD not only affects the production performance but also presents a limitation on the design development. Most of the primary designs concern usually on the improvement of the technicality or material itself [15]. The fundamental issues are to recognize (1) the industrial ceramic design practice and system applied for mass production, (2) how ceramic designers performed their design plan while developing products, and (3) the structural pattern from 2D and 3D sketch leading to the conceptual design which includes functional requirements and esthetics. It will be applied to a specific phase of the design process to transform solution principle to a materialized design (Fig. 26.4) [16].

Fig. 26.4 The design methodology



3 Design and Analysis

There are several explorations and ideations to get the pattern design from three cultures. Figures show the exploration for craft work and pattern work. The pattern needs to be developed before applying to the form (Table 26.3).

Pattern application of culture in craft work has been divided into four types which are flora, fauna, relief, and piercing. The table shows that the Malay and Indian culture has flora type of pattern. It is because both culture used nature to create their identity. As for Malay culture, the use of living creatures is prohibited. Craft work for fauna pattern has been seen in Chinese and Indian patterns. As for Chinese, the use of the fauna pattern such dragon as well as their own believes in tradition where Chinese dragon was legendary creature in Chinese mythology [17].

Table 26.3 Shows the exploration of craft work for Malay, Chinese, and Indian culture

Races/culture	Craft work			
	Flora	Fauna	Relief	Piercing
Malay	√	X	√	√
Chinese	X	√	√	X
Indian	√	√	√	√

Table 26.4 Show the exploration of pattern work for Malay, Chinese, and Indian culture

Races/culture	Pattern work				
	Flora	Fauna	Hue color	Value color	Scheme color
Malay	√	X	√	√	√
Chinese	√	√	√	√	√
Indian	√	√	√	√	√

Table 26.5 Shows the pattern exploration for three cultures

Design pattern	Description
Malay pattern	Malay culture usually used repetitive patterns, for instance, the pattern of itik pulang petang
Chinese pattern	Chinese culture mainly uses patterns of flora and fauna. In a dragon pattern, for instance, it can be seen that the dragon will cross and is facing each other (reflection)
Indian pattern	Mostly Indian culture used full and intricate pattern with striking color combination

Malay, Chinese, and India have relief type where three of them basically using relief pattern as their origin to generate their culture. As for the piercing type, only the Chinese culture doesn't seem to get involved because only Malay and Indian cultures are using this type of craft work, for instance, in decorating a Malay house and the Indian temple.

Pattern applications for pattern work are divided into five types which are flora, fauna, hue color, value color, and wheel color. As for the flora and fauna types, the explanations are made in application for work craft (refer to Table 26.4). Malay, Chinese, and Indian have hue, value, and wheel color but in different terms. In Malay culture, hue colors give attention through blend color which was deeper color. It is more on earth color. The value is close because the Malay shows the pattern more than the color combination, and scheme color for this culture is cool color. For Chinese culture pattern, hue color attends to energetic, exciting color. The value is contrast because Chinese culture carries both positive and negative implications which they show the pattern and colors equally. The scheme color for Chinese culture pattern was harmony based from analogous colors. As for Indian culture, hue colors were bright colors. The value carries close and contrast because it shows a variety of colors and patterns. The scheme color was harmony based from complementary color (Table 26.5).

4 Discussion

By using the element of art based from the research, the researcher analyzes to compose a series of Malaysian culture. The series of pattern application differentiates each main multicultural pattern in Malaysia. The variety of pattern in different culture could tell us their identity and perhaps could tell us their own story (Fig. 26.5) (Table 26.6).

The round shape is used as a base for random sketches. The “itik pulang petang” motif is used for Malay culture pattern. As for Chinese culture, the concepts of “yin and yang” which reflected/mirror each other are added in the middle of the design. The element of Indian culture comes from bright colors such as green, red, and yellow for the pattern design. The Paisley pattern can also be added into this design because the shape of the design for Chinese culture and Indian culture doesn’t seem any different. This clearly shows contradict on the color management, the flora and fauna subject matter as well as the pattern composition itself where the three main of multi – cultural in Malaysia is applying on tea caddy surface. The design was uncomplicated and minimalist and suits well to the tea caddy to look more exclusive rather than intricate.

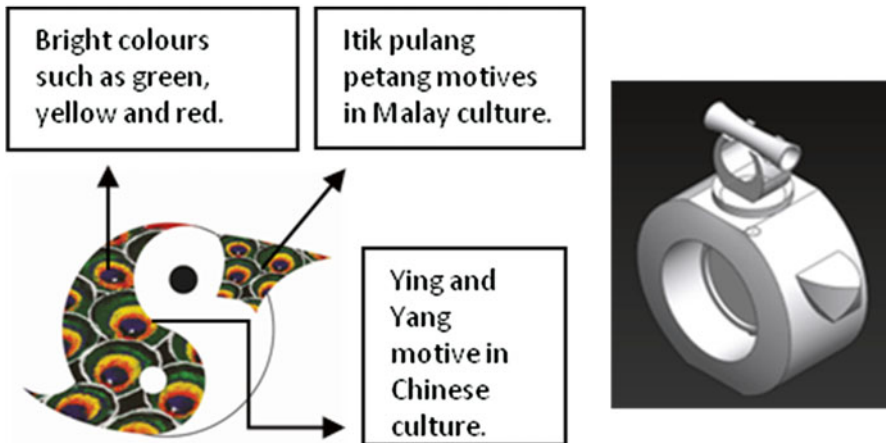
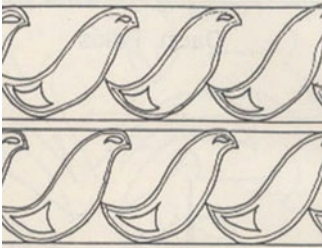




Fig. 26.5 The intercultural pattern application as 2D before converting it into 3D

Table 26.6 Pattern motifs and description

Motifs	Description
	<p>Itik pulang petang Malay proverb: It means people who walk slowly. Malay culture always used terms or proverbs based on the surroundings where the duck walked slowly</p>
	<p>Yin-yang In Chinese philosophy, yin and yang means opposite or contrary in the natural world and how they interconnect/ relate to each other. Yin and yang represent the two sides of principle in culture. The characteristics of yin are negative and feminine, while yang stands for masculine and positive</p>
	<p>Bright color Bright color is one of the complementary colors and considered as warm color or contrast. Among the bright colors are red, orange, and yellow</p>

5 Conclusion

5.1 Application Design Pattern of Multicultural Malaysia History Suitable in Ceramic Tea Caddy Surface

From the case study, it can be concluded that tea caddy in ceramic form with a series of pattern of Malaysian history could represent the culture of Malaysia. The process of data collection, ideation, sketching, idea development, and production presents an impact to the production process [18]. The tea caddy ceramic product with cultural pattern could attract the audience and also enhance the ceramic product to be

more exclusive. The tourist could learn the culture based on the pattern applied in the tea caddy surface while enjoying the taste of Malaysian tea. “How can we progress to the future if we don’t remember what we were before?” [6]. As for marketing, tea caddy also could be an exclusive corporate gift or souvenir for people or tourists who come to Malaysia. As a result, the combination of elements includes the relation between the pattern design and color composition of the three cultures constructed as a surface pattern design. It is proposed that it should be affixed on a ceramic tea caddy to highlight and promote the uniqueness of Malaysian culture as well as to promote the “taste of Malaysia.”

Acknowledgment We would like to acknowledge the generous participation of the interaction designers in the research. This study was conducted in Formgiving Design Research Lab established by Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to the Malaysian Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 27

The Sustainability of Gasing as an Icon of Malaysian Heritage Product to Promote Tourism Industry

Nur Fadhilah Mohd Omar, Mohd Fairus Yusoff, Mohd Shahril Rusman, and Amer Shakir Zainol

Abstract This research paper continues from the study of the design process and product development to identify the character of Gasing. This paper looks forward in the process of production for huge quantity to promote tourism product industry, at the same time to introduce our icon of Malaysian heritage. The study also will look at the current local manufacturing process to produce the product such as a decorative and souvenir item. In this phase of study, it will focus on mass production that will consider the quality and also the aesthetic values. The outcomes of this study can boost the local cottage industry and also propagate the existing tourism product.

Keywords Gasing • Manufacturing process • Potential • Commercialized • Sustainable heritage product

1 Introduction

1.1 Gasing

Gasing is one of the traditional games in Malay society. In this modern era, this folk game is still practiced by society. *Gasing* is not an elite sport but is a traditional game. Usually, *Gasing* is played in rural areas especially in Kelantan, Pahang, Melaka, Johor, and Selangor. Besides that, some small communities of other states in Peninsular Malaysia still play this traditional game and make the spinning tops. The name of the Malay spinning tops can be defined as *Gasing* in Peninsular

N.F.M. Omar (✉) • M.F. Yusoff • M.S. Rusman • A.S. Zainol
Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor Darul Ehsan, Malaysia
e-mail: deefadhilah96@yahoo.com

Name	Material	Code Number (Location)	Year
<i>Gasing Pangkah</i>	Wood	E12321962GIE Muzium Negara	1962



Fig. 27.1 *Gasing Pangkah*

Malaysia [1]. There are 33 types of names for *Gasing*. Each spinning top is different from each other. *Gasing* is a toy that can stand and spin on its axis in balance (Delta Pamungkas 2004) [2]. Traditional *Gasing* can be made from wood or bamboo that is carved and shaped as the body of it. Object used as the spinner is a rope that is made from nylon, yarn, or bark. In other countries like Indonesia, the traditional *Gasing* game had been known to people in Riau since the Dutch colonial era in Indonesia. At that time, this game very quickly spread to many regions in Indonesia. It creates a variety of *Gasings* that embedded their physical characteristic, such as *Gasing* from Bangka Belitung, Bali, Jakarta, West Java, and Lombok. *Gasing* is also found in Brunei, Singapore, and Japan, and it differs in size and name because each country's geographical location influences its name and shape [1]. The traditional *Gasing* product can be used as a new income and costs in the manufacturing process to produce a large of quantity product *Gasing* exported from Malaysia because they believe that Malaysia's top maker of hard work and conscientious as well have great expertise in producing.

Rizam [3] and Ahmad et al. [4] mentions that Wau and *Gasing* are indeed assets that could help to increase the sales of the crafts which also can attract the tourist and act as the national heritage product in Malaysia [5]. This can be seen in the effort to preserving and regaining the culture and heritage as the core in shaping the individuality to build the nation (Fig. 27.1).

1.2 Commercialize/Innovation Traditional Product (Folk Game Product)

The word commercialization according to Kamus Dewan [6] is related to or trading nature which are produced in large quantity and fast and offers a competitive price to the masses. Heritage products such as *Gasing* can be commercialized and are able to contribute to the economic growth besides being played for leisure or in competition. This concept will produce products in large quantities with guaranteed

quality and can be marketed extensively and be able to attract the masses to play *Gasing* and recognize *Gasing* as one of the national heritages. As stated in Shuhaimi Jusoh [7], the handicraft product is defined as any product that has artistic or traditional cultural attractions and is the result of a process that depends solely or partly on the skill of the hand. The most popular handicraft products in Malaysia are batik, weaving materials, labu sayong, flute, jewelry, and pewter. Folk games such as *Gasing* and Wau are categorized as forest production or *hasil rimba* [8]. Commercialization is based on the theories of business. It is different from innovation. Innovation is based on diffusion and comprises of theories [2]. Commercialization definitions within the business community are equally complex, depending on the context. Our road map requires a strong basis for analysis, an accepted definition of both from the start. Unfortunately, the scholarly literature is not much more consistent in the use of these terms than in popular use [9].

“Innovation and Commercialization are often used in overlapping ways to refer to the product of discovering knowledge, developing it into technologies, and transforming these into new or adapted products, product and services to be used or sold in the market place” [2]. Isabelle provides an integrated definition of commercialization as the “process of translating research knowledge into new or improved products, product and services, and introducing them into the marketplace to generate economic activity benefits” [2]. Based on Malaysia Cultural Arts and Heritage Industry, the term was used in the 9th Malaysia Planning (RMK-9) for the years 2006–2010 under the fourth core (Improving and Strengthen Quality of Life), Chapter 23, Enriching National Cultural Arts and Heritage. Total value of RM 442.2 million has been allocated for the purpose, and six prospects were identified in enriching national cultural arts and heritage products, by introducing craft industry and craft promotion for world market and being creative in developing cultural industry and introducing development programs in cultural arts and heritage [10]. Innovation in transforming the commercialization of *Gasing* is important as it helps the commercial producer to be competitive in order to produce high-quality products which are assessable and easy to produce and save time. The innovation and commercialization of traditional games like *Gasing* is very crucial to ensure that *Gasing* will remain in existence as the nation’s heritage which will be known to generations to come [11]. Shamsuddin Sulaiman [12] has done a research on *Gasing* from engineering point of view. In his research, he has made *Gasing* from its usual material that is wood to plastic using Computer Numerical Control (CNC) which has added value to his outcome. The purpose of this research is to identify the machining sequence with the selection of a suitable tool and reducing machining cycle time with the use of CNC Lathe for manufacturing *Gasing*. This is one of the ways to produce *Gasing* to meet the demand and to produce high-quality *Gasing*. The traditional games have been existing since thousands of years ago, and the value of ancient people is still strong. Even though these traditional games are very old-fashioned, they still play their roles in the individual learning process, especially to young kids.

1.3 *Technology Making Gasing*

1. *Lathe machine*: The use of this machine in the production of Gasing is important as each Gasing will be made using this machine. The example is the CDM Machine. According to Mr Rimy Azizi Abd Karim (personal communicator (Craftsman, September 2013)), by using the Lathe machine, 40 pieces of Gasing can be produced a day. This is supported by [13–15]. The Lathe machine is so far the finest machine in making Gasing besides using traditional methods [16]. Nevertheless, this process does not include balancing and finishing process. The Lathe machine is one of the oldest machines invented for Gasing making.
2. *CNC machine*: Numerical Control (NC) utilizes a dedicated stored program. According to Jones [17], Computer Numerical Control (CNC) retains the fundamental concepts of Numerical Control (NC) but utilizes a dedicated stored-program computer within the machine control unit. Since its introduction, NC technology has been found in many including lathes and turning centers, milling machines and machining centers, punchers, electrical discharge machines (EDM), flame cutters, grinders, and testing and inspection equipment. Previous studies linked CNC machine by Shamsuddin Sulaiman's [12] research on the plastic spinning tops using this machine produced [9].

1.4 *Example of Gasing Innovation (Product Design)* (Fig. 27.2)

2 Research Methodology

The researcher has decided to carry out the research with qualitative approach to this study [18, 19]. This approach is suitable to use, quick, concise, and accurate. This method is very suitable with this research which requires major processing information related to the subject of the research [20]. Research is a systematic process by which we know more about something that we did before engaging in the process. Quantities are generated by quantitative research, and the focus is on how much or how many, and results are usually presented in numerical form by Merriam [18]. Interviews are included by asking good questions. Begin the interview by recording, and evaluate the interviewed data and the nature of interaction between the interviewer and respondent [18]. This study uses qualitative research approach and interview is one method of this study. Qualitative research can be in all forms and occasionally some data are collected through interviews. De Marris [18] defines an interview as a process in which a researcher and participant engage



Fig. 27.2 Gasing innovation

in a conversation with questions related to the research study (p. 55). In this study, we have conducted interviews with four experts in making *Gasing*. Observation research involves recording ongoing behavior without attempting to do publishing. This method takes two general forms which are naturalistic observation and participant observation from the research by McBurney [20]. Participant observation is when investigators participate and record their observations. This study uses participant observation research. Participant observation is characterized by the effort to view some behavioral activity from the viewpoint of an insider to a situation. A very

careful observation is very important in this research to understand the process of making *Gasing* from the beginning until the product is ready to be played and sold to collectors or customers. The researcher will observe the way the craftsman crafts and record what has transcribed. The researcher will also record the process by using audio and video recording [11].

2.1 SWOT Analysis Approach

The point of a SWOT analysis is to help the craftsmen develop a strong business strategy by making sure they have considered all of your business's strengths and weaknesses, as well as the opportunities and threats it faces in the marketplace. As mentioned, SWOT is an acronym that stands for *strengths, weaknesses, opportunities, and threats*. A SWOT analysis is an organized list of the business's greatest strengths, weaknesses, opportunities, and threats. Strengths and weaknesses are internal to the company (think: reputation, patents, location); you also can change them over time but not without some work. Opportunities and threats are external (think: suppliers, competitors, prices); they are out there in the market, happening whether you like it or not.

1. *Idea development*: Once all the sketches are compiled together, all the sketches will be traced to know the detail about specification before proceeding to propose manufacture (Figs. 27.3 and 27.4).

2.2 Proposed Method of Manufacturing Applied

1. *Fiber glass*: Fiber glass offers a wide variety of products to work in many manufacturing processes and resin systems. It has products that are resin specific to match your manufacturing needs also used in a variety of applications from filament winding to multi-axial weaving. If you find a product that fits the process, but needs to have some tweaks, we have a great team of technical experts who can help. With a variety of our other products and technical expertise, this proposed material of fiber glass can help you grow your business and invest in new opportunities.
2. *Metal casting*: A metal-forming process whereby molten metal is poured into a cavity or mold and, when cooled, solidifies, taking on the characteristic shape of the mold. Almost all metals and alloys used by engineering specialists have at some point been in the molten state and cast. Aluminum-, copper-, zinc-, titanium-, cobalt-, and nickel-based alloys are also cast into many forms, but in much smaller quantity than cast iron and steel. Selection of a given material for a certain application will depend upon the physical and chemical properties desired, as well as cost, appearance, and other special requirements. A previous

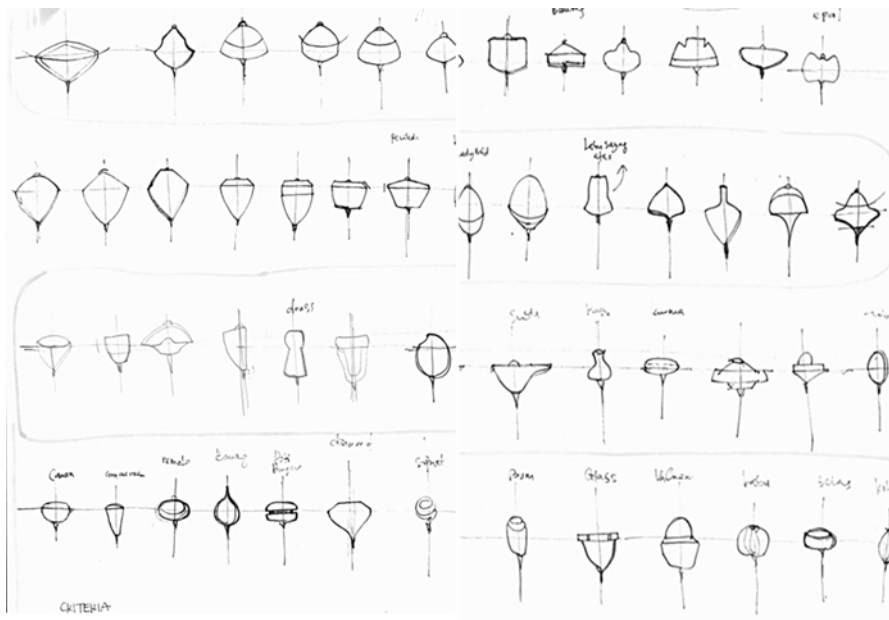


Fig. 27.3 Idea development 1

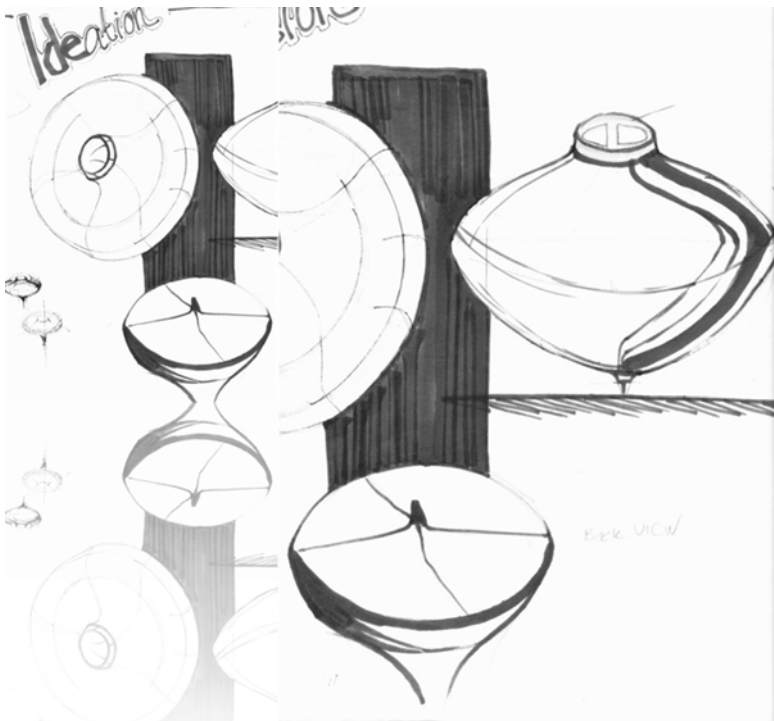


Fig. 27.4 Idea development 2

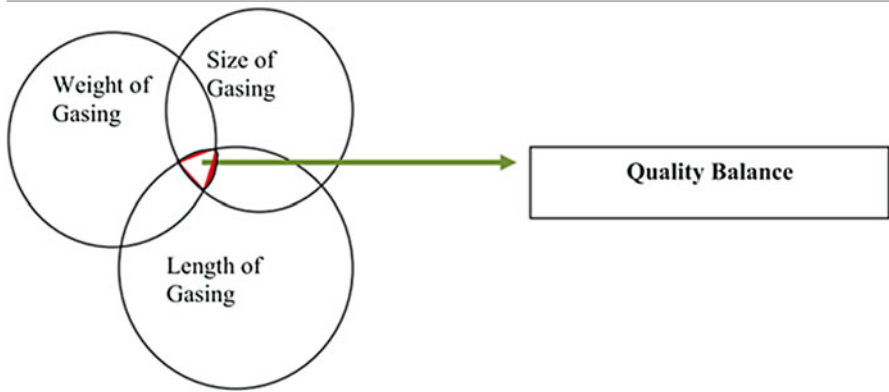
study on aluminum casting has been conducted to determine possibility to develop Malaysian craft industry by applying this material as potential option in making [21]. The advantages of using metal casting are low cost of material, the huge amount of resources, and its applicability to current methods of production. Besides that, this material purpose is also lightweight, is easy to fabricate, and can save time production. It is suitable for commercialized metal casting (material) for craft product development [21].

- 3. *Ceramic*: Ceramics are classified as inorganic and nonmetallic materials that are essential to our daily lifestyle. Ceramic and material engineers are the people who design the processes in which these products can be made, create new types of ceramic products, and find different uses for ceramic products in everyday life [22, 23].

2.3 Preliminary Result for Manufacturing Process

For this step, the result of process making is not complete because this study is still an ongoing process. With this preliminary result for the characteristic of Gasing have done. For manufacturing process not complete and will be present other conference with detailed. As shown in the table below, about the important quality of balance making, Gasing has been done by four craftsmen under Handicraft Malaysia [16] (Table 27.1).

Table 27.1 Quality of balance (Gasing)



3 Result and Discussion of the Physical Characteristic of Gasing

From the process of designing Gasing, there are a few aspects which contributed to the physical characteristic of Gasing. The researcher believes that the main physical aspects or characteristics for Gasing are the design or shape, size, weight, and balance. The researcher believes that the main factors of its physical characteristics are its shape which influences the dynamic aspects and the accuracy process of the Gasing. The characteristics which can be found in this study on Gasing are:

1. Design/shape
2. Size
3. Weight
4. Balance
5. The length of the axis
6. Design development
7. Material

3.1 Design/Shape

The shape of the Gasing is the most important basis in designing Gasing. Without the design by the craftsman or the designer from the manufacturer, the process of making Gasing will be put on hold. This game is known as a game whereby the Gasing spins on its axis. The earlier research has found that most craftsmen make the design or shape of the Gasing as either round or oval [24].

3.2 Size

The size of the *Gasing* is different based on its function. Its size for tournaments has to be according to the specifications under the law which has been set by PEGAMA. For *Gasing* as a craft, it is usually crafted based on the craftsmen's creativity, and it is not based on any specific criteria. Due to this situation, this kind of *Gasing* has limited usage, and it is not meant for games or tournament. From the data collected from the research, the height of *Gasing* for games must not exceed 4 in. or 6 cm.

3.3 Weight

The *Gasing's* weight is an important aspect in the process of making *Gasing*. The size and weight influence each other. This is because its weight will determine how long the *Gasing* will spin. For example, *Gasing Leper Kelantan* owned by

Respondent 3 can spin up to more than 2 h due to its weight (Ismail Muhammad 2013). The beauty of the Malay craft has yet to be discovered due to the earlier craftsmen expertise in creating the *Gasing*. It is known that *Gasing* was originally played during leisure time during the evenings, but from the 1970s to 1980s, it was a craze among the younger generation especially the Malays to play the *Gasing* Shuhaimi Jusoh [7]. For *Gasing* which is for playing, its weight must not exceed 800 g as stated in the law set by PEGAMA. This is to ensure fairness among the participants in competitions. For commercialization of *Gasing*, there is no specification set as the design totally depends on the craftsmen's creativity. Nevertheless, the craftsman has to accommodate the preference and needs of their clients and buyers when making this cultural heritage.

3.4 *Balance*

Balance is compulsory in ensuring the *Gasing's* quality. From the interviews, all respondents emphasize the importance of balance. Balance will also determine the perfect *Gasing*. When the *Gasing* has been shaped, the process of smoothing and testing the balance of the *Gasing* is done. There is more than one way to test the balance of the *Gasing* such as putting it on top of the hand and spinning it around and other ways as stated by the respondents. The body of the *Gasing* is made from various kinds of wood. The kind of wood used to make *Gasing* will also have an impact to the balance of the *Gasing* as it determines how long the *Gasing* will spin. The factors which influence the balance of the *Gasing* are its weight, its size, and the length of the axis [2].

3.5 *The Length of the Axis*

This feature is also important in determining the speed of the spinning *Gasing*. The suitable length of the axis must be taken into consideration in achieving longer spinning *Gasing*. This has been proven by Respondent 7 which states that the *Gasing's* size, its length of the axis, and the weight of the *Gasing* are the factors which determine a good quality. From the researcher's observation, the axis of *Gasing* Pangkah and *Gasing* Leper is totally different as the lengths of *Gasing* Leper's axis are much smaller compared to *Gasing* Pangkah. Nevertheless, the purpose is the same, that is, to observe how the *Gasing* spins on their axis and the duration the *Gasing* spins. In the end, the purpose is to determine which kind of *Gasing* spins longer than the other, *Gasing* Pangkah or *Gasing* Leper. From the study, the researcher has concluded that the axis of *Gasing* Leper is quite low, and its circumference is quite broad compared to *Gasing* Pangkah. *Gasing* Leper's weight is much heavier compared to *Gasing* Pangkah in which the researcher believes that *Gasing* Pangkah is much lighter and easier to be played by all walks of life.

4 Conclusion

This paper is still in the process of purpose guide and manufacturing process applied in Gasing making. The researchers are still compiling data in spite of the lack of information and data for this particular study. After the research know that this study uses industrial design approach, and proceed to know deeply about the purpose of other processes like the CNC machine and Lathe machine interim of material or process technology. The researcher will continue depth for purpose and material for manufacturing process of Gasing.

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Chapter 28

The Interesting Mathematical Approach Toward Analyzing Songket Design

Norakmal Abdullah, Norwani Md. Nawawi, Rafeah Legino,
and Mohd Firdaus Md Khalid

Abstract Songket is an aesthetic fabric which is showed by the complexity of songket patterns which encourage the Malay weavers to be more patient, diligent, and creative in ideas and furthermore become excellent in mathematics. Songket and mathematics cannot be separated as it is needed in all the processes as to produce the beautiful results of songket patterns. This paper is about the analysis of Malaysian songket patterns with the use of 2D plane method which are the wallpaper patterns (badan kain and kepala kain) and frieze patterns on its border patterns (punca kain, kaki kain, and kepala kain). This paper is also based on the classification of Malaysian songket patterns which are from kain sarung and kain lepas/selendang (shawl), based on their geometric symmetries on the plane. It constitutes an extremely valuable tool for this paper because it enables researchers to identify the characterization of songket patterns triggered from wallpaper patterns and frieze patterns. The aim of this paper is to document and catalogue useful guidelines for related professions and database for future references. It will also serve as evidence of the existence of geometric and symmetry patterns on Malaysian songket patterns as a useful contribution to the songket design industry and finally as examples for other Malaysian arts or crafts in having design ideas in an effective way.

Keywords Songket • Mathematical pattern • Frieze pattern • Symmetry • Geometry • Pattern transformation

N. Abdullah (✉) • M.F.Md. Khalid
Faculty of Art and Design, Universiti Teknologi MARA, Selangor, Malaysia
e-mail: cahayasempurna79@gmail.com

N.Md. Nawawi
Faculty of Art and Design, Universiti Teknologi MARA, Shah Alam, Malaysia

R. Legino
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

1 Introduction

The fabric which was highly favored in Malaysia for fashioning traditional costumes is songket. Songket is a luxurious product made by weaving silk and gold threads in various indigenous traditional patterns which are very beautiful and extremely varied. In “kain songket,” *kain* refers to the cloth or woven material and also the sarong. Most of the Malays used to wear it as clothing during daily or ceremonial occasions such as *kain sarung* with *baju kurung* or *kebaya*. In the olden days, *kain songket* was only used by the royalties and people of the palace. “*Tenunan songket benang emas*” and “*kain limar bersongket*” were the most popular handwoven fabrics which are often woven for the imperial family. But nowadays, the *kain songket* is being worn from the ordinary people to the royalties. The history of songket weaving is very difficult to be identified. This is due to the source of reference which is limited and the material itself is very sensitive to be turned into evidence. However today in Malaysia, Terengganu and Kelantan are the two main areas where weavings are still carried out. The techniques and motifs of the Malay weaving could be from the influenced of China, Cambodia, India, and Arab. This condition may be also influenced toward the development of *songket* weaving in the East Coast Malaysia. However, this paper only concentrates on the pattern of the traditional sarong *songket* and to find out the classification of wallpaper pattern and frieze pattern in *songket* textile design.

2 Songket

The process of an extra weft weaves where gold threads are inserted into plain weave to create motifs and patterns on the woven fabric is called *songket* weaving. Gold-, silver-, and metallic-colored threads are the additional weft threads the Malay weavers use to weave the *songket*. There are about ten steps in making *songket*. The process of *songket* starts with *mencelup warna pada benang* (dyeing), *menerai*, *menganing* (warping), *mengulung* (rolling the warps), *menyampak* (inserting warp through the reed), *mengarat* (making shafts), *meneguh* (tensioning the warps), *gigi belalang* (making *tekat* 3 or 5), *menyongket* (uplifting warps for *songket* pattern), and finally *menenun* (weaving) [1].

The structure of *songket* patterns is being created with six basic textile patterns. The six basic textile patterns are full-patterned *songket* (*corak bunga penuh*), isolated pattern (*songket bunga bertabur*), stripe patterns (*songket corak jalur berdiri* and *corak jalur melintang*), zigzag patterns (*songket corak siku keluang*), checkers (*songket tapak catur*), and the triangle shape of bamboo shoot (*songket pucuk rebung*) [1]. At the same time, the motif of *songket* weaving is inspired from plants, cosmos, earth, animals, and nature. The design is mainly concentrated on geometry, whether it is abstract, stylistic, or realistic [2]. The structure of the *songket* fabrics are mainly in sarong and *kain lepas* (shawls). Therefore, the structure of sarong *songket* consists of “*kepala kain*,” “*badan kain*,” and “*kaki kain*” which include the “*mengapit kepala kain*” and the “*kendik*.” The “*kendik*” is the smaller board pattern

that is placed at the “pengapit kepala kain” or at the boarder of kaki kain sarong. Meanwhile, the structure of kain songket lepas consists of punca kain, badan kain, and kaki kain.

2.1 Structure of Kain Sarong Songket (Fig. 28.1)

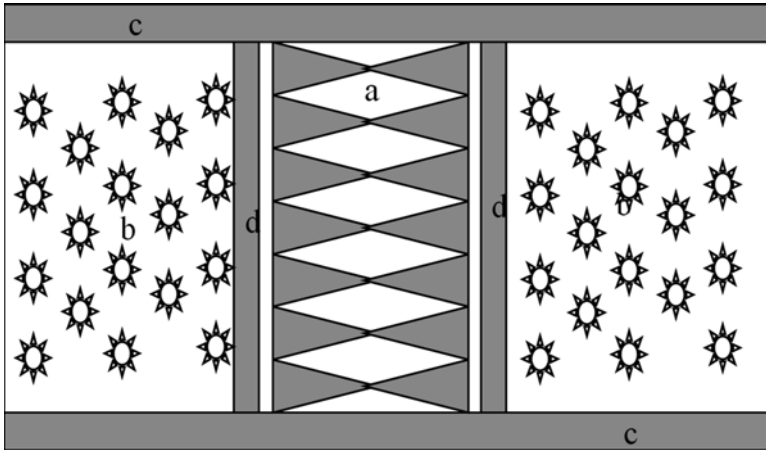


Fig. 28.1 (a) Kepala kain, (b) badan kain, (c) kaki kain, (d) pengapit kepala kain

2.2 Structure of Kain Lepas Songket (Shawl) (Fig. 28.2)

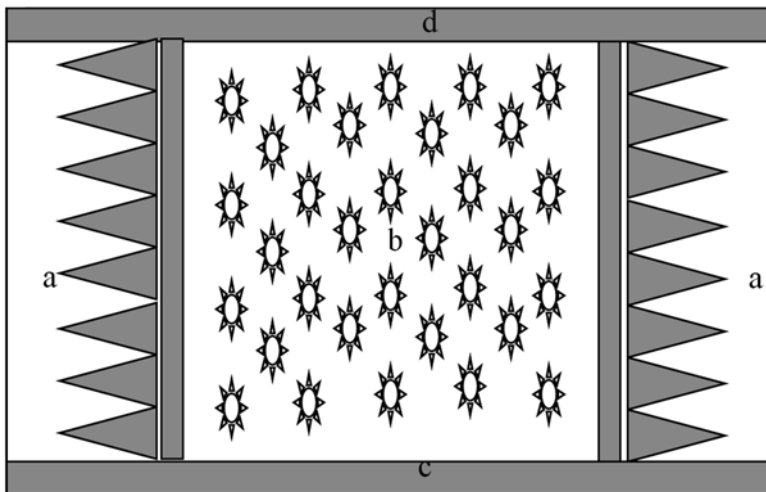


Fig. 28.2 (a) Punca kain, (b) badan kain, (c) kaki kain, (d) pengapit badan kain

3 Related Work

Most work related to classifying the pattern in symmetry group mainly aims to study the geometrical concepts of symmetry and pattern. In the work of Djbril M.O. and Thani R.O.H, the authors propose a general computational model for the extraction of the symmetry features of Islamic geometric pattern (IGP) images. In E. Rokiah et al.'s paper, the authors discussed the mathematical thinking of the weavers and the process of *songket* weaving. M. A. Hann writes about the classification and analysis of regular geometric patterns with particular reference to textiles. For this paper, it is based on the traditional Malay *songket* patterns.

4 Geometry, Symmetry, and Symmetry Group

The word geometry comes from the Greek words “geo” meaning earth and “metria” meaning mantra or dimension [3]. Geometry is the study of shape, size, and position of both flat-plane figures such as lines, circles, ellipses, triangles, rectangles, and polygons, objects that repeat in an order [4]. The word symmetry also comes from the Greek word *symmetria* which means same measure. Symmetry is when one shape becomes exactly like another if we flip, slide, or turn it. In other words, symmetry is a reflection or mirror. Symmetry is one of the elements in geometry.

The words transformations and symmetry operations are commonly related to the process of moving a motif to another position in the pattern. These processes are involved in motifs and patterns which may be classified with respect to their symmetry characteristics such as translation, reflection, rotation, and glide reflection [5, 6]. Symmetries of a pattern have a group structure. The group structure is named symmetry group of the pattern. Symmetry group consists of three types of periodic patterns which are based on 2D plane (wallpaper patterns and frieze patterns) and 3D plane (crystal patterns) [7].

5 Wallpaper Patterns

One of the periodic patterns which are based on 2D plane is wallpaper patterns. Wallpaper patterns are involved with the patterns which repeat along two linearly independent directions to tile the plane. Wallpaper patterns consists 17 types of patterns [8]. One of these patterns can be found in all over-patterns of isolated motif or full designed *songket*.

6 Frieze Patterns

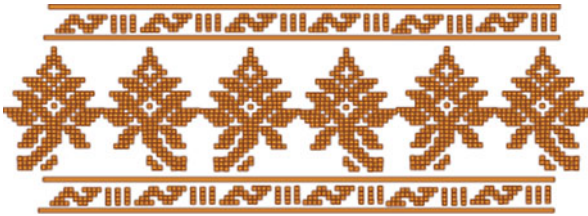
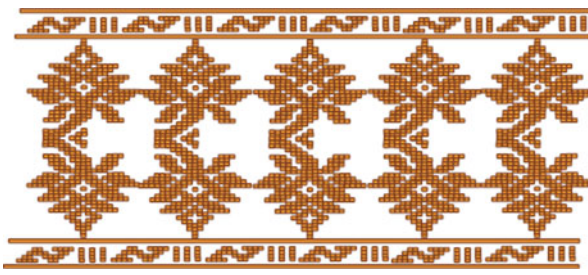
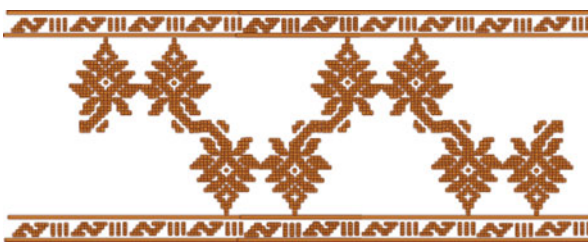
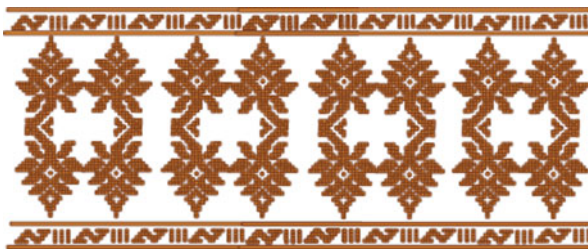
A frieze pattern is an infinite strip with a repeating pattern and it can also be called as border pattern [9]. In architecture, the term “frieze” refers to a decorative carving or pattern that runs horizontally just below a roofline or ceiling. Frieze pattern consists of seven types, and several of these patterns can be found in the border pattern in *songket* [10, 11]. There are seven different frieze groups, as displayed in Table 28.1.

Table 28.1 Seven types of frieze patterns in *songket* design

No	Type	Description	Illustration
1	11	Translation	
2	12	Translation and 180° rotation	
3	1 g	Translation and horizontal glide reflection	

(continued)

Table 28.1 (continued)

No	Type	Description	Illustration
4	m1	Translation and vertical line reflection	 <p>The illustration shows a repeating pattern of stylized floral motifs. The motifs are arranged in a single horizontal row. Each motif is a complex, symmetrical design with multiple points and internal details. The pattern is bounded by two horizontal lines, each featuring a repeating geometric sequence of vertical bars of varying heights.</p>
5	1	Translation, horizontal line reflection, and horizontal glide reflection	 <p>The illustration shows a repeating pattern of stylized floral motifs. The motifs are arranged in two horizontal rows. The top row motifs are mirrored across a horizontal line to form the bottom row. The pattern is bounded by two horizontal lines, each featuring a repeating geometric sequence of vertical bars of varying heights.</p>
6	mg	Translation, 180° rotation, vertical line reflection, and horizontal glide reflection	 <p>The illustration shows a repeating pattern of stylized floral motifs. The motifs are arranged in two horizontal rows. The top row motifs are rotated 180 degrees relative to the bottom row motifs. The pattern is bounded by two horizontal lines, each featuring a repeating geometric sequence of vertical bars of varying heights.</p>
7	mm	Translation, 180° rotation, horizontal line reflection, vertical line reflection and horizontal glide reflection	 <p>The illustration shows a repeating pattern of stylized floral motifs. The motifs are arranged in two horizontal rows. The top row motifs are mirrored across a horizontal line to form the bottom row. Additionally, the motifs in each row are mirrored across a vertical line. The pattern is bounded by two horizontal lines, each featuring a repeating geometric sequence of vertical bars of varying heights.</p>

7 Wallpaper Pattern and Frieze Patterns in Songket (Figs. 28.3, 28.4, 28.5, 28.6, and 28.7)

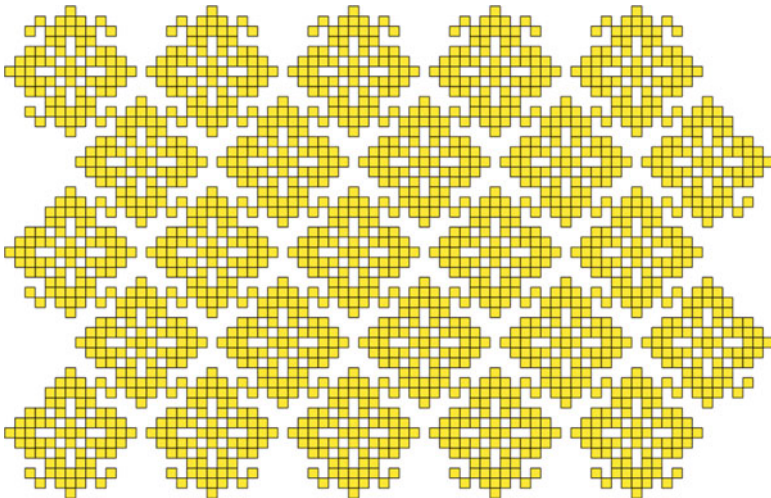


Fig. 28.3 Wallpaper pattern (*badan kain*) rotations and reflections type cmm

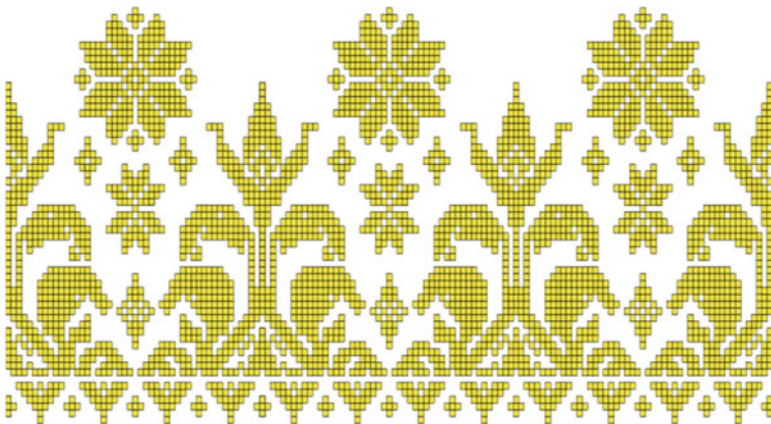


Fig. 28.4 Frieze patterns (*kepala kain*) translation type 11

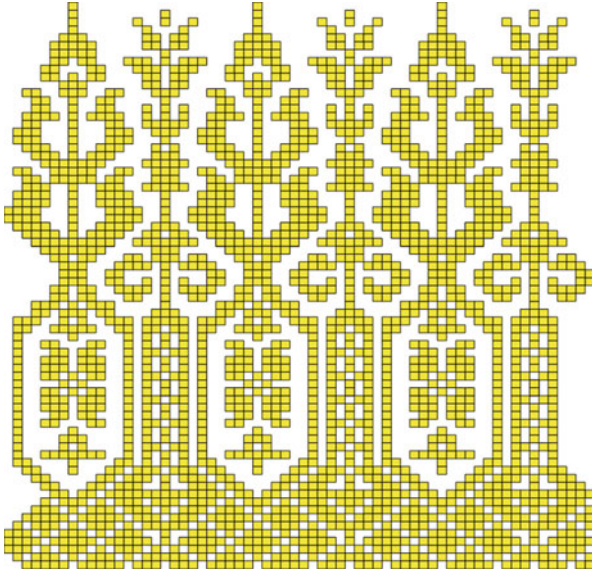


Fig. 28.5 Frieze patterns (*kaki kain*) translation type 1

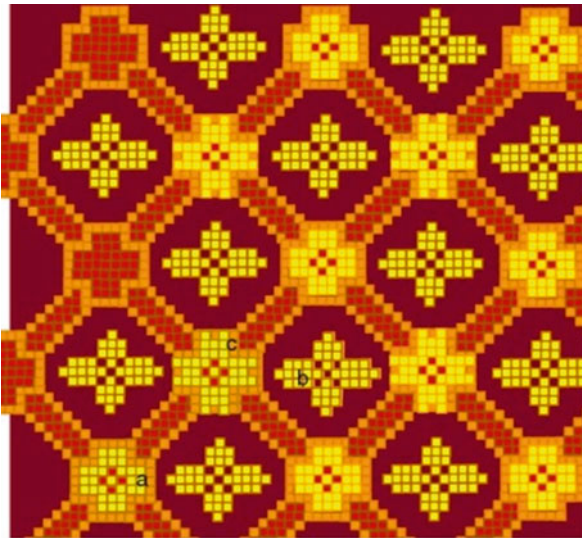


Fig. 28.6 Wallpaper patterns (*badan kain*) rotations with reflections type $p4m$ – fold rotation centers lie on reflection axes



Fig. 28.7 Frieze patterns (*pengapit kepala kain*) translation and 180° rotation type 12

8 Conclusion

Based on the analysis of *songket* patterns in Figs. 28.5 and 28.6, there are rotations and reflection types of pattern on the *badan kain*. The repetition of rotations and reflection *type cmm* and *p4m* are parts of wallpaper patterns. We could see the repetition of translation type 11 in both frieze patterns at *kaki kain* and *kepala kain*. The analyses of *songket* patterns had shown the existence of wallpaper patterns and frieze patterns in the Malay traditional *songket* design. Therefore, the outcome of this paper is to verify that *songket* patterns are mainly repeated in both classifications of frieze and wallpaper patterns. These patterns can be found in “*badan kain*” area, *pengapit badan kain*, *kepala kain*, and at *kaki kain*. It is interesting to identify them at a mathematical classification (in terms of symmetry groups) of repeated patterns into finitely countable classes in which very few researchers had studied on the local textile especially in *songket*. Furthermore the motifs of weaving *songket*

are traditionally composed of geometrical pattern, and the research on geometry of *songket* textiles is involved with the motifs' composition. Therefore, it is essential to fill the gap of the lack of geometry and symmetry research particularly on the elements of *songket* pattern design.

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Chapter 29

On the Role of Police Car Graphic Stripe in Design

Mohd Azlizan Jamaludin, Wan Zamani Wan Zakaria, Mazlan Said, Shahrman Zainal Abidin, Effandi Main, and Ismail Zakaria

Abstract This paper discusses the role of police car graphic stripe in design. Police car from Polis DiRaja Malaysia (PDRM) has been chosen as a case example. The main issue and problem is that there are no uniformity and standard guidelines produced by any country in the world pertaining to police car graphic stripe design. Content analysis has been carried out through the existing literature in order to understand the phenomena and to establish the knowledge gaps. The researchers found that there are three main factors that need to be addressed in this research topic such as (1) the effect of brand image and identity, (2) the effect of graphic stripe design, and (3) the effect of public perceptions on the PDRM. In conclusion, gaining information from the public about PDRM is the effective way in promoting police car graphic stripe in design. For future research, verifying could be extended to a larger setting, including two main phases: semantic transformation and semantic attribution.

M.A. Jamaludin (✉)

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA, 40450 Shah Alam, Malaysia

Crime Investigation Department, Polis DiRaja Malaysia, 40000 Shah Alam, Selangor Darul Ehsan, Malaysia
e-mail: azlizanjamaludin@gmail.com

W.Z.W. Zakaria • M. Said

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA, 40450 Shah Alam, Malaysia

S.Z. Abidin

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

E. Main

Crime Investigation Department, Polis DiRaja Malaysia, 40000 Shah Alam, Selangor Darul Ehsan, Malaysia

I. Zakaria

Awang Had Salleh Graduate School of Arts and Sciences, Universiti Utara Malaysia, 06010 Sintok, Kedah Darul Aman, Malaysia

Keywords Brand image and identity • Graphic stripe design • Police car • Public perception • Semantic

1 Introduction

A police car also known as mobile police vehicle (MPV) is an on-road vehicle used by police to assist with their duties in patrol and react to incidents [1]. The uses of a police car comprise transportation for officers to attain the scene of an incident, to transport suspects, or to patrol an area while providing high visibility prevention of crime. Some police cars are specially tailored for certain locations such as to work on busy roads or for certain operations such as to transport police dogs or bomb squads. For that particular reason, visual appearance of police car design plays an important role in presenting its existence as an enforcement agency in the public eyes. It converses as a visual communication that makes public awareness of their role.

Visual communication relies on both eyes in order to create a communication because these senses are able to see things around us and send the impulses to the brain to be interpreted [2]. The perception theory states that visual communication is how the brain processes, derives meaning, and uses the information received [3]. Visual communication has become one of the essential aspects of human lives which are done indirectly through symbols and signs. Many organizations pay a lot of attention to their corporate image such as uniforms, signs, flags, and many more because they believe in the importance of developing and maintaining emotional states and creative impulses [4].

2 Issues on Police Car Design

The name of “Tanah Melayu Police Force” was changed into “Tanah Melayu Royal Police Force” when the third Royal Highness of Tanah Malaya has consented to award the “Royal” title on July 24, 1958. It was later known as “Polis DiRaja Malaysia” (Royal Malaysian Police) or PDRM after the formation of Malaysia on September 16, 1963, and the component of Singapore police was automatically separated from PDRM when the republic community has left Malaysia on August 9, 1965. The police force has continued to develop as entrusted institution based on the requirements of the Constitution of Malaysia. Police have the role to act as a catalyst to build unity among nations and integrity of the territories to ensure a secured and protected country [5].

Accordingly, the Police Act 1967 was designated as a special law of PDRM, and the Inspector General of Police (IGP) has the power to determine suitable policy during his administration period which is suitable with the government policy [6]. PDRM has also made a drastic adjustment in the structure, function, and organization



Fig. 29.1 The evolution of logo of PDRM

to achieve the goals that have been entrusted. Some departments and units are also set up to give excellent services to the public community. The changes have affected the corporate image of PDRM. This includes the changes of the design of the logo from time to time in the organization. Figure 29.1 shows the evolution of the logo of PDRM from the early day until now. It started with the Straits Settlements Police in 1826 until new logo of PDRM in 1997.

Most of the existence researches about police address issues on (1) tailoring law enforcement tactics to meet the different needs of individual communities, (2) improving relations with minorities and young people, (3) maintaining a professional demeanor while interacting with citizens, and (4) developing a good working relationship with the press [7].

However, as of today, none of the researchers on police agencies give a focus on police car design research that could reflect in the eyes of public perceptions. Figure 29.2 shows the evolution of police car graphic stripe design for PDRM in parallel with the gradual changes of lifestyles in Malaysia. It started with the use of Austin Princess and the Proton Inspira as a platform or car that carry the brand image and identity of PDRM.



Fig. 29.2 The evolution of police car graphic stripe design of PDRM

Police car design functions as a priori medium to influence product and brand categorization and to shape public beliefs about products and brands [8]. Brand recognition can be regarded as a special area of application within design semantics. In the context of design semantics, aesthetics within the context of design research stands for the features of a product that create its appearance and have the capacity to generate immediate responses during the experience of an object through the sensory system [9].

According to Hekkert [10], “aesthetics” comes from the Greek word *aesthesis*, referring to sensory perception and understanding or sensuous knowledge. In the eighteenth century, the philosopher Baumgarten picked up the term and changed its meaning into gratification of the senses or sensuous delight [11]. Since works of art are (mostly) produced for this reason, i.e., to gratify our senses, the concept has

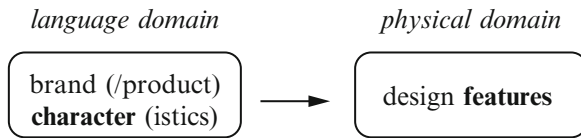


Fig. 29.3 Semantic transformation occurs between the domains of language and physical reality as design features are being created that carry semantic references to brand or product character [13]



Fig. 29.4 The side-shoulder, also known as the “catwalk,” carries semantic and syntactic functionality as part of the Volvo form language [15, 16]

since been applied to any aspect of the experience of art such as aesthetic judgment, aesthetic attitude, aesthetic understanding, aesthetic emotion, and aesthetic value. These are all considered part of the aesthetic experience, and although we can still experience nature or people aesthetically, the phrase is most often used in relation to the arts, especially visual art.

The key question is how value-based design features can be constructed, in other words how brand-specific meanings are evoked through design features. This concern implies the process of “semantic transformation” in which qualitative brand or police car characteristics that embodied in various physical design features of a product [12]. On the level of language, specific characteristics, often manifest as core values, are linked to specific brands and thus constitute the brand character [13] (see Fig. 29.3).

In Monö’s [14] model, messages are encoded into the product of the designer (the sender). These messages are carried by the physical product gestalt (the combination of form, color, texture, structure, etc.) and eventually decoded by the public (the receiver of the message). Monö proposes that four types of semantic functions (describing, expressing, exhorting, identifying) form the basis for the communication of meaning between artifacts (and their representatives) and public, for example, in Fig. 29.4, where a shape element, namely, the side-shoulder, also known as the “catwalk,” communicates a structural function of increased strength and improved aerodynamics and carries important aspects of the semantic and the syntactic functionality of the Volvo form language [15, 16].

Warell [17] states the design of semantic differential scales to measure perceptions of the product experience is an important factor for validity of results. A variety of semantic differential scales are found in the literature, two of the most common being the Likert-type scale (as used by Osgood et al. [18]) and the visual analogue scale (VAS).

According to Gould et al. [19], visual analogue scale “is a measurement instrument that tries to measure a characteristic or attitude that is believed to range across a continuum of values and cannot easily be directly measured.” Both types of scales can be either unipolar (i.e., measure a single attribute for a given concept) or bipolar (i.e., measure two opposed attributes for a given concept). Semantic differentials featuring an adjective and its antonym (e.g., happy – sad) were used by Osgood et al. [18]. The problem with this type of scale is that not all adjectives have a singularly defined antonym and thus may not be interpreted as expected [20, 21]. As a means to avoid this problem, Küller [22] employed a seven-step Likert scale with anchor points titled “slightly” and “very.” Other researchers [20, 21] have employed similar approaches.

According to Perez Mata et al. [23], there were significant relations between the desire to own a product and how the product is perceived and also between the perceptions and the parameters of the vases.

3 Case Example

In this paper, we illustrate design used by the Polis DiRaja Malaysia (PDRM) as a case example (see Fig. 29.5). There are eight selected items or variables can be used to analyze the design such as (1) stripe or line features, (2) typo (i.e., font, text), (3) logo, (4) color, (5) pattern, (6) ornamental, (7) car character (i.e., aggressive, masculine, etc.), and (8) heritage and culture.

For more details, stripe is a stroke or blow with a rod or lash on the police car. Line features are a long narrow mark on a surface and a prominent part or characteristic. Typo is a printed text like “Polis.” Logo is a symbol that is used to identify an organization and that appears on the police car. A logo is a quality such as blue and white that we see when we look at something. The color also means the visual perception that enables one to differentiate otherwise identical objects. The pattern is a repeated form or design especially that is used to decorate something. Ornamental is used to make something more attractive: used for decoration. Car character is the way someone thinks, feels, and behaves: someone’s personality such as aggressive, masculine, etc. Finally, the heritage which is the traditions, achievements, beliefs, etc., that are part of the history of a group or nation; and culture such as the beliefs, customs, arts, etc., of a particular society, group, place, or time.

Comparing with the police car from other countries, the uses of graphic stripe differ from one country to another country. It also differed from one state or territory to other states or territory. Figure 29.6 shows the differences of graphic stripe designs with various dominations in order to show the characteristics of police cars and its roles.

4 Discussion

Here, we can see that there are three effecting factors that can be used in the analysis of the police car through graphic stripe design.








 <p style="text-align: center;">Design 1</p>	<p style="text-align: center;">Domination of color (Black and white)</p>
 <p style="text-align: center;">Design 2</p>	<p style="text-align: center;">Dominationn of typo (Word of 'POLIS')</p>
 <p style="text-align: center;">Design 3</p>	<p style="text-align: center;">Domination of logo</p> 
 <p style="text-align: center;">Design 4</p>	<p style="text-align: center;">Domination of stripe or line features; ornamental; and car character</p>
 <p style="text-align: center;">Design 5</p>	<p style="text-align: center;">Domination of pattern</p> 

Fig. 29.5 Example of police car used by the PDRM in Malaysia

4.1 The Effect of Brand Image and Identity

Visual recognition of brands and products has become a central competitive factor within various product categories. PDRM must develop products with designs that not only appear attractive but also carry distinctive references to the “character” of the brand, manifest in defining core values [13].









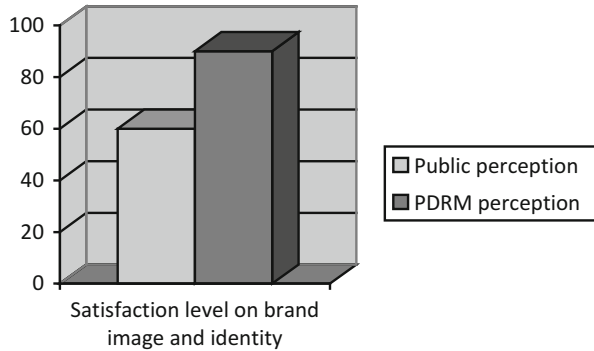
 <p>United Arab Emirates</p>	<p>Domination of stripe or line features; ornamental; and car character</p>
 <p>United States of America</p>	<p>Domination of color (Black and white)</p>
 <p>Thailand</p>	<p>Domination of logo</p> 
 <p>Japan</p>	<p>Domination of heritage and culture</p> 
 <p>United Kingdom</p>	<p>Domination of pattern</p> 

Fig. 29.6 Example of police car used by other countries

In order to create a distinctive identity and foster consistent associations, companies need to nurture visual consistency over their current portfolio and successive product generations. Consistency is fundamentally embedded already in the definition of recognition that proposes the idea of “re-cognition, cognitizing again, identifying something by its kind” [24]. Graphic stripe design (or product) can be designed to carry explicit and implicit references (or simply called as explicit and implicit design cues) [25]. Explicit visual references are embedded in the design features designers implement with the intention to be immediately perceived and recognized.

Fig. 29.7 Satisfaction level on brand image and identity



The brand image and identity of PDRM have been perceived differently by the public due to several factors occurring around the country and within PDRM. Based on the current problem, the researchers want to determine whether the current image of PDRM is good enough from the eyes of the public and the members of PDRM itself. Mainly, the researchers want to identify the impact of visual identity in building the corporate image of PDRM.

Based on the preliminary survey (pilot study) of 30 public respondents and 30 PDRM member respondents in the area of Shah Alam conducted by the researchers, it is indicated that both public and members of PDRM agree that corporate image of PDRM should be enhanced to meet the demand of today's challenges. Specifically, 60 % of public respondents and 90 % of PDRM members believe that visual identity and branding of PDRM are in satisfactory level (see Fig. 29.7). Thus, the researchers will investigate how creating the new visual identity of PDRM influences the corporate image building of PDRM.

Studies suggest that corporate image was significantly related to the branding, perception, and visual identity of the organizations.

4.2 The Effect of Graphic Stripe Design

In this particular case research, the emphasis of seven visual elements and seven principles of design might provide police car graphic stripe design solutions for PDRM [26]. This is because in common practice, these variables are useful in determining the quality of design work [27].

(a) *Seven visual elements:*

1. Lines: contour lines, parallel lines, and intersecting lines cross the line of the object quickly express or gestural lines, expressive lines, and implied lines
2. Appearances: geometric and organic appearance, the appearance of positive and negative way, and the look and appearance of abstract outline
3. Shapes: the geometric, organic, natural forms and realistic, abstract, and non-object forms

4. Texture: real and imitation tie, tie in the fabric, wood, metal, and natural
5. Spaces: a two dimensional and three dimensional, the creation of space with different size and appearance as well as the overlapping perspectives
6. Colors: prime and secondary colors, warm colors, cool colors, natural color, dark color
7. Values: the high key painting and low key, the cons, the level, and the quality and value found in perspective

(b) *Seven principles of design:*

1. Unity: color, thread, appearance, and value are used to create a union.
2. Balance: symmetrical balance and nonsymmetrical balance, radiation balance, and the balance, appearance, color, and networking.
3. Emphasis: the dominance of the color, the focus, and appearance.
4. Movements: the movement of the horizontal or straight, movement and visual appearance, and values and perspectives.
5. Contrast: the clash, color immersion, networking, appearance, color clash of hot and cold.
6. Rhythm: regular rhythm and the chaotic and progressive rhythm of creation which includes the repetition of color, form, and line.
7. Patterns: repetition planned and random covering color, line, value, and networking to create a pattern.

4.3 *The Effect of Public Perceptions*

Semantic interpretation has become a central issue on public perceptions. In developing and maintaining the brand recognition into public perceptions, design involves two important aspects: attractiveness and strategic meaning creation. First, by simply developing visually attractive designs, PDRM can substantially strengthen their brand image [28]. Second, police car graphic stripe design can be used strategically to foster favorable brand identity and to create brand value [29]. Intentional meanings into police car graphic stripe design that, as a result, target public (or customers) then interprets in a favorable manner. By managing selected design features strategically and consistently, PDRM can substantially impact on the visual recognition of their brands [15].

Among the main problems in building public perceptions on PDRM are:

- (a) *Some walks of life expressed their negative perception of credibility and responsibility of the police in solving public problems.*
 - There is a need to create the motto “The Police Are Part of Our Family.” Through visual media and communication technology, the motto is clearly the impression in nurturing community and police as family members in conflict resolution of current issues and legislation. This can reduce or even solve the problem of misconduct among members of the community

and the police on the issue of corruption abuse of power and responsibility in preventing crime.

- (b) *Adverse issues occur involving offenses among policemen seen as biased by the public to law enforcement nationwide.*
 - There should be a campaign that reflects the police as loving, caring, friendly people that act quickly, have integrity, and are professional and successful in venturing into other fields, as other members of society.
- (c) *Some members of police lack appreciation toward their duties and responsibilities of the field as well as their career against race, religion, and nation.*
 - There should be a constant reminder information on the tasks and police services as well as a major priority by means of visual communication in an effective and comprehensive manner.
- (d) *There is a lack of visual technology support on police's image branding in building high performance and professionalism in the PDRM.*
 - Visual technology support is very important in delivering accurate information and persuading the people's minds about the ethical duties and responsibilities of the police to members of the community.

5 Conclusion

This paper drew major conclusions on public perceptions about PDRM which is the effective way of promoting police car graphic stripe in design. Moreover, three contributing factors such as the effect of brand image and identity, the effect of graphic stripe design, and the effect of public perceptions might bring down the motivation, confidence, and commitment level of how police forces should stand.

A preliminary survey of a pilot study of the public members and PDRM members in this study can provide beneficial remarks in supporting the brand image and identity of PDRM in the development of sustainable branding while maintaining its professional standards across the organizations. Since the information of this paper is derived from the content analysis from the literature reviews and pilot survey, for further task, the researchers plan to carry out a full flash field work in a form of survey clinic and design workshop in order to answer research questions and hypothesis formulated via effective impacts on public perception, corporate branding, and visual identity on PDRM.

In future research, verifying could be extended to a larger setting, including two main phases: semantic transformation and semantic attribution. Such a setting would, in particular, offer a structured approach to analyze value-based design cues in the organization. First, the organization would be designed according to specified intent (e.g., brand characteristics). Second, the organization would be attributed with perceived characteristics of a number of persons, for instance, using semantic differential scales.

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Chapter 30

Interaction Textile Design: Aesthetics Eco-friendly Material

Rusmawati Ghazali, Rusmadiyah Anwar, Hema Zulaika Hashim,
Rainal Hidayat Wardi, and Sabzali Musa Khan

Abstract It has been known that ideas in the textile design field are currently limited. The ‘new material surfaces’ main purpose is to improve the current problem in the textile design’s field. From design success factor, it was claimed to be able to increase waste recycling and produce the new specialized material in making the textile products from recycled or found objects and bring this new exposure to the limelight. Apart from textile design, the material surface can be judged from the physical factors that must be present to create a form of art. The shape, the surface’s colour, the materials used and the combination when worn, all these comes together, making an artistic statement. It has also been acknowledged that the development of technology and the revolution of industrial manufactures have contributed in the world environmental problems and thus building up natural resources crisis on earth. It appears that the mixed material is reflected to improve the sufficiency of resource usage. Therefore, a number of environmental protection policies in the world have been created in order to enhance the characteristic of lower environmental effects. ‘Reduce, reuse and recycle’ motto, without a doubt, has definitely become a new life trend taking on ‘recycle and re-make new substance from old pieces, found object always be re-used’ saying. Both quality and the style are made use in this study; priority of life cycle structure is the foundation of sustainability in textile design. In addition, the sustainable design model (SDM) method was implemented

R. Ghazali (✉) • R.H. Wardi
Culture Centre, Universiti Malaya, 50603 Kuala Lumpur, Malaysia

Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: rusma362@salam.uitm.edu.my

R. Anwar
Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

H.Z. Hashim
Contemporary Metal Design, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

S.M. Khan
Academy of Malay Studies, Universiti Malaya, 50603 Kuala Lumpur, Malaysia

in this research. It is used to thoroughly check the sustainable design factors considered for the new surface's application in the textile design appearance. Moreover, methods will be created by the researcher to ensure the achievement in the investigational study of fish scales (FS). By using SDM in FS-Textile Design Appearance (TDA), the research will increase the effect of the addition of mixed material on design factors. In the end, this study will be beneficial to those that are involved directly and indirectly in enhancing the textile design business in Malaysia.

Keywords Component • Interaction • Textile design • Aesthetics • Eco-friendly • Material

1 Introduction

This research was drawn from a study based on the aesthetics and expressiveness of material surface on textile design [1]. This paper is focusing on the interplay between spatial and temporal gestalt in the everyday design. As such, the module called or a close integration and combination of textiles material on the basis of their expressions rather than in terms of technological innovation. Although such technology innovation was in demand and carried out, the idea is worked on the basis of aesthetic perceptive. Design by virtue of its very nature is largely dominated by formal exploration. Its physical appearance however is basically perceived by way of implementation considered reductive as far as generative design methods are considered [2, 3].

2 Interaction Textile Design

2.1 *New Ways of Thinking*

We learn from interaction design that a thing/system relates their functions and interactions with each other. While function stresses on what the object does when we use it, interaction is focusing on what we do when the object is used. Therefore, the focus in textile interaction design is on the connection concerning function and interaction. For example, in a situation where there is a carpet laying on the floor, a connection will form between me walking, talking, sitting, etc., and the carpet protecting, absorbing, being soft, etc. These connection and relation sparked two questions: What are we doing when we use textile objects and what are the textile objects are doing when we use them?

The way we answer these two questions will draw boundaries of the design's space. It is at this point that we put together the bases and basics of the design's program. This is almost like the actual fashion design practice, but the difference

is that in textile design, it would make a small radical change in perspective because textile design is much more technical in nature.

The combination of textiles, the computational technology and the use of new high-tech textile materials – what does it mean and how does this textile interaction design related to the smart textiles issues? Apparently, since we do not start off from materials and techniques, no implicit or explicit boundaries were drawn up when it involves materials and technology. In terms of mixing programmability and stretchability, it is easier and somewhat natural to imagine it as ‘being flexible’.

2.2 Transformative Design for the Future

To focus on the rationale, literature surveys’ guidance was provided in order to identify the knowledge gaps in the material surface of fish scale in textile design appearance. It helped in developing an argument that is related to the ‘waste material’ topic. Based on a literature review and a conducted study, it has been identified that the sustainable design model (SDM) process is used to improve the knowledge towards sustainable designs opportunity (Fig. 30.1) [4]. The identified process was then incorporated into a conceptual framework to help develop knowledge for both material and design field. The growth of the waste material combination into the new system has increased the current market innovation process strategically in order to separate competitive advantage and grant it suitable recognition, promotion

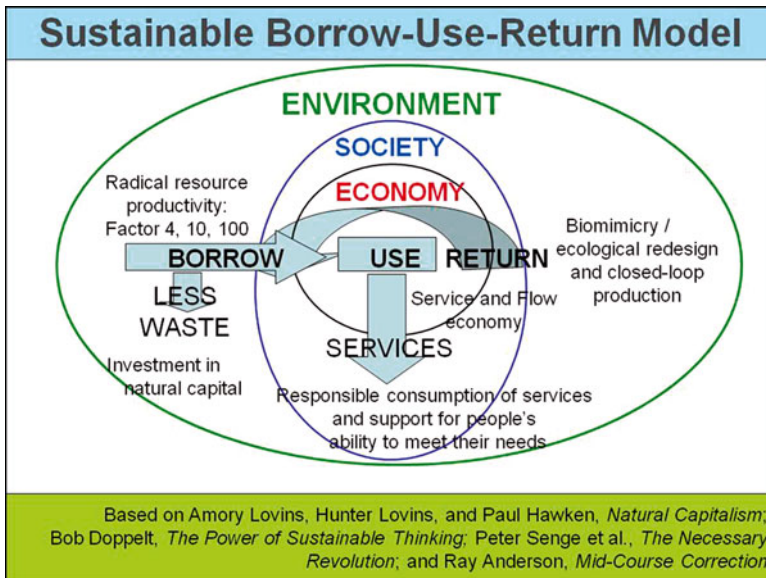


Fig. 30.1 Sustainable design model

and strength to develop an excellent effort. In the end, the results will be determined by the incorporation of the mixed material through the design's success [5].

To solve environmental problems, we need to think and act differently, and this is where design thoughts come into play.

The eco-friendly material concept is pretty much closer to the concept of 'Design for Environment' (DFE). DFE stands for a universal concept that directs a range of design approaches that try to trim down the overall environmental impact of a product or process.

Aesthetics' term focuses on both our senses and responses towards an object. A steadily consistent pair with a particular aesthetic concept can be a big factor in developing a product. According to Alberto Alessi [6], designer:

More and more people buy objects for intellectual and spiritual nourishment.

The quote above indicates that the world of product design has changed. A pleasure of appreciation in using the product is becoming one of the main importances to both consumer and the design industry [7].

In addition, another essential basis in the design process is defining limits for the creative process and focusing on performance-based solutions that combine aesthetic, function and long-term impacts.

3 Eco-friendly Material

Design processes that are informed by material and/or fabrication constraint as part of the generative phases of design are regarded as material- and fabrication-based design [7, 8]. The aim is to create a preliminary taxonomy that tries to redefine the embellishment and the application of material surface through craft's idea [9–11]. In this circumstance, the term 'eco-friendly material' describes the ability, skill or potential to be in charge of the material arrangement and behaviour through a particular fabrication process inherent in the nature of the exploration.

The eco-friendly material system helps designers to find out the best way to lessen the environmental damage and make the best use of its effectiveness throughout the entire life product. When designers are in the early phase of crafting a product, they will analyse each stage in the product life cycle. This is to find a method to make each stage as effective and as efficient as possible, just like when eco-friendly materials are use.

3.1 *Fish Scales Embellishment in Textile Design*

Flattened rigid plates, covering the outer part of fish that are usually removed and were not used when we clean the fish before we cook, are called fish scales. But now, Malaysians' awareness has increased thanks to the recycling campaign

organized by the government and other parties [1]. Hence, a study on the colouring fish scales was conducted. Generally, the scales were geared up freshly after it was removed from the fish by cleaning them thoroughly or, if needed, soaking them in clear water until the scales are soft and pliable. Then they are dried in order to categorize the right colour and combination ratio for the colour coding process.

It was known that embellishment is the ultimate tool for the decorators. In textile design, it is regarded as the heart and soul of the decorative world. We can say that to understand and accept embellishment is to understand and accept decoration. Textile particularly is a no stranger to embellishment. Adding embellishment to fabrics can create any forms, including adding together pure stitching to other fabrics (Fig. 30.4) using FS. Embellishment was not limited to textiles only. As a matter of fact, all the major and minor decorative arts – ceramics, glass, metal and wood – used embellishment to decoratively enhance the end result of the material.

Unlike before, today's artist has new ideas in regard to today's collage, which focuses on one solid focal point. This is because fish scales can adapt the design factors into the textile embellishment.

3.2 *The Natural Characteristics of Fish Scales*

- There are four types of fish scales that are studied based on their sizes, forms and also textures. The Malabar Red Snapper or also known as 'Ikan Merah' is covered with the thickest scales among the other fish types. The John Snapper or 'Ikan Jenahak' – as Malaysian calls it – has a finger print-like texture. Toli shad or 'Ikan Terubok' has the contour or curve lines on its surface, which is interesting. Its scales become more attractive once dried because the scales' edge will produce a sort of furry lines [1].
- Fish scales have that unique characteristics where the scales are smooth and flat when water is spread over them but become hard and rolled up when they are placed under the sun. The fish scales will then become smooth again when they are in contact with water and hard and rolled up again if they are not.
- Fish scales can last for a long period in water even if they are soaked for a month.
- Fish scales have that plasticity feel to it, which makes them hard to be taken out from the surface or to be crushed due to that texture.
- Fish scales can only be crushed and pounded after well fried. They will then be split into two forms. One is when the fish scales are finely pounded into powder form and the other form is when the fish scales are pounded slightly to get that rough texture.
- The percentage of colour absorbent depends on the fish scales' thickness and the tone of colours that are used. Threadfin breams, toli shad and John Snapper have thinner fish scales, and this makes them absorb colours easily, while the Malabar Red Snapper, which has the thickest scales out of the four fish scales types, absorbs colour hardly. For colour tone, the remazol turquoise blue and remazol olive green have less percentage of absorbent compared to the other tones.



Fig. 30.2 Example of a figure caption

3.3 Drying and Colouring Process (Fig. 30.2)

Fish scales are better when they are dried on sunny days, although they have to be covered or be done under the shed. This is because direct sunlight will only cause the fish scales to roll up, thus making them difficult to form back unless after rewetting, by spreading some amount of water on to the surface. There are many ways to clean the fish scales, and most have nearly the same results at the beginning which is a clean, white fish scale. It is known that the scales that are cleaned using bleach agent will turn yellowish. Among the three cleaning ingredients, it has been identified that lime juice is the best cleaning agent so far, followed by the detergent.

Based on Fig. 30.3, it can be seen that the fish scales are flexible; they can be bent or flexed without difficulty and without breaking the material's surface (Fig. 30.4).

When the coloured fish scales are dried, they are then sewn onto fabric strips with the size of a 1 in. wide, a size suitable for the rubbing tester machine (Fig. 30.5).

Four different tones of coloured fish scales – green, blue, golden yellow and red – are tested. All colours show different absorbent level. The green colour shows 10 % washed-off colour. The blue colour shows 5 % washed-off, while golden yellow and red colours show 10 % and 15 % washed-off, respectively. Based on the end result, it has been decided that reactive dye (Remazol brand) is the most suitable dye to colour fish scale (Fig. 30.6).



Fig. 30.3 Example of a figure caption



Fig. 30.4 Example of a figure caption

4 Conclusion

Few tests on the fish scales have been conducted, and the researcher has decided that the Remazol brand reactive dye is the most suitable dye to be used on fish scales. Currently, Remazol brand's reactive dye has two types of dye, that is, the cool



Fig. 30.5 Example of a figure caption



Fig. 30.6 Reactive dye Remazol in powder form

reactive dye and the hot reactive dye. The cool reactive dye consists of a cold water soluble, whereas the hot reactive dye consists of a hot water soluble. The one that is used for colouring the fish scales is a cool reactive dye [1].

Remazol reactive dye was chosen because the level of absorption is highly effective compared to the other types of colouring, thus making it the most suitable for colouring the fish scales. Remazol dye gives bright colour effect, and it is also cheaper compared to the other brands such as Disperse and Vat dye. And the good thing is Remazol is easily found in Malaysia as it is the same dye used for colouring batik cloth.

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Chapter 31

The Potential of Coldstream Bidor Clay (CBC) as Replacement for Porcelain Body

Diana Mohamed Raif, Nurul Shafinaz Ibrahim, Verly Veto Vermol, and Rasmadiyah Anwar

Abstract In Malaysia, local clay remains as one important material in production applied among local ceramic entrepreneurs. Local clay became popular in these industries due to the amount and inexpensive price rather than the imported ones. This material is used as an alternative porcelain body due to the components similar with the conventional existing porcelain. It is hard to identify the possibility of local clay named as “coldstream clay” to endow with translucent porcelain character. In this study, coldstream clay from Bidor, Perak, will be used as developed body to be compared with conventional porcelain. In terms of physical appearance and color, coldstream clay is similar with porcelain. Additional feldspar and silica with suitable percentage to the body is to find and observe physical reaction between compared porcelain formulations. These two materials were tested to investigate the slip performance and clay character at the green stage. Similarly, the test pieces were prepared through slip-casting technique. The finding has proved the most suitable firing temperature is above 1,260 °C to achieve the translucent maturity for the coldstream clay. On the other view, ball clay still plays the role to maintain the performance of casting. This study successfully proved the Coldstream Bidor Clay has the potential to substitute porcelain body for future ceramic industries.

Keywords Coldstream • Porcelain • Translucency • Plasticity

1 Introduction

This paper will discuss on developing coldstream clay to produce as similar as porcelain body and a new body formulation by using local clay. Based on the observation studies, clay from Bidor seems to come in wet condition with gray color. It can be obtained by digging 3 ft deep from the topsoil. The clay is famous among local

D.M. Raif (✉) • N.S. Ibrahim • V.V. Vermol • R. Anwar
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: diana0156@salam.uitm.edu.my

ceramic entrepreneur and craftsmans' who produced a design such tableware, lighting and giftware. Few local ceramic artist was also implementing. The research and test on the local coldstream clay is to enhance the usage of the clay [1]. The physical appearance of the clay is gray and off-white after firing has triggered the idea of the coldstream clay development to produce local clay which possesses ability like a porcelain body.

The test was made by using the clay as a main medium and adding other materials to get the translucent effect. It started with preparing the clay powder, by measuring the weight for each component material needed [1]. The materials were then mixed in the jar mill or the blunger to produce slip. Then the slip went through the casting, drying, and firing processes. The translucency of the body after firing was tested with light, manually. The clay specifically was obtained from the coldstream village in Bidor Perak. It was usually used to produce traditional pottery and has been one of our heritages. It has become the main body in pottery making, by adding water for forming process.

As general, it can be considered as stoneware, which nature made by the rock cycle and other minerals by the process of erosion or abrasion phenomena [2]. Basically, particle size for coldstream local clay is 2umm. Similar with the conventional clay, it is also derived from the second level from three layers from the Earth. The first layer is the topsoil, which contains the organic material and is suitable for farming. The second layer, normally 3 ft deeper, consists of clay which is suitable for pottery making with high plasticity. The last layer consists of nonplastic clay and mostly contains rocks [1, 2].

2 Coldstream Bidor Clay (CBC)

CBC is an easily obtained local clay and probably got high demand among the local entrepreneurs around Perak, Malaysia. The objectives of this research and study are:

- To achieve translucent effect with local clay that could hopefully be used as local porcelain
- To identify the strength of local clay especially CBC, whether it is equivalent to the ready-made porcelain
- To determine the suitable firing temperature of local clay to achieve the translucent effect with few possible temperatures

Local clay is a commonly used material among potters for traditional pottery production. Currently, even the local pottery production has been influenced by more modern design [3], but the manipulation of local clay is still the same [4]. The issue identified that became the factor of this is:

- The lack of understanding among craftsmen about the multipurpose usage of local clay. Pottery activities are limited to just throwing and casting technique. It ended with the same result with other traditional products.

- Colors for ceramic from the local clay usually in opaque condition. And conventional local clays such as terracotta and coldstream are not translucent. With this research and exploration, deposition of other component materials with suitable percentage and firing temperature aims to achieve the translucent effect.

3 Ceramic and Components

Campbell explained that the term porcelain refers to a wide range of ceramic products that have been baked at high temperatures to achieve vitreous, or glassy, qualities such as translucence and low porosity. Among the most familiar porcelain goods are table and decorative china, chemical ware, dental crowns, and electrical insulators. Usually white or off-white porcelain comes in both glazed and unglazed varieties, with bisque, fired at a high temperature, usually in 1,200 °C, representing the most popular unglazed variety [5]. Porcelain is a hard white substance that is used for making expensive cups, plates, and other tableware goods [6].

The history of porcelain stated by Camusso as a hard-paste or “true” porcelain originated in China during the T’ang dynasty (618–907 A.D.); however, high-quality porcelain compared to modern wares did not develop until the Yuan dynasty (1279–1368 A.D.). Early Chinese porcelain consisted of kaolin (china clay) and pegmatite, a coarse type of granite. Porcelain was unknown to European potters prior to the importation of Chinese wares during the middle Ages. Europeans tried to duplicate Chinese porcelain, but, unable to analyze its chemical composition, they could imitate only its appearance. After mixing glass with tin oxide to render it opaque, European craftspeople tried combining clay and ground glass. These alternatives became known as soft -paste, glassy, or artificial porcelains [7]. The material in porcelain basically contains kaolin ($\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$), ball clay/bentonite ($\text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2 \cdot \text{H}_2\text{O}$), potash feldspars ($\text{K}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$), and silica/quartz/flint (SiO_2) [8].

3.1 Kaolin ($\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot \text{H}_2\text{O}$)

True porcelain normally derives all its plasticity from kaolin. Since kaolin is normally of limited plasticity, this obviously limits the workability of throwing or modeling porcelains made from them. There is some very plastic kaolin, and it is possible to make a fairly plastic body from them, although the limited range of particle sizes can mean less than ideal drying performance. For casting porcelains, an all-kaolin approach is quite feasible (using 50 % kaolin rather than 25 % kaolin and 25 % ball clay) since these bodies benefit greatly from the reduced drying shrinkage and increased water permeability associated with the larger particle size of kaolin. Kaolin differs widely in maturity. British kaolin requires the use of a lot less feldspar because they already have some natural fluxes as part of the mica mineral they contain. Although these might be less plastic, less flux is needed; more kaolin can be used in a recipe [9, 10].

3.2 *Ball Clay (Al_2O_3 4SiO₂ H₂O)*

Ball clay is much finer and thus much more plastic than kaolin. Ball clays can have 10 or 20 times the amount of brown-firing iron oxide that kaolin has, and many have heavy soluble salts that produce a dark-colored scum on the burned surface. Many also contain lignite particles that can produce glaze imperfections. The fired maturity and plasticity of bentonites and ball clays can vary even more than kaolin. This is so much the case that a porcelain formulation project often becomes a ball clay/bentonite comparison and testing project. Again it is very important that you have a well-defined testing program to compare these materials [9, 10].

3.3 *Potash Feldspars (K_2O Al₂O₃ 6SiO₂)*

These materials contain the fluxes. Fluxes are the oxides that help develop fired maturity by liquefying and slowly dissolving both clay and silica. The total flux amount necessary is easily determined by simply firing to a range of temperatures above and below the one you intend to work on; studying the absorption, strength, and firing shrinkage curves; and adjusting the amount of feldspar to give the desired maturity [1, 5]. The amount of feldspar for a cone 10 body can vary from 15 to 35 %, depending on the maturity of other materials (especially the kaolin) in the recipe. Feldspars are not without potential problems. Some can present flocculation problems due to slight solubility (i.e., nepheline syenite). Sodium feldspars are generally cleaner and more potent, although they can produce a body with more of a tendency to warp. Use two or three together if possible [9–11].

3.4 *Silica/Quartz/Flint (SiO₂)*

Silica tends to be a very consistent and inexpensive material. Quartz grains act primarily as a microaggregate or framework structure for the fired matrix. In addition, some of the silica is dissolved by the fluxes to produce aluminum-silicate glasses [1, 5, 7]. Too much silica in a recipe could mean lower plasticity (since less room is left for clay). However, there is also much discussion about the detrimental effects of cristobalite (i.e., dunting), whose development during high temperature firing is related to available free quartz [11, 12].

4 Reformulating CBC as Porcelain Body Replacement (Tables 31.1, 31.2, and 31.3)

Table 31.1 Standard porcelain body investigations

Test piece	Standard body		Test piece	Modified porcelain	
P-A	Standard porcelain	100 %	P-B	Standard porcelain	85 %
	(Control group)			Potash feldspar	15 %
					100 %
P-C	Kaolin	25 %	P-D	Standard porcelain	70 %
	Potash feldspar	25 %		Potash feldspar	20 %
	Silica	25 %		Silica	5 %
	Ball clay	25 %		Ball clay	5 %
		100 %			100 %

Table 31.2 Developed coldstream clay body formulations

Test piece	Coldstream clay formula			Test piece	Coldstream clay formula	
C-A	Coldstream clay	30 %	VS	C-B	Coldstream clay	50 %
	Potash feldspar	40 %			Potash feldspar	20 %
	Silica	25 %			Silica	20 %
	Bentonite	5 %			Ball clay	10 %
		100 %			100 %	
C-C	Coldstream clay	50 %	C-D	Coldstream clay	50 %	
	Potash feldspar	25 %		Nepheline syenite	25 %	
	Silica	25 %		Silica	25 %	
		100 %			100 %	




Table 31.3 The description of body formulation

Test piece	Descriptions
P-A	Using 100 % standard porcelain, made in England. This test was conducted to find the difference in translucent effect of porcelain and local clay
P-B	For this recipe, 85 % standard porcelain added with 12 % potash feldspar and 5 l water and 15 ml sodium silicate. All the material was prepared for 5 kg
P-C	Slip was made without using the coldstream local clay. This test was made to try whether the slip has cast ability and to test which combination of this material will produce body strength and have a translucent effect after firing
P-D	70 % standard porcelain added with 20 % potash feldspar, 6 % silica, 4 % ball clay, and 5 l water and 15 ml sodium
C-A	Slip was made with 30 % coldstream local clay, 40 % potash feldspar, 25 % silica, and 5 % bentonite. This test was made to evaluate the slip-casting ability and to test which combination of this material will produce suitable body strength and have a translucent effect after firing. 5 % bentonite added to enhance the plasticity of casting body
C-B	Slip was made with 50 % coldstream local clay, 20 % potash feldspar, 20 % silica, and 10 % ball clay
C-C	Slip was made with 50 % coldstream local clay, 25 % potash feldspar, 25 % silica, and 5 % bentonite
C-D	Slip was made with 50 % coldstream local clay, 25 % nepheline syenite, and 25 % silica

5 Discussion

Table 31.4 is a result the test made for all body composition with firing process with different temperatures and the hardness of body. In P-A, slip recipe is found suitable for casting, and casting time is at a usual rate. Thickness of the casting pieces also suitable, 0.5 mm. The body color after firing is off white. Translucent effect did not appear maybe because the 100 % usage of ready-made porcelain is not suitable. The addition of one part of kaolin may give more plasticity. P-B test pieces produced translucent effect maybe because of the porcelain’s natural property. Slip for recipes one is suitable for casting. The casting time is at a usual rate, with a suitable

Table 31.4 Standard porcelain body investigations

Code	Test piece	Firing (°C)	Physical reaction
P-A		1,260	No translucent effect Physical body is hard
		1,280	No translucent effect Physical body is hard
		1,300	No translucent effect Physical body is hard
		1,260	Some translucent effect Physical body is hard
		1,280	Translucent effect appeared Physical body is hard
		1,300	Translucent effect appeared Physical body is hard
P-B		1,260	No translucent effect Physical body is hard
		1,280	Some translucent effect appeared Physical body is hard
		1,300	Translucent effect appeared Physical body is hard
		1,260	No translucent effect Physical body is hard
		1,280	Some translucent effect appeared Physical body is hard
		1,300	Translucent effect appeared Physical body is hard
P-C		1,260	No translucent effect Physical body is hard
		1,280	Some translucent effect appeared Physical body is hard
		1,300	Translucent effect appeared Physical body is hard
		1,260	No translucent effect Physical body is hard
		1,260	No translucent effect Physical body is hard
		1,260	No translucent effect Physical body is hard

thickness of 0.5 mm. 15 % feldspar is added physically not affecting the slip. In test P-C, slip recipe was found suitable for casting, and the casting time is at a usual rate, producing thickness of 0.05 mm. However, it was observed that after pouring out slip from mold, the casted body starts to crack. This is because of the lack of plasticity [12–14]. After the firing, it was observed that in P-C, slip recipes are suitable for casting at a usual casting rate. Thickness produced was also suitable, 0.5 mm. The added 15 % feldspar did not affect the slip. The body investigation observations can be further explained as per recorded in Table 31.5.

Table 31.5 Coldstream clay body development





Code	Test piece	Firing (°C)	Physical reaction
C-A		1,260	Achieves a translucent effect clearly seen under the light
			Casting ability is not successful
			Physical body is hard
		1,280	No translucent effect
			Physical body is hard
		1,300	No translucent effect
	Physical body is hard		
C-B		1,260	No translucent effect
			Physical body is hard
		1,280	No translucent effect
			Physical body is hard
		1,300	No translucent effect
			Physical body is hard
C-C		1,260	No translucent effect
			Physical body is hard
		1,280	Some translucent effect appeared
			0.03 mm thickness may produce a translucent effect
			Physical body is hard
		1,300	Translucent effect has appeared
Physical body is hard			
C-D		1,260	No translucent effect
			Physical body is hard
		1,280	Some translucent effect appeared
			Physical body is hard
		1,300	The translucent effect has appeared
			Physical body is hard

Table 31.5 is the result for the standard porcelain body composition after a firing process with different temperatures and the hardness of CBC body [9]. In body composition test C-A, the casted body cracked after pouring out the excess slip, which may result from high absorption rate and less suitable body thickness. There were cracks observed around the body due to low plasticity. Besides that, the casted body was found clinged at the mold wall.

The result for test C-B provides a more positive outcome. This slip is suitable for casting with suitable absorption rate. The added 10 % ball clay has given a plasticity effect than the recipes in C-D. Even the slip is suitable for casting and high of plasticity; this test has given no translucent effect. In sample test C-C, some crack was observed after pouring out the excess slip, probably due to low plasticity [13–15]. C-D sample casting process was done twice. This is because in the first attempt, the body was totally cracked. In the second casting attempt, with a control on the absorption, the casted body was managed to be removed from the mold.

6 Conclusion

Based on the observation made on the outcome of fired body compositions, it can be concluded that CBC can be used to produce the ceramic castware product. The clay has showed an equivalent competitive performance with existing porcelain clay body. This result proved the possibility of the CBC potential as replacement for the porcelain body. However, most of the clay needs accurate adjustment of additive materials to enhance the physical properties' performance such as the casting ability, casting time, thickness, and body strength. To improve the translucency, the body required additional raw materials such as nepheline syenite and also suitable oxidation setting during firing. As a recommendation for future works, we suggested the next stage from these findings is to implement the glaze defect into ceramic mass production. To test the core relation between technical and conceptual design, CSWD research methodology should be brought into practice. It happened to observe how the designer or artist finalized their problem solving in identification of form and design structure [16]. Toward applied research to bring this CBC development as alternative clay to replace the existing porcelain body.

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Chapter 32

Hard Ceramic Porcelain Physical Test Through Potential Formulation Parameter

Rusmadiyah Anwar, Mohamad Rizal Salleh, Verly Veto Vermol,
Zainal Zakaria, and Mohd Rizwan Hassan

Abstract The research and development to find a new body formulation for any ceramic industry became a critical circumstance in order to increase the production yield. The investigation of technological procedure in conventional body for industrial ceramic tableware design field brings a new invention on studying the new method of design process. The idea of investigating the conventional component in ceramic hard porcelain formulation could inspire a new design for mass production. The case study was about the limited material which moves towards from local provider. Re-designing the hard porcelain body slip through the experiment in laboratory will manage to identify the suitable formulation which competence with the design or form. The result shows a variety outcomes and performances which later can be tested to find a kind of design derived from the formulated designed porcelain body. Comparison between each recipe proved the comparable cast and production performance. The evaluation by a conventional production practiced awarded a perfect result. The casting slips provided alternative substance for production based on the design approaches. In the terms of productivities, these local hard porcelain explorations have enhanced the production yield which automatically can inspire a new tableware design development. Highly technological innovative exploration as alternative body component also can contribute with the enhancement to a complex design and development in the ceramic industries.

Keywords Hard porcelain • Formulation • Physical reaction • Slip casting

R. Anwar (✉) • V.V. Vermol
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: rusma935@salam.uitm.edu.my

M.R. Salleh • Z. Zakaria
Department of Industrial Ceramic, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

M.R. Hassan
Advanced Materials Research Centre, Sirim Berhad, Seksyen 2,
40000 Shah Alam, Selangor, Malaysia

1 Introduction

Porcelain, pronounced POUR suh lihn, is a type of ceramic highly valued for its beauty and strength. It is often called china, or chinaware, because it was first made in China. Porcelain is a ceramic material made by heating raw materials, often including clay in the form of kaolin, to high temperatures in a kiln at temperatures between 1,200 °C (2,192 °F) and 1,400 °C (2,552 °F) [1, 2]. The toughness, strength and translucence of porcelain arise mainly from the formation of glass and the mineral mullite within the fired body at these high temperatures. Essentially, porcelain is achieved by combining kaolin with feldspar and firing the mixture to the point where the body is on the verge of melting. The composition of porcelain is highly variable, but china clay, comprising mainly or in part the platey clay mineral kaolinite, is often a significant component. Other materials have included feldspar, ball clay, glass, bone ash, steatite, quartz, petuntse and alabaster [2, 3]. Hard-paste porcelain is a hard ceramic that was originally made from a compound of the feldspathic rock petuntse and kaolin fired at very high temperature. It was first made in China around the nineteenth century [1].

2 Experiment Methodology

This physical test body formulation is to discover shrinkage, bulk density, water absorption and the strength of the ceramic body. Unlike other clay bodies, hard porcelain can only be prepared from a body compounded of several ingredients and is impossible to be produced from any single natural material. Hard porcelain is distinguished from other clay bodies only by its whiteness and by the fact that it is thin and translucent [4–6].

The exploration of local materials will base on hard porcelain formula such as kaolin, ball clay, feldspar and silica and extract the formula into four groups of recipe with different percentages of kaolin, ball clay, potash feldspar, silica and calcium carbonate. Hard porcelain formula will be divided into four different compositions as physical test procedure. The test bars will be fired on four different temperatures which were determined at 900 °C, 1,000 °C, 1,100 °C and 1,200 °C [6].

The experiment began with looking into the shrinkage of the hard porcelain body. Shrinkage, contraction of clay or bodies within drying and firing caused by the loss of physical and water chemical sand the archiving of molecular density [7]. It continues with the second stage to find the bulk density of the body. Mass/volume is a property of particulate materials. It is the mass of many particles of the material divided by the volume they occupy [7]. The volume includes the space between particles as well as the space inside the pores of individual particles [6]. It is not an intrinsic property of a material and can change depending on how the material is handled. In the third stage, water absorption of the body will

be scrutinized. All organic polymeric materials will absorb moisture to some extent resulting in swelling, dissolving, leaching, plasticizing and/or hydrolyzing events which can result in discoloration, embitterment, loss of mechanical and electrical properties, lower resistance to heat and weathering and stress cracking [6]. It is about identifying amount of water absorbed by a porcelain body when it is immersed in water for a stipulated period of time. The purpose of this experiment is to see the original result and also to find a suitable raw material and the best formula of hard porcelain which later can be matched with the design that has been developed, in order to automatically utilize it to produce new product design with better quality [7].

3 Reportoning of Ingredients for Porcelain Body Formula (Table 32.1)

3.1 Porcelain Preparation

This process takes about 4 h before the porcelain can be used. Diagram 2 shows the ball mill that was used in jar mill. Diagram 3 and 4 show the material before and after milling process, respectively (Fig. 32.1).

3.2 Test Bar Preparation

The test bar will be standardized with each piece developed in 10 cm (length) × 1 cm (depth). The sample required a sample's code with the firing temperature (Table 32.2 and Fig. 32.2).

Table 32.1 Conventional slip body shrinkage

Porcelain batch	Batch 1	Batch 2	Batch 3	Batch 4
Kaolin	40 %	30 %	25 %	25 %
Ball clay	10 %	15 %	25 %	20 %
Potash feldspar	25 %	18 %	25 %	25 %
Silica	25 %	35 %	20 %	20 %
Cal/carbonate		2 %	5 %	10 %
Total	100 %	100 %	100 %	100 %
Water	45 %	45 %	45 %	45 %
Sodium	0.3 %	0.3 %	0.3 %	0.3 %
Specific gravity	1.69	1.64	1.73	1.76



Fig. 32.1 Porcelain milling process by jar mill

Table 32.2 Samples code

Sample identity			
Porcelain 1 =P1	Porcelain 2 =P2	Porcelain 3 =P3	Porcelain 4 =P4

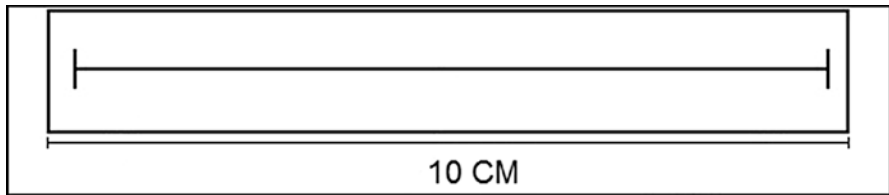


Fig. 32.2 Standard test bar [7]

Shrinkage is a contraction of clay or bodies in drying and firing caused by the loss of physical and chemical water and the archiving of molecular density. In this experiment 80 pieces of test bars have been prepared to follow physical test procedure. Twenty pieces of test bars are provided to represent one porcelain body and will be fired at four different temperatures of 900 °C, 1,000 °C, 1,100 °C and 1,200 °C. The vernier calliper was used to aid in measuring all the shrinkage [8, 9].

4 Shrinkage

$$\text{Dry Shrinkage}(\%) = (\text{Original Length} - \text{Fired Length} / \text{original Length} \times 100).$$

Figure 32.3 shows the result of all porcelain shrinkages after firing process. It was found that Porcelain 2 has the highest percentages of shrinkages after firing process. This is followed with Porcelain 1, Porcelain 3 and lastly Porcelain 4. It resulted that higher firing temperature increased the rate of shrinkages. After firing process, it was found that the percentages of shrinkages of Porcelain 1 were at 3.74 % after firing at 900 °C, 3.6 % after firing at 1,000 °C, 4.74 % after firing at 1,100 °C and 11.72 % after firing at 1,200 °C. Porcelain 2 was found to shrink at

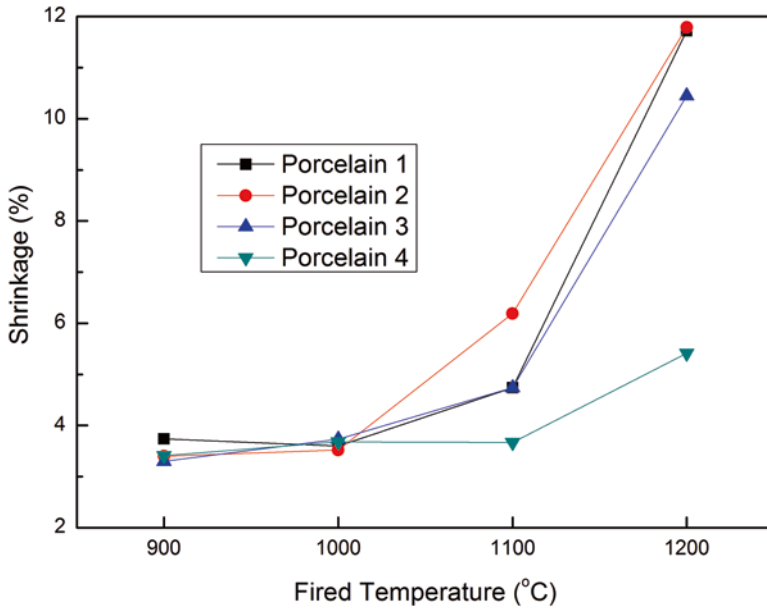


Fig. 32.3 Physical test: shrinkage result

3.4 % after firing at 900 °C, 3.52 % after firing at 1,000 °C, 6.19 % after firing at 1,100 °C and 11.79 % after firing at 1,200 °C. Subsequently, it was found that the percentages of shrinkages of Porcelain 3 are 3.30 % after firing at 900 °C, 3.73 % after firing at 1,000 °C, 4.74 % after firing at 1,100 °C and 10.45 % after firing at 1,200 °C. Porcelain 4 shrinkages after firing process were found at 3.41 % after firing at 900 °C, 3.68 % after firing at 1,000 °C, 3.67 % after firing at 1,100 °C and 5.41 % after firing at 1,200 °C.

5 Water Absorption

Water absorption is the amount of water absorbed by a composite material when immersed in water for a stipulated period of time [7]. It is also the ratio of the weight of water absorbed by a material to the weight of the dry materials. In this experiment dried weight of the entire test bar after firing was recorded. After that the entire test bar must be soaked in fleshy container filled with water and the soak weight of the test bar is recorded [8]. This is the formula to determine water absorption:

$$\text{Water Absorption} = (\text{Soak weight} - \text{Fired weight} / \text{soak weight}) \times 100$$



Fig. 32.4 Soaking procedure

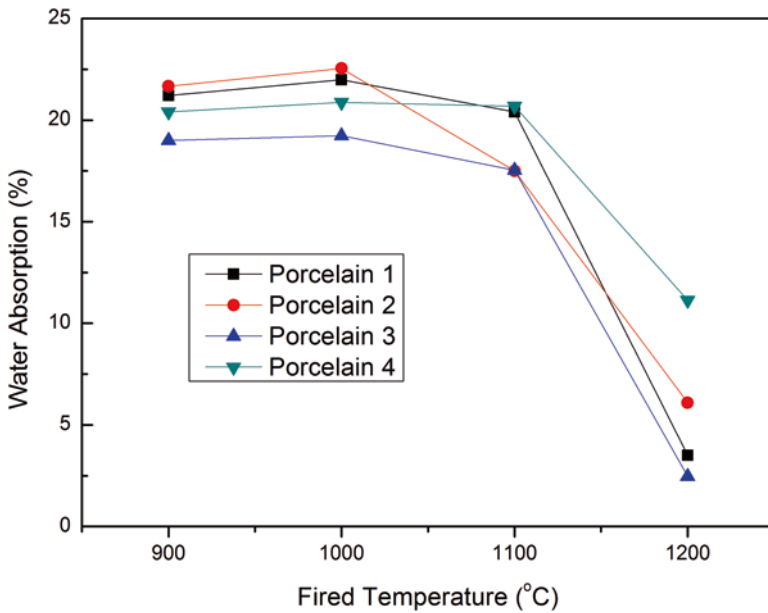


Fig. 32.5 Physical test: water absorption result

Figure 32.4 showed the test bar soaked in fleshy container filled with water. This process is about 24 h before soak weight of the test bar is recorded. Diagram 2 shows that triple beam balance has been used to determine weight of the test bar. The table below shows all the result of water absorption after firing process.

Figure 32.5 shows the result of all porcelain water absorption after firing process. It was found that Porcelain 4 has the highest percentages of water absorption after firing process, followed by Porcelain 2, Porcelain 1 and Porcelain 3. We can see increasingly higher firing temperature decreases rate of water absorption. Water absorption for Porcelain 1 after firing process was found at 21.21 % after firing at 900 °C, 21.99 % after firing at 1,000 °C, 20.4 % after firing at 1,100 °C and 3.51 %

after firing at 1,200 °C. Porcelain 2 water absorption after firing process was found at 21.67 % after firing at 900 °C, 22.55 % after firing at 1,000 °C, 17.5 % after firing at 1,100 °C and 6.09 % after firing at 1,200 °C. Porcelain 3 water absorption after firing process was found decreased at 19.00 % after firing at 900 °C, 19.24 % after firing at 1,000 °C, 17.54 % after firing at 1,100 °C and 2.46 % after firing at 1,200 °C. It was found that the percentages of water absorption of Porcelain 4 were at 20.4 % after firing at 900 °C, 20.87 % after firing at 1,000 °C, 20.68 % after firing at 1,100 °C and 11.13 % after firing at 1,200 °C.

6 Bulk Density

Bulk density is a property of particulate materials. It is the mass of many particles of the material divided by the volume they occupy [7, 10]. The volume includes the space between particles as well as the space inside the pores of individual particles. The formula to determine a bulk density will base on the formula below:

$$\text{Bulk Density (g / mm}^3\text{)} = (\text{dried weight / volume}) \times 100$$

Figure 32.6 shows the result of all porcelain bulk density after firing process. It was found that Porcelain 3 has the highest average of bulk density after firing process, followed by Porcelain 1, Porcelain 4 and lastly Porcelain 2. We can see increas-

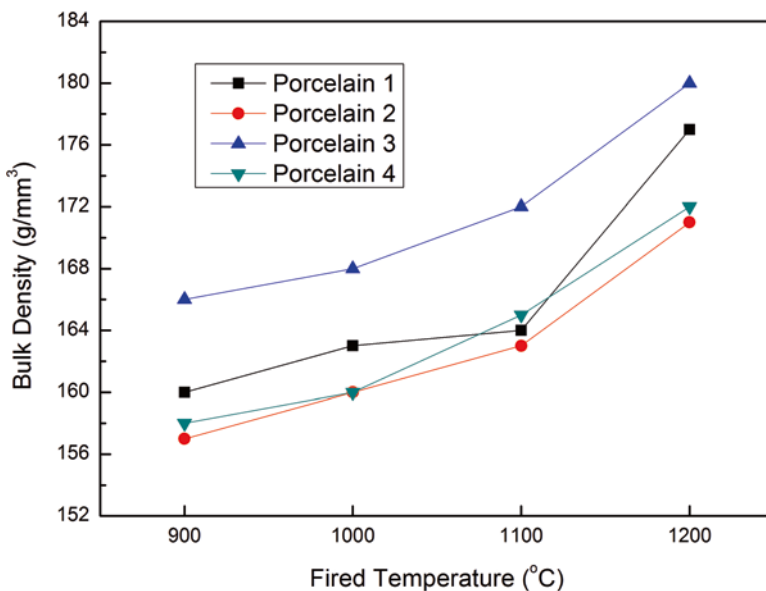


Fig. 32.6 Physical test result: bulk density

ingly higher firing temperature increases rate of bulk density. Based on the reading it was found that the average of bulk density on Porcelain 1 is at 160 g/mm³ after firing at 900 °C, 163 g/mm³ after firing at 1,000 °C, 164 g/mm³ after firing at 1,100 °C and 177 g/mm³ after firing at 1,200 °C. Porcelain 2's bulk density after firing process, being the lowest reading, was found at 157 g/mm³ after firing at 900 °C, 160 g/mm³ after firing at 1,000 °C, 163 g/mm³ after firing at 1,100 °C and 171 g/mm³ after firing at 1,200 °C. Porcelain 3's bulk density after firing process was recorded achieving highest reading at 166 g/mm³ after firing at 900 °C, 168 g/mm³ after firing at 1,000 °C, 172 g/mm³ after firing at 1,100 °C and 180 g/mm³ after firing at 1,200 °C. Porcelain 4's bulk density after firing process was found at 158 g/mm³ after firing at 900 °C, 160 g/mm³ after firing at 1,000 °C, 165 g/mm³ after firing at 1,100 °C and 172 g/mm³ after firing at 1,200 °C.

7 Physical Test Result

Figure 32.7 shows the result of all porcelain shrinkages and water absorption against firing temperature. As we know good porcelain has low percentages of shrinkages and water absorption after firing at 1,200 °C. We can see that Porcelain 3 has low percentages of shrinkages at 10.45 % and low percentages of water absorption at 2.46 % after firing process.

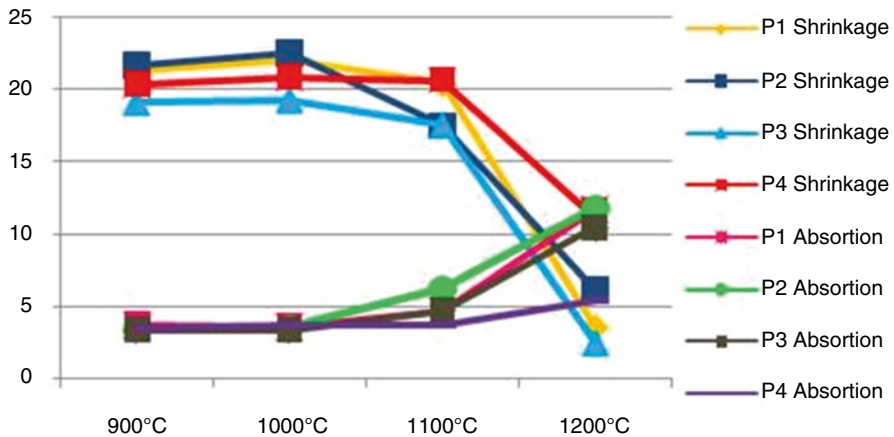


Fig. 32.7 Cross tab shrinkage vs water absorption

8 Conclusion

The need for the porcelain clay studies has become significant in production of ceramic product and education application. Although the research has long been conducted, based on the observations and testing, there is still space for further improvement to achieve the objective. Other than its application in ceramic production, the study has also triggered various fields such as artwork production process and also design application [11, 12]. The objective of the study is to enhance the production yield, which automatically can inspire a new tableware design development. The exceedingly technological innovative exploration as alternative body component also can contribute with the enhancement to a complex design and development in the ceramic industries [13]. Design consideration for manufacturing process of the material could widen the use of porcelain into a more affordable material in the future. By studying the porcelain properties through several different compositions of porcelain, shrinkages, water absorption and bulk density, the possibility of commercialization of porcelain could bring benefit to production field and academia.

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Chapter 33

Theoretical Framework for Ceramic Design Studies Facing Advanced Mathematical Educational Research

Rusmadiyah Anwar, Oskar Hasdinor Hassan, and Shahrیمان Zainal Abidin

Abstract *Labu sayong* is one of the significant traditional ceramic crafts in the Malay world and appreciated for its aesthetics, values and motifs. There is so much of mathematical pattern language used in the process of structuring the pattern and form itself. Without any thought about the mathematics principles underlying the process, it will never end up with a variety of designs constructed. This paper will discuss about the mathematical design-thinking framework for the ceramicist especially the Malays and its contribution in the process of developing the industrial ceramic wares. Identified from the observations and derived from ethnographic design theory which put into practice. The investigation will be in the range on some of the structured theoretical frameworks, which observational design approaches as main measurement, accuracy, equality, transformations and estimation in exploring the development process. Finally, the paper concludes with the possibility of Malay design challenge identified by implementing the protocol analysis procedures, offering valid comparison of experimental data across the whole range of research undertaken.

Keywords Industrial ceramic • Mathematical principle • Design challenge • Design thinking

1 Introduction

1.1 Research Motivation

This research will investigate the design specification and mathematical thinking that practiced based on a *labu sayong*. Which fundamental of designing a form structure and pattern composition still widely discussed. The most part design were

R. Anwar (✉) • O.H. Hassan • S.Z. Abidin
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: rusma935@salam.uitm.edu.my

builds on a same standard layout as the properties design needs [1]. The design layout of *labu sayong* shows a big difference even though it was initiated by a different craftsman. At the same time, the created designs consequentially showed an existing mathematical principle. It's proven by form's structure, neither ergonomics nor balance. As expected, these mathematical values turn out to be the expectation as fundamental of design for Malay's designer [2]. Niss, as reported by Ernest in 1991, explained that the mathematics education suddenly moved into another level of thought. Previously, lot of individuals are ignorant of the basic facts of mathematics and its theory. It shows a kind of perspective that became an obstruction towards the success of capability in lifelong learning, especially in adapting mathematical approach to build new-fangled knowledge and pertain them to 'situations which are of significance to their private, social and professional lives'.

Escher's first issue of an impossible reality was *Still Life and Street* in 1937. This woodcut print shows the artist's imaginative perspectives and his expression, wherein he created images in his minds. His famous 'Drawing Hands' shows two hands at work where one was actively drawing the other. In the direction of mathematical ability, Escher essentially used calculation and made use of line and the advantages of quirks of perception and perspective in his drawing. Escher's artworks had strong mathematical components even though he was deficient in mathematics education. However, with the high understanding of mathematics prove the significance values of his artworks visually and spontaneously generated. Moreover, many of Escher's artworks applied the tessellation concept. In other views, Escher is a trendsetter of using polyhedral and geometric distortion who was mainly admired by mathematicians and scientists. These statements have some correlation with the problem that engages the Malay challenge in designing local ceramic design. Most of the existing idea is expressed and influenced by the East and West colonial. Although a complete history has been recorded, none of the ceramic design revealed a local identity. In order to achieve the goal, the structure and pattern design of *labu sayong* will be considered to illustrate Malay's fundamental ceramic design was influenced by mathematical approaches.

1.2 Contributions and Paper Outline

The purpose of this paper is to present a theoretical framework of mathematical design research towards investigation on model or models which may be appropriately used, and in what context as fundamental for industrial ceramic design practice. First, the problem faced by the industrial ceramic designer especially local Malay is in what context the mathematical value is adapted. The adaptation of mathematical approaches on the existing design and the application used is reviewed. Includes the use of Pattern Language model could be as a part of solution-based reviewed in Sect. 2. Then, an important design requirement in the mathematical design research is identified and discussed in Sect. 3. While the interactions between the two models draw the most attention, the combination of two concepts structured

and detailed is the main focus of Sect. 4. Authors rely on and believe that understanding the use of mathematical design is fundamental for industrial ceramic design in specific context.

2 Industrial Ceramic Design Challenge

2.1 *The Existence of Mathematical Thinking by Associating Modern and Conventional Product in Ceramic Design*

Any industrial ceramic designers who wish to become mathematically able should be open to mathematical experiences that promote decisive thinking. The problem is that a great number of designers either turn back thinking about or respect or dislike mathematics. Their fear of frozen on their fortune in mathematics learning. Mathematical concepts are considered shallow when the ceramist, as the one and only source of information, cannot apply its basics that have been used since the good *labu sayong* has created. Problems are associated with the Malay design concept; additional investigation of human factor to achieve best design balance with culture is required for sustainable Malay design trends. Relatively, a high number of literature used for Malay ceramic design based on *labu sayong* and its association with a new development were not compatible for the purpose of introducing an original Malay ceramic design.

In working towards achieving the aim, this study is guided to investigate the influence among the mathematical concept in the scope of Malay ceramicist. Concerning accomplishment of design solution, a new fundamental of pattern design for Malay ceramic ware needs responsive establishment. Figure 33.1a, b was a design development studies reported by Noordin described the significance of evaluating and comparing a design structure between teapots with *labu sayong* could initiate a new design for Malay Fusion Teapot [3]. The segmenting practice on the form structure has realized the existence of mathematical influence in Malay design-thinking process.

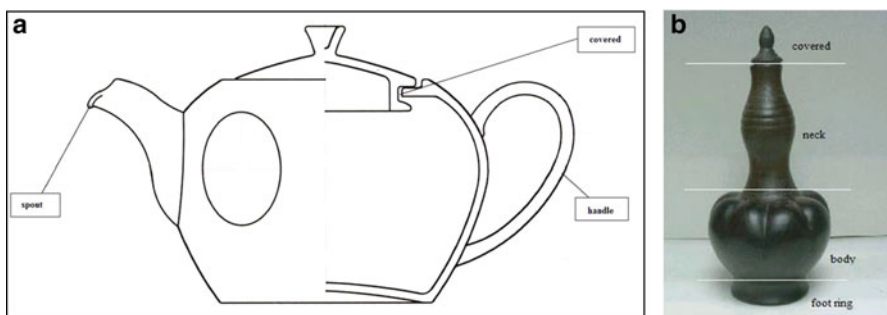


Fig. 33.1 (a) Teapot design structure; (b) *labu sayong* design structure

Noordin also has defined the importance of including a mathematical design education in *labu sayong*. The introduction of luminescence theory in modern *labu sayong* initiates more alternative design methods [4]. A formulation procedure in developing material includes firing parameter identification that required another skill in dealing with mathematics. These samples proved the possibilities of connecting the mathematical demand by the Malay designers in introducing a new product design.

2.2 The Adaptation of Pattern Language in Relation to Ceramic Design Education

A pattern language was specified by Alexander and popularized in his book *A Pattern Language* [5]. It is a structured method of describing in force design effectuation within a field of expertise. Advocates of these design approaches claim that people can use it to successfully solve very large and complex design problems. He confirms two essential purposes behind this format: first, to present each pattern connected to other patterns, within which you can create an infinite verity combination, and, second, to present the problem and solution of each pattern in such a way that you can judge it yourself, and modify it, without losing the essence that is central to it. These rationalizations provide evidence that when any designer designs something whether it is a house, computer program or lamp, they must compose numerous decisions about how to solve problems. In that sense, all patterns combined together will for a language.

By design, it creates a coherent picture of an entire region, with the power to generate such regions in a million forms, with infinite varieties in all details. The range of situations in which the problems and root addressed in a pattern apply is known as its discourse. The crucial part in each pattern is to describe this context. Examples can further elaborate on how the pattern applies to very different situations. For ceramic product design incorporated with Malay design thinking is in agreement with Alexander; any small sequence of patterns from this language is itself a language for a smaller part of the ceramic design situation. This small list of patterns is then capable of generating a million sanitary wares, tiles, tableware, art ware or craft design.

3 The Challenge of Adopting Advanced Mathematical Design Research in Ceramic Design

Adaptations of mathematical approaches in ceramic design fundamentally differ with the conventional approaches. The design research suggested four segments concerning on how to turn the abstract into concrete design phases. The implementation is important to quantify especially on the design structure development.

3.1 Design Classification

Throughout design, one of the fundamental challenges is the restriction, for example, restriction on the element of arts and the value of design. The problem of compartmentalization requires key outy and beginning. Once in a while, new discoveries suggest changes to the organization [6]. The number of patterns used will be investigated to set where exactly the pattern is initiated. This advanced mathematical influence will discover with each form sex to the pattern re-paper. The structured forms and patterns are grouped into classes. These classes have both synchronic names (updraft, downdraft or cross draft) and numbers.

3.2 Mathematical Design Research

In mathematics, assortment troubles also require key examples and judgement organization. Mathematical classifications have one extra feature – completeness. Escher concept which he spent a great deal of elbow grease on classification problems, elicited in separate symmetries, apposition, polyhedral, stamping normal, joined seating, and probably many more mathematical compendium [7]. One clear reason for his interest was that he used these concepts in his artwork and wanted to discover all possible variations. This method will inspire Malay designers to also have a concern on classification for the same justification as scientists – psychological feature and agreement of the world. Moreover, it takes time in examining symmetries, apposition, and other concepts. In practice, the study will easily simplify and classify problems involving polygonal shape as a sample.

3.3 Core Issues for Investigation May Include Frieze Patterns on Labu Sayong

All patterns on *labu sayong* should be identified and investigated to see the translation symmetry present. A horizontal frieze pattern and vertical frieze pattern are studied for further investigation on mathematical studies. It is important that the study on each pattern extends infinitely far in both directions, so that there are no ‘ends’ that appear different. One must calculate translational length is to know the distance between repeats of the pattern and how it exists. Translational symmetry is described with an arrow that gives both the length and direction of the symmetry.

3.4 Analysis and Evaluative Methods May Include Tessellations by Recognizable Pattern

This exploration is aimed at using the techniques from the first section of Tessellations by Recognizable Pattern to find some composition. Conversion is used to find out if any tessellation existed. Composition has to create a recognizable pattern. On the following geometric or organic composition, modify one side, and propagate that change throughout the tessellation by rotating about the highest point. Midpoints on the sides of one of the points, modification on half of each of the sides, and spread the change rotations through the midpoints.

4 The Proposed Theoretical Framework Solution

In this research, the theoretical framework solution for all challenge faced in ceramic design activities was derived from the research model defined by Cash as shown in Fig. 33.2. The selection of this research model is to allow the industry to implement a research-based strategy to be aligned with their conventional operating protocols [8]. It will give a comparability foundation between the industrial and academic researches.

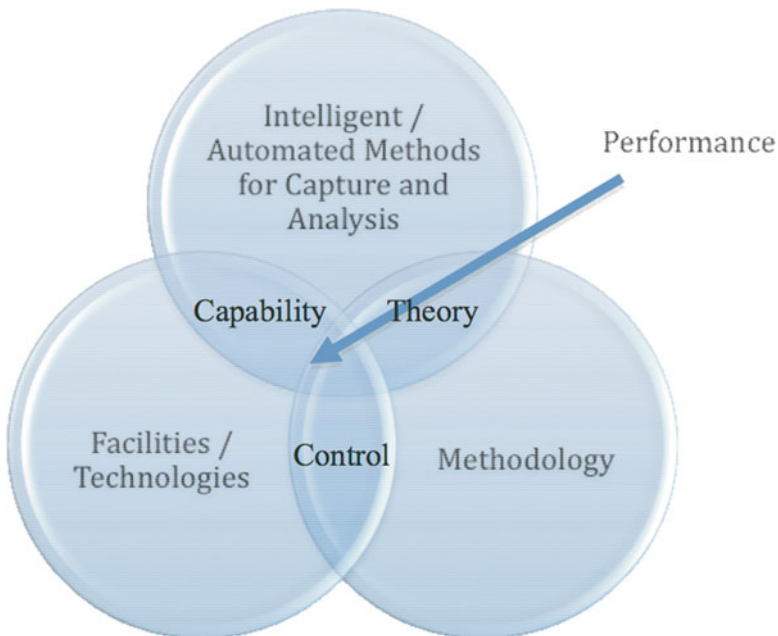


Fig. 33.2 The three-part research model defined by Cash [9]

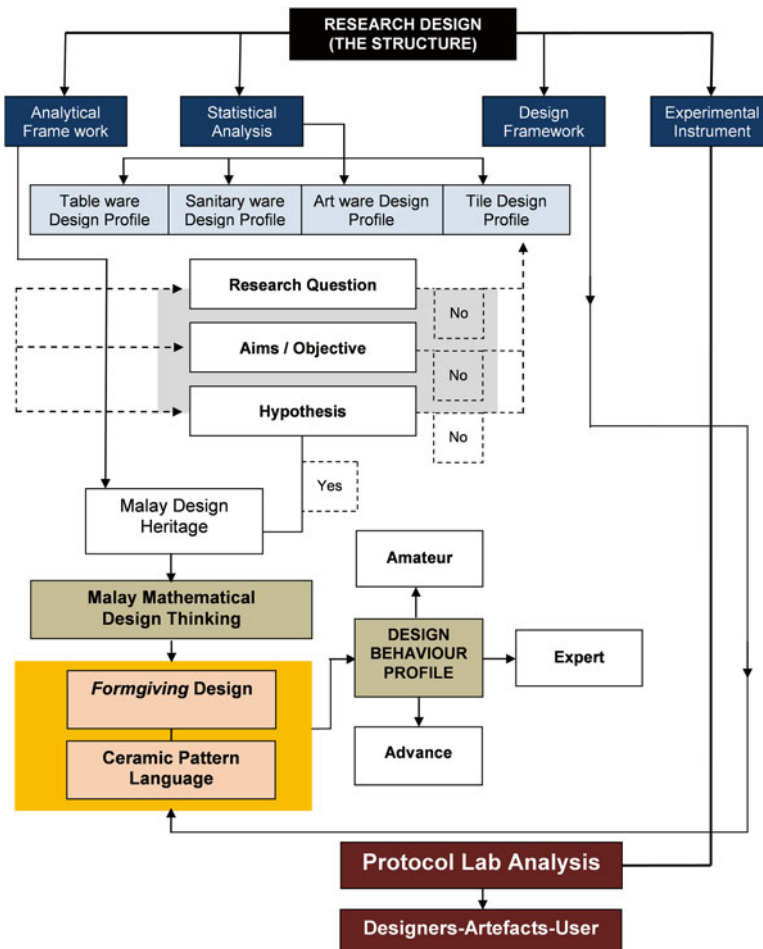


Fig. 33.3 Research design framework to investigate the Malay mathematical design thinking

The identification of design challenge will be made between lab-based and industrial tests, different cultures and facilities as well as other key areas. The theoretical framework proposed to undergo the Protocol Analysis Lab procedure in order to identify the mathematical design thinking among Malay designers. The lab, which consists of a setting artificial environment, will be used to investigate the design behaviour among selected Malay designers [10]. Figure 33.3 shows the activity of empirical design research that brings Amateur-Advance-Expert designer as subject matter. The aim of selecting those three different levels of design is to empirically investigate rather any experienced background, history or knowledge to provide significant findings. This comparison of groups will gain a pattern used as a language where the task of investigation will apply. The groups of designers mentioned will be

given a task on structuring based on four ceramic product segments: sanitary ware, tableware, tile and art ware. *Formgiving* in design development as wrap up by Abidin furthermore becomes the benchmark in design solutions comparable to the four product segments. The selection of *formgiving* design theory nearly because it's related to the artistic visual elements, while in engineering design, the use of this same keyword is related to the engineering principle solutions [11].

4.1 Experimental Instrument

Minghini et al. believed that by challenging the principle of the ceramic material itself, they can perform a ceramic constructive artwork beyond the ability of its nature [12]. The experiment instrument is applied as a theory mentioned by Driver [13] who explained: it is invaluable to understand how an object functions, how it will be held, what it feels like to touch and how it performs when used as intended. Instead an evaluation on mathematical design processes in ceramic design, it would keep on judging similarities among the classifications of decorative patterns as related in the Minoan pottery where the finding follows a command pipeline that could be easily altered to other similar proceeding studies. Papaodysseus, who developed the automated system of rules that was built to assist the archaeologist, concludes any judgement [14]. His finding offers new method in computational pattern recognition and digital archaeometry, showing scholar how to discover dependable machine-controlled methods for quickly reconstructing archaeological matter and benefit from the application of non-destructive, automated processing of archaeological find. In this study, a detailed design drawn by designers will be used as a tool to investigate the design thinking. This entire design task is then compared to the pattern language used by the craftsmen while designing *labu sayong*. Continuously, all patterns shows will derived to the quantitative structure that can be contributes to the four industrial ceramic product segments mentioned. In conjunction with the finding, there will be high possibility to introduce a new design segment into any industrial ceramic products.

4.2 Observation Design Approaches

The confirmation of quantitative design structure mentioned requires undergoing the Verbal Protocol Analysis as rethought by Abidin [10]. It is very important to validate all order suits with industrial design practice. The direction of observation design approaches will be carried out and emphasized based on the model developed, the CSWD model [2]. It is used to clarify the significance of interaction design research as design practice in industrial ceramics. Observation design approaches will be set in practice of artificial design situations. With the time frame set, the observation procedure required technological challenge. In conjunction with Design

Observatory, the development and implementation need to use the extended and intelligent design environment [9].

The key factor on this kind of design research is based on the well-ordered environment where the full volume of data can be recorded, developing a real-life scene or design scenario for the experimentation. The creation of database in the Protocol Analysis Lab for the whole range of module combinations allows a database to be created where clear relationships and trends can be explored. Particularly important for the proposed theoretical framework is understanding the relationships between different facilities and cultures, the context surrounding industrial and academic environments and the construction of meaningful comparison between these areas. The three subject Designer-Artefacts-Users shown at the end of flow as the core aspect to confirm the existence of mathematical design challenge and identifications.

5 Closing Remarks and Suggestions for Future Work

This paper discusses the challenge faced by the Malay designers by taking ceramics as subject to be discovered. The conceptions to be erudite are taken into the experience in which they lock. The Malaysian ceramicists are tortuous in determining what they will learn and how they are going to learn it. Winning *Labu Sayong* as benchmark as Malay first design, result can be provided with opportunities to develop mathematical thinking and diagnose their own power to utilize mathematics into varied post of creativeness. The example will test on designer's possible ways of facilitating basic cognitive process in a possibility-rich design environment.

In order to address the limits and try to overcome this challenge, theoretical framework is proposed with consideration of the ethnographic design research [8] and the implementation of observation design approaches. With an artificial but following standard environment sets, it can aloud a multiple test with core data to structure a reference frame against which experiments can be added and compared with truly scientific data. Offering valid comparison experimental data across the whole range of research undertaken.

Successful investigation will lead and offer a designer the freedom to explore the research and attach their mathematical thinking abilities. It will expatiate into trade good look into the following likely research, amongst others and can be widespread. Any pattern design used in all house of worship and Malay residence driven portable applications to industrially a product of ceramic. Advanced mathematical design concept hopefully ensures the Malay design heritage.

Acknowledgements We would like to acknowledge the generous participation of the interaction designers in the research. This study was conducted in Formgiving Design Research Lab established by Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to Malaysia's Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 34

Layout Design of *Muwajjah* from Safavid Collections

Rosmahani Mat Hussain, Rusmadiyah Anwar,
Muhamad Fairus Kamaruzaman, and Rafeah Legino

Abstract Design pattern is an arrangement of lines and shapes that can be seen on surface as a decoration to embellish the art beautifully. There have been plenty of designs in Islamic art such as geometric, arabesque, and calligraphy which are generally familiar in the art world. Furthermore, this paper will be discussed as an ornament in the manuscript of Safavid's Qur'an called *Muwajjah* pattern that derived from Arabic words which mean front page. The purposes are to study the layout design of the *Muwajjah* pattern from Safavid collections and to preserve the Islamic art in Qur'an's manuscript from art modernity. The approach of this research starts from overviewing the related literature review on Safavid art and gathered relevant information from an Islamic art Museum officer. This will assist in gaining their feedbacks on the *Muwajjah* design pattern. This study can be a crucial topic to other researchers and designers in order to conserve the Islamic art.

Keywords Design pattern • Islamic art • Muwajjah pattern • Safavid

1 Introduction

Qur'an is the "mother of all books" and the record of divine revelation of God in Islam. It was copied and compiled in a manuscript by hand to guide the Muslims. The manuscript was written in Arabic words as the language of the Holy Qur'an

R.M. Hussain (✉)

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor Darul Ehsan, Malaysia

R. Anwar • M.F. Kamaruzaman

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: rosmahanimhussain@gmail.com

R. Legino

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

with 114 chapters of *surah*. The earliest Qur'an manuscript was written in *hijazi* script text which is one of the calligraphy styles. Moreover, calligraphy has been evolved into art, and from that it is grown into another style of calligraphy such as *kufi*, *naskh*, *thuluth*, *diwani*, *riq'ah*, and *ta'liq*. Calligraphy in Greek word means beautiful writing, and it is important in the Islamic world as it related to Qur'an [1]. Besides calligraphy, there are also illuminations in the manuscript called the *Muwajjah* pattern. *Muwajjah* derived from Arabic words that mean front page which is the most beautifully drawn by an artist in order to express the freedom in their nature in art, and it usually has full ornaments in a manuscript. The religion and art are autonomous agents and they have relation with each other [2]. Figure 34.1 below shows the example of the manuscript of *Safavid* Qur'an.

The illumination in Qur'an has been influenced by many countries and has the *Muwajjah* design pattern on its own. This paper will be discussed about the *Muwajjah* pattern in the Safavid era. The purposes are to study the layout design of the *Muwajjah* pattern from Safavid collections and to preserve the Islamic art in Qur'an's manuscript from art modernity. The Safavid Empire dawned at the beginning of the sixteenth century bringing about new administrative and cultural reforms in the reign. One of the fields that greatly flourished was art. It has been historicized that the Safavids were artists themselves which was ultimately a strong reason for the development of art and culture.



Fig. 34.1 Safavid Qur'an

2 Research Background

In the Islamic visual art, figural images are not allowed to replicate any real-life object unless they have been styled or have a natural element such as floral and geometry design. Because of the flexibility of Arabic letter forms and the apparent desire of early Muslims to distinguish their culture from those of the people they conquered, the decorative properties of the Arabic script were appreciated and exploited from the beginning of the Islamic era onwards [3].

According to Kuhnel in Koran manuscript, Al Qur'an, *Muwajjah* is a symbol of the concept and meaning of the light. In addition, the continuity of the *Muwajjah* pattern also can be seen in every page of Al Qur'an as a frame. The illumination in Al Qur'an started on the first century of Hijra [4], and Dust Muhammad states that Ali bin Abi Talib was introduced as the *tazhib* in Al Qur'an [5].

As time goes by, the Islamic world has evolved and gives a lot of influence in Islamic art. In the sixteenth and seventeenth centuries of the Safavid era, the decorative art in the Al Qur'an has reached the highest artistic achievement values [6]. The name of Safavid derived from the ancestor Ismail, Safi od-Din, which is founded in 1502–1736 [7]. It is located in Iran and reasserted the Iranian identity of the region. The art of illumination in the Persian manuscript has a considerably longer history than that of miniature painting.

From the earliest Safavid Qur'ans, the gold decoration was emphasized in the holy book's heading, and its chapter (*surah*) in the form of horizontal rectangles enclosing the *surah* heading and the most sumptuously decorated manuscripts contain a *shamseh*, an Arabic word that means sun [8]. The placements of illumination in manuscripts follow certain established norms in the Safavid period.

Furthermore, the illuminated frontispieces without writing appear in double pages in Abbasid Qur'ans as early as the tenth century although these pages normally incorporate writing within a complex framework of bands of illumination by the sixteenth century. The style of illuminated in Qur'an changed when paper replaced the vellum (parchment) and the format of vertical bound books increase compare to horizontal.

3 Method

The research is focusing on the *Muwajjah* design pattern in the Safavid era, and the approach of this research starts from overviewing the related literature review on Safavid art. In addition, an interview will be held to get feedback on the *Muwajjah* pattern from the experts in the field. Interviews are useful to understand consumer perceptions, motivation, opinions, and behavior concerning products or services [9–11].

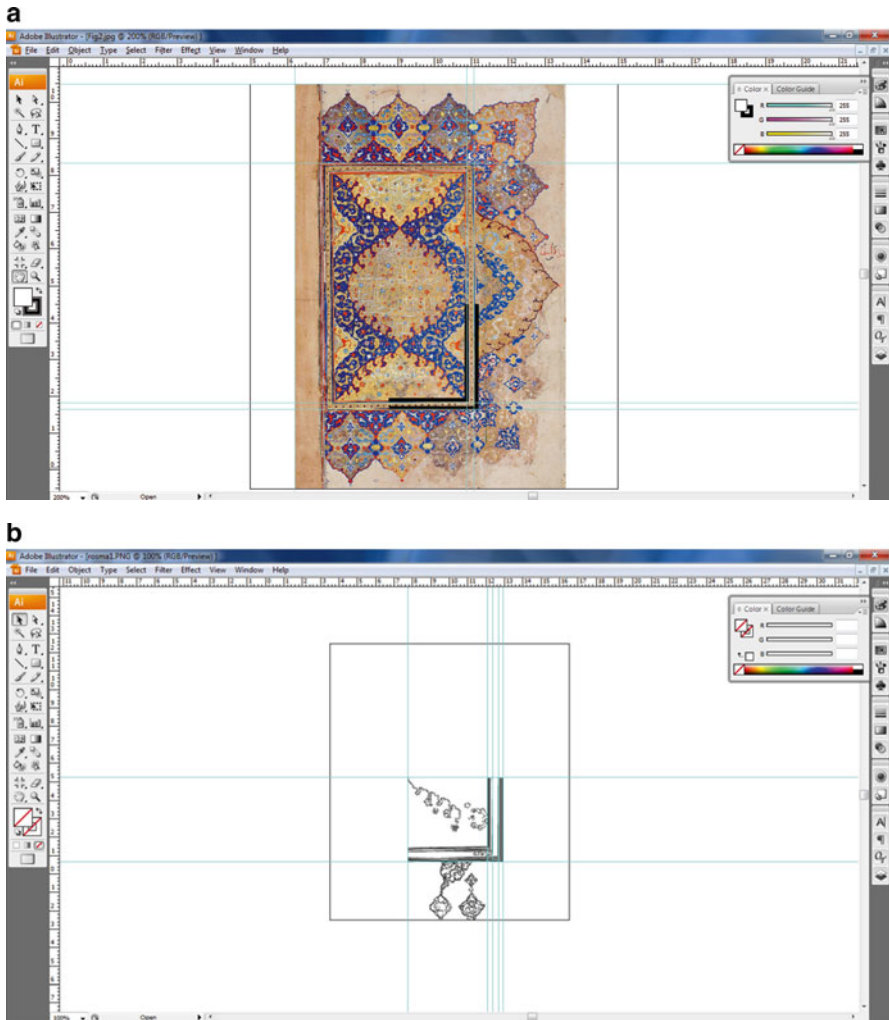


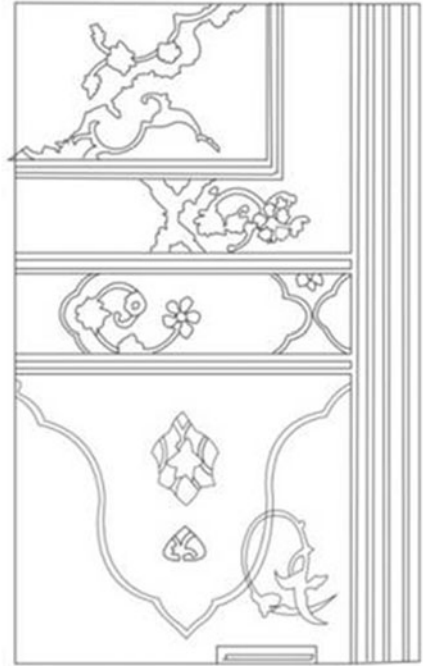
Fig. 34.2 (a) Tracing technique of *Muwajjah* using Illustrator. (b) Tracing result of *Muwajjah*

Furthermore, to study the layout design of *Muwajjah* from Safavid Qur'an, tracing technique will be used in order to capture the layout design using Adobe Illustrator to get a sharp design such as that shown in Fig. 34.2a, b.

4 Analysis

Based on the figures below, there are three examples of *Muwajjah* from the Safavid era. Figure 34.3a–c shows that the structure has a reflection or mirror repeat in creating the illuminations. There are also geometric patterns and floral fauna as decorations. The structure also looks fully ornamented with small flowers and filigrees.

a



b

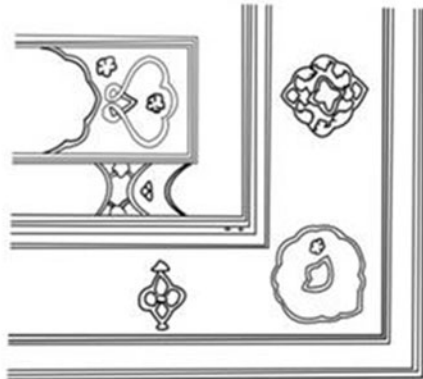
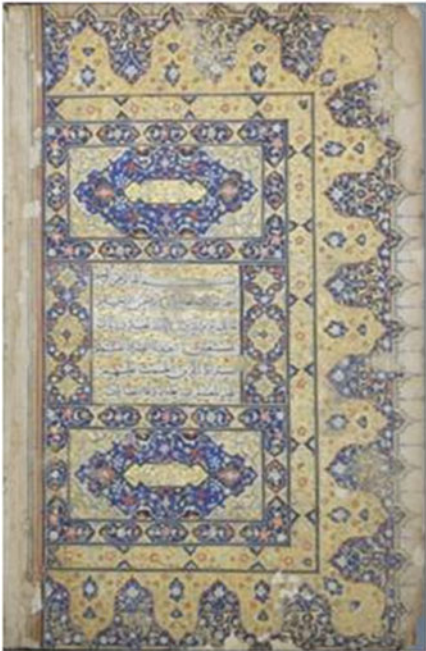


Fig. 34.3 (a) Safavid Qur'an. (b) Safavid Qur'an. (c) Safavid Qur'an

c

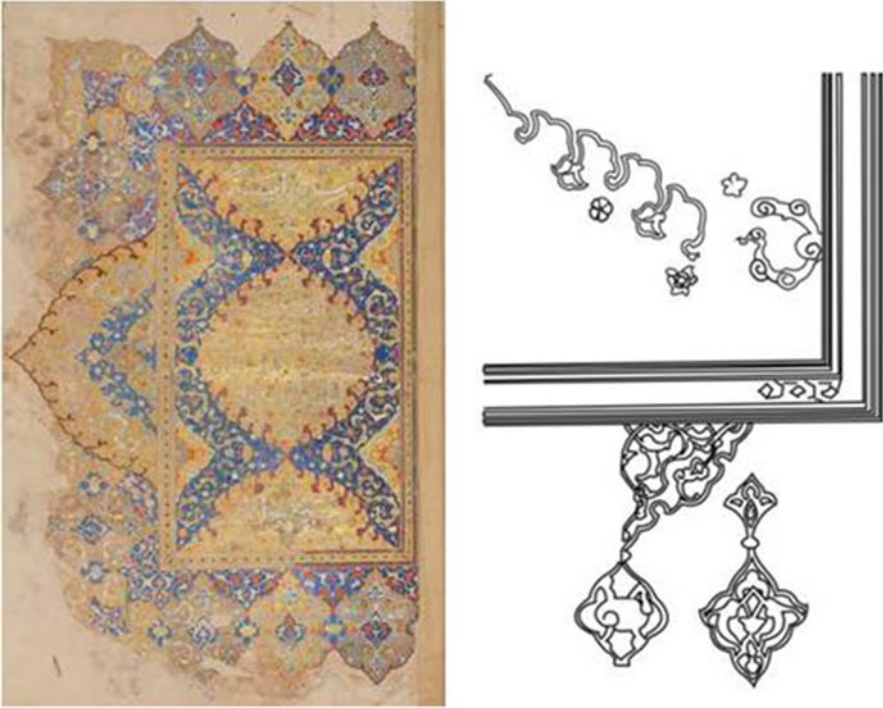


Fig. 34.3 (continued)

In addition, the illuminations were drawn with details by hand and have different designs between the columns. Overall, in these three examples of Safavid Qur'an, it is using dark blue and golden color.

5 Conclusion

Safavid is one of the successful eras that has reached the highest artistic attainment standards especially in the Qur'an decorative art. The *Muwajjah* pattern can be used as an art to achieve the splendor in Islamic art which is valuable and unique. Therefore, the researcher hopes through this research that the *Muwajjah* pattern can be preserved as one of the Islamic arts in Qur'an's manuscript from art modernity.

Acknowledgment We would like to acknowledge the generous participation of the interaction designers in the research. This study was conducted in Formgiving Design Research Lab established by the Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to the Malaysian Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 35

Adaptation of Kansei Engineering Concept in Designing Appealing Computer Animation on Sabah Oral Tradition

Teddy Marius Soikun and Verly Veto Vermol

Abstract A few efforts to produce animation on Sabah-rich oral tradition have been done but without understanding on how to create an appealing computer animation, based on feelings and impressions. As animation is a tangible product, it may require impressions before decisions are made to purchase. The Kansei engineering concept may be the suitable method to be incorporated in this project. It proposes to understand how oral tradition animation could be made appealing and identify the affective values, theories, and principles in oral tradition animation. A method will then be proposed to grasp the affective (emotions and feelings) value and will be used to produce a manual on Sabah oral tradition animation.

Keywords Oral tradition animation • Kansei engineering concept • Anime

1 Introduction

A lot of efforts have been done by certain quarters to produce or create animation based on oral traditions. However, there was no concrete understanding on how to create animation based on feelings and impressions of the viewer. The creation of an appealing animation on oral tradition needed thorough understanding on how these kinds of animations evoke feelings and impressions to the viewer. Most of these animations are created without the understanding of appealing narrative and human emotions. Animation is a product just like any other tangible products that requires feelings and impressions before decisions are being made to purchase it.

T.M. Soikun (✉)

Faculty of Humanities, Arts and Heritage, Universiti, Malaysia Sabah,
Kota Kinabalu, Sabah, Malaysia
e-mail: teddysoikun@gmail.com

V.V. Vermol

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

To integrate values in animation, it requires an affective method that can support the process of creating the animation, a method that can translate emotions and feelings. The nearest method related to feelings and emotions is in fact Kansei engineering that has been developed in Japan for the past few years to incorporate the said subjects to the production of animation.

This project proposes to understand how oral tradition animation could be made appealing to the viewers and at the same time improve their interest in viewing such animation. It is proposed to identify the affective values, theories, and principles in oral tradition animation. It is also proposed to identify and propose a method that can be used to grasp the affective (emotions and feelings) value and use them as a base to create an appealing animation.

2 Statement of the Problem

Appeal. It is stated as 1 of the 12 principles of animation. The word is often misinterpreted to suggest cuddly bunnies and soft kittens. To us, it meant anything that a person likes to see, a quality of charm, pleasing design, simplicity, communication, and magnetism [1]. In order for an animation to be successful in conveying messages and receive decent viewership, it must contain the principle of appeal. Many animators and producers are facing problems with appeal. With most familiar with the word but unfamiliar of what it meant. It is hard to define appeal because it is very subjective. Most animation on oral traditions would fail to get good numbers of viewers for the very reason. Citing a case from India, particularly on oral tradition animation, Rishtee Kumar Batra said, “a lot of Indian animated content lacks an appealing narrative” [2], which is the identical case with oral tradition worldwide. India is one of the technology-advanced countries in creative industry with plentiful content on oral tradition. She also said that animation companies just draw their plots from mythology: Ramayana in 1992, Hanuman in 2005, Krishna in 2006, and Luv Kush in 2010. Most oral tradition animations are so focused in instilling values and morale tale until they forget that the foundation of any oral tradition animation is about affecting human emotions, and she further said that almost none of the animated films have been successful.

Oral traditions are told from generations to generations and passed as form of verbal stories, and normally it is a tale about people, life, animals, spirits, and fairy tales. Sometimes it carries morals and life values. As stated by Lopamudra Maitra [3], the reflection of folklore (oral tradition) similarly in animation bears a responsibility of highlighting the underlying message and functions through its tales of legends and mythologies to make the receiver perceive the story as a symbol, a function that it has been performing from the times of oral tradition. Hence creating oral tradition animations carries a distinctive weight. The aim of shaping and guiding young minds and perpetuating sociocultural anxieties remains the same. The responsibility of the storyteller has shifted from the shoulders of the elders in the

family to the gadgets of modern society. The storyteller has the ability to provoke emotions through verbal and body language.

The animation scenario in Malaysia paints a slightly different picture. A few researches blame the aspects of animation education as the main cause of less quality animation [4]. Hassan Muthalib also stated that a lot of animation production houses complained that animation graduates are only trained on animation technology and are less knowledgeable on basic animation, storytelling, cinematography, acting, and editing [5]. From a blog site, discussing about local animation on oral tradition subjects, the writer of the blog was hoping that animation house in Malaysia would continue to produce more animation films on legends and oral tradition like Batu Belah Batu Bertangkup, Raja Bersiong, si Tanggang, and Hikayat Merong Mahawangsa. He added that Malaysia is not without its own great oral tradition, but it must be produced with great creativity and appeal. Another post from a different blog, stating his personal opinion, the writer commented that the very reason why local animation in Malaysia does not do well is not because the plot or script is bad, but the animators involved draw rather badly and the characters and movements lack appeal. The writer also advised animators to start from basic and learn how to draw at least the basic sketch.

The father of Malaysian animation, Hassan Muthalib, points out that local film animators today are so engrossed with how their work looks visually that they forget how to convey a good story [6]. Animators and educators teach only the technique and software and forget the other important basic things to make an animation appealing. He further adds, "But they forgot that the technique is about sending the story across". A good technique or research method to create an oral tradition-based animation must be developed to at least improve the animation-making process to attract viewers and at the same time preserve and convey messages included in these familiar stories. The oral tradition animation had one problem to be solved. It is on how to make it appealing and interesting and to make the story perceive as a symbol, a function that an oral tradition should be making.

3 Methodology

The project is started off with the collection of a few oral traditions from around the world particularly from Japan in the form of animation with standardized qualities to understand the affective values incorporated in them. As there are a limited number of animations that had undergone study on Kansei, the method will be adapted from Kansei engineering studies done on previous research on tangible products like cars, furniture, and web design. A number of animations from Japan proved beneficial as many of them drew their subject from Japanese and Chinese fairy tales and folklore. Toei Doga produced six animation features based on folklore [7]. Some of the animations selected were The Legend of the White Snake (Hakujaden) (inspiration from a Chinese legend) and Magic Boy (Shonen Sarutobi Sasuke) (based on the story of a legendary ninja in Japan.)

The animations specifically on oral traditions were collected through library, DVDs, and online search and analyzed on their impact and magnitude in affective and emotional values assumed significant (generally) and to be chosen later for synthesizing process. Out of all the animations observed, only 30 animations (specimens) were chosen to undergo the Kansei measurement (Fig. 35.1).

Kansei measurement that will be involved in this study is Kansei words or known as KW. The Kansei words will be selected based on their suitability to portray animations particularly on their fundamental nature in oral traditions. Selected theories

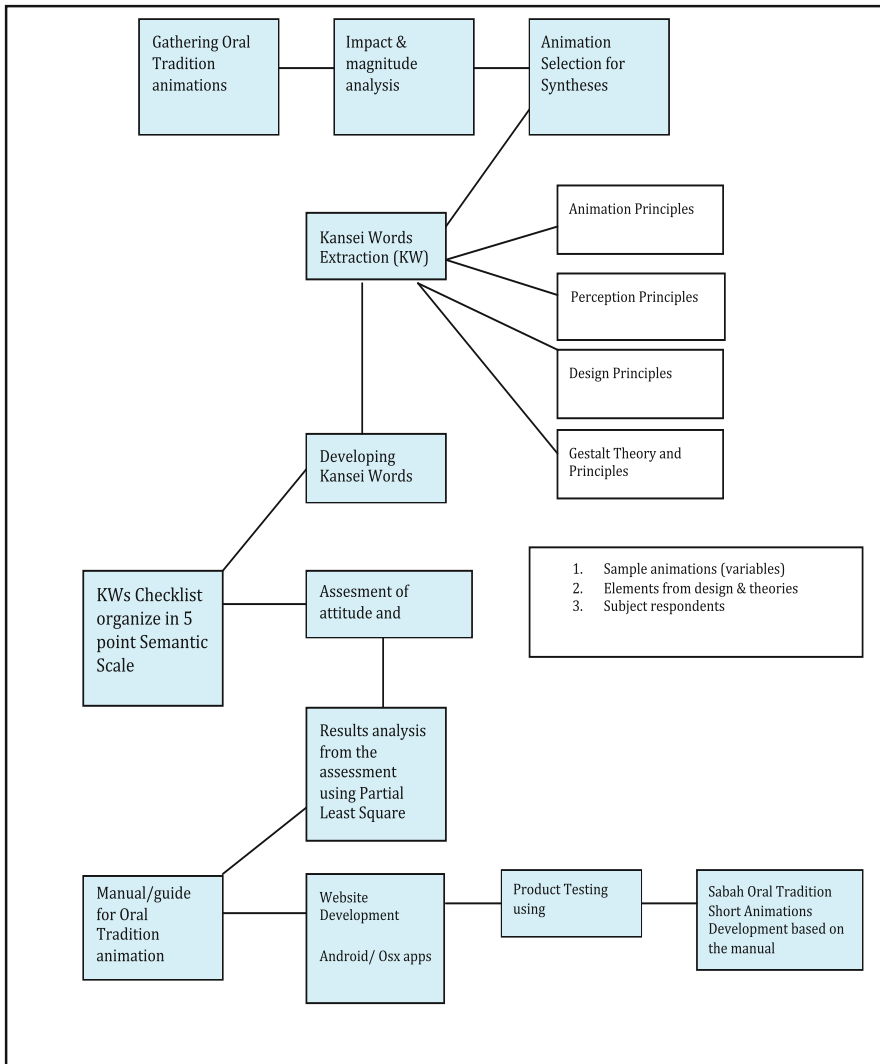


Fig. 35.1 Proposed methodology

will be incorporated in finding the right Kansei words such as animation principles, design principles, Gestalt theories, and perception theories. Suitable sources for the Kansei words can be from magazines, pertinent literature, manuals, experts, and experienced users, relating Kansei study ideas and visions [8]. All available sources can be used in order to obtain the complete selection of words. Words that emerge as similar or the same can as well be used.

KW will be used to develop a checklist to rate the animations. Kansei words are words that describe the subject domain [9]. Often these words are adjectives, but other grammatical forms are possible. For example, when describing the domain “forklift truck,” adjectives such as effective, robust, quick, etc., and also verbs and nouns such as accelerate/acceleration can occur.

After these KW checklists are completed, it then will be organized in a 5-point semantic scale. These methods are introduced in 1957 by Osgood, Suci, and Tannenbaum in their book *The Measurement of Scaling* [10]. These methods are related to the assessment of emotion as it deals with attitude mostly. It is normally composed of adjectives of polar opposites with a scaling of 5–7 points in between. Two hundred university students will participate in the Kansei study in which students are required to have at least some basic knowledge in animation as most of the theories used are related to animation and design, and the most suitable participants would be from the school of arts as they would have some prior knowledge in arts and design [11]. The Kansei evaluation session will be done within a year period that will involve art and design students, separately according to their group. There will be no specific numbers of students in each session as the animation specimen will be screened using a projector. After viewing each specimen, students then will rate according to the checklist provided. The models were adapted from a few Kansei-related researches on product design such as cars, furniture, website design, and food packaging.

This ongoing project also will find a suitable methodology in dealing with affective values in animation and propose developments, experimental design, and a manual on affective animation productions that can be used to improve the creation of oral tradition animation in Sabah and Malaysia generally. In conclusion, the adaptation of Kansei engineering in oral tradition animation is hopeful to continuously develop and integrate with new methods as a way to progress the animation industry, generally.

Acknowledgment This paper is a preliminary research and is meant to suggest the most suitable methodology for the final research project.

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Chapter 36

The Survey into the Implementation of Certified Digital Proofing

Mahadzir Mohamad, Muhammad Yusuf Masod, Ridzuan Ahmad, Intan Natasha Abdul Azim, and Jebakumari Selvarani Ebenezer

Abstract This document gives formatting instructions for authors preparing papers for publication in the proceedings of an IEEE conference. These graphic technology prepress terms defined proof as a hard or soft copy reproduction made using various technologies to simulate an intended printing output. As a graphic medium for visual verification from design to print production, color proof not just contains a pretty picture, but it is a prototype representing the “look and feel of printed page.” In publication printing, a contract proof serves as a legal binding agreement between advertisers and publishers. Printers are required to print to match contract proofs. This survey will address the implementation of color management concerning digital proofing and its associated practices in the Shah Alam printing industry. A questionnaire is designed to assess the implementation of digital proofing process and its proof certifications. The goal of this research is to conduct a survey in order to capture the view of printing companies regarding certified digital proof.

Keywords Digital proofing • Print standard • Offset lithography

M. Mohamad (✉) • R. Ahmad • I.N.A. Azim
Department of Printing Technology, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: mahad476@salam.uitm.edu.my

M.Y. Masod
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

J.S. Ebenezer
Academy of Language Studies, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

1 Introduction

Proof was released before making a plate that involves the separation of colors and page layout preparation. Digital proof is now growing and more prevalent nowadays for the color accuracy and fast processing, and more important it is accepted by the customer. Proof is very important in the printing industry for customers to comprehend the work that will be printed. Moreover, the customer can correct any error or change before the job goes to the press, and if a mistake occurs and the production of proof is not produced, it would be a waste of time, paper, ink, and labor. Digital proofs are made directly from the electronic file, without film or plate, separations of color, and press proof. "If you have ever printed out your files to a color laser printer or inkjet, then you have already seen an example of a digital proof" [1].

Without proper tools and awareness, the implementations of certified proof in the printing industry are not widespread. Throughout this survey, the cooperation within the industry becomes a challenge to this survey.

2 Digital Proofing Processes

The aim of digital proofing processes is to create the most accurate possible simulation of the printed product to be produced. By utilized digital data set to create proof. In most cases the most important factor is that the proof visually matches the later print quality (color proof, see below for definition). Special printing parameters (e.g., dot structures) can only be reproduced in line with the print run using special proofing processes (true proof, screen proof).

The objective for this research is to explain the application and the implementation of certified proof in the printing industry. Nowadays, the printing industry is competing to get the print right, recognized by ISO standards, because their company will be better known and their print is of high quality. A survey was conducted through the Shah Alam printing industry that implements the certified digital proof in their company by distributing questionnaires [2]. The questionnaires were distributed for collecting the data and making assumptions about the implementation of digital proofing in printing industries.

To investigate the color management practices by the printing industry, Mortimer [3] stated, "Color management is the essence of the task of color reproduction. Their task is to understand the customer's requirement, the character of the original, the mutations of color accuracy caused by the printing process and the changes to color caused by surrounding color which, while specified in the art-work may not be seen until color output is made."

The aim of this survey is to implement the right color management measuring by the standard that is applied in the industry. Other than that is to ensure that issues and problems arise when communicating with customers when performing color control. Additional objectives are to determine the percentage of participants who wish to obtain the certification process in the near future.

3 Research Methodology

The research methodology used in this research is a descriptive research in the form of a case study. Data was collected from books, journals, interviews, and questionnaires. The next stage was choosing instruments used to collect data and interpreting the findings. Data collected is attached to the title of the research, which is “An Investigation into the Implementation of Certified Digital Proofing.”

A set of questionnaires was designed to assess the color management practices in order to obtain certified proof from the printing industry. The questionnaires were distributed to 20 companies in the Shah Alam industrial area. The questionnaire’s main purpose is to investigate on the observant about the certified proof in the printing industry in the Shah Alam industrial area. The questionnaires were able to make an accurate analysis of the research.

4 Data Analysis

In general, there were many commercial printing publication in that area which was on the other hand, the second most activities of printing company which are pre-press providers followed by packaging printing [4]. For the least activities is other such as documentation and solution company.

According to this survey, there are 9 respondents out of 20 respondents (45 %) who are from the publication and commercial printing. Besides that, three of the respondents (15 %) are from the packaging printing company, and six of the respondents (30 %) are prepress service providers. The survey also found that two of the respondents (5 %) are others coming from printing activity companies.

There are two types of company sizes at the Shah Alam industrial area, which are the small and medium industry and large industry. As we can see now, small and medium companies are higher than larger companies in the Klang Valley area. There are 15 respondents out of 20 (75 %) respondents who are from the small and medium industry, and five of the respondents (25 %) of the companies are from the large industry.

Basically, the highest types of printing technologies retained by the industry are offset lithography. There were 14 respondents from the offset lithography employed in the main printing technology, and 5% of the respondents are from the flexography printing and gravure printing technologies employed, whereby one respondent is taken from each type [5–6]. There were no respondents in the screen printing industry. Lastly the figure above shows other printing technologies employed such as digital printing which has only four respondents (20 %).

There were 10 out of 20 respondents who received ISO 9001 quality system certification. Based on the figure above, 3 out of 20 respondents (15 %) did not receive ISO 9001 quality system certification in their company. Other than that there were seven respondents that did not know about the ISO 9001 quality system certification (35 %).

There was only one company (5 %) that received G7 Master Printer. For the other printing process certification was PSO that was 3 out of 20 (15 %) respondents received it. There were nine (45 %) respondents who did not receive any of the printing process certification or qualification.

There was a high percentage of respondents who implemented color management in their digital proofing workflow. From the research about 11 (55 %) of the respondents agreed that there is an implemented color management in their digital proofing workflow in the company. Only two (10 %) respondents disagreed that there was implemented color management in their digital proofing workflow, and only one (5 %) of the respondents did not know about the implemented color management in their digital proof. The respondents who were not applicable about the implementation of color management in their digital proofing remained as six (30 %) respondents.

About seven (35 %) of the respondents agreed that they were using standard profiles in their digital workflow in the company. [Figure 3.6](#) showed that five (25 %) respondents disagreed that they were using standard profiles in their digital workflow in the company and only two (10 %) respondents did not know about standard profiles in their digital workflow, e.g., ISO coated v2 (ECI) and coated GRACo1 2006. For respondents who were not applicable about the use of digitally recorded proof were six (30 %) respondents only. Five (25 %) respondents agreed that they are able to build their own proof of color profiles in the company. It also stated that eight (40 %) respondents disagreed that they can build their own proof of color profiles and only three (15 %) of the respondents did not know about their own proof of color profiles. The respondents who were not applicable about the proof of color profiles remained as six (20 %) respondents.

For the next statement about eight (40 %) respondents agreed that there is a good match between customer-submitted proof and our contract proof. It also stated that five (25 %) respondents disagreed that there is a good match between customer-submitted proof and our contract proof, and only five (25 %) respondents did not know about a good match between customer-submitted proof and our contract proof. For respondents who are not applicable about whether there is a good match between customer-submitted proof and our contract proof was two (10 %) respondents.

Furthermore, five (25 %) respondents agreed that there is a good match between their contract proof and OK sheet. Twenty percent of the respondents disagreed that there is a good match between their contract proof and OK sheet, and only seven (35 %) respondents did not know whether there is a good match between our contract proof and OK sheet. The respondents who are not applicable about whether there is a good match between our contract proof and OK sheet remains as four (20 %) respondents.

For the last statement about six (40 %) respondents agree that they use display-based soft proofing. It also stated that five (25 %) respondents disagreed that they use display-based soft proofing, and only five (25 %) respondents did not know about the use of display based on soft proofing. For respondents who are not applicable about the use of display based on soft proofing remains as four (20 %) of respondents.

For the certified proofing system, basically there is no company using IDEAlliance in their proofing system, and only one (5 %) company used Fogra-certified proofing system. While 11 (55 %) of the company are not using certified proofing system.

For the other companies five respondents (25 %) did not know about the certified proofing system. For respondents who are not applicable about the certified proofing system remained as three (15 %) respondents.

Limitation in research material for standard printing is very limited. I had difficulties to find a standard reference based on industry implementation of certified proofing in Malaysia [7–9].

5 Conclusion

Majority of the printing companies in the study are still many who do not perform proofing standards in their daily workflow chart. Printing is a very important standard in the printing industry as it can symbolize the printing quality that is maintained.

The study was conducted to see whether there is proof of a certified implementation of the company which may raise the status or value of the company. Besides, it will be able to distinguish the quality of the print job generated from companies that implement certified proof with companies that do not implement certified proof.

Every printing company should implement certified proof because it will help raise the quality of their printing. At the same time, the implementation of certified proof is very useful as it provides consistency in the quality of the printing. Otherwise, it satisfies all involved no matter how the customer, manager, or printer will be able to achieve the desired color. Especially with the arrival of the implementation of this certified proof, the production of printed product will be enhanced, and we will synchronize the standard utility printing standard in the printing industry [10].

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Chapter 37

An Overview of the Digital Inkjet Printing for Fine Art Painting Reproduction

Muhammad Yusuf Masod, Mahadzir Mohamad,
and Intan Natasha Abdul Azim

Abstract It was in the early 1990s that digital fine art print began to emerge. Many scholars proposed that the purposes of digital fine art print can be divided into a reproduction of a work of art intended to be used for interior decorations and as an original artist print. The fine art print has become a very important element in today's printing, reproduction and art market. A number of different printing processes have been adapted to their needs. The term Giclée means that the ink is sprayed as introduced by Jack Duganne for inkjet print on fine art paper. Inkjet printing was favoured compared to other digital printing processes based on its advantages in creating high-resolution digital reproductions of original paintings, drawings, sketches or even original photographs. In order to understand the application of inkjet printing for the reproduction of fine art, this paper aims to explain the breadth of inkjet technologies available and to suggest the critical parameters to produce high-quality fine art reproduction using inkjet printing. This paper will provide an example from two artists: Richard Hamilton and Martin Constable.

Keywords Component • Formatting • Style • Styling • Insert

M.Y. Masod (✉)

Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
e-mail: yusuf595@salam.uitm.edu.my

M. Mohamad • I.N.A. Azim

Department of Printing Technology, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

1 Introduction

The common assumption of digital fine art is an inkjet digital reproduction print based upon an existing painting or photograph which sometimes is referred to as 'Giclée'. Derived from a French word, this term was introduced by an artist Jack Duganne in 1991. In addition, H. Johnson stated that the term also has a connotation of sprayed or squired ink inkjet prints on fine art paper [1]. Wilhelm [2] described the term Giclée as analogous, as similar to the use of the term *serigraph* for a silk screen, and it became popular throughout the world [2]. Alpers [3], in his article which was published in Digital Fine Art Magazine, explained that the term described something exotic or at least sophisticated and it does not imply 'digital processing' [3]. He added that, with magnificent inkjet output quality, it is hard to distinguish between original artworks and inkjet prints. After all, if the well-made digital print does not reveal digital signature to the untrained eye, why put the commercial kiss of death on it by necessarily calling attention to how it was made?

Historically, Giclée was initially a synonym for an Iris fine art print. Iris inkjet technology was originally manufactured by Iris Graphics. It was developed to be used in the printing industry to simulate commercial four-colour offset printing. Its advantage is to print in high resolution on a variety of different materials. This advantage opens up an opportunity to the photographers and artists. As an increasing number of print studios were found to be offering high-edition reproductions and posters, as a result, studios making original art soon distanced themselves from the term, often opting instead for the simple term *Iris print*. Consequently, Giclée soon became used mostly for commercial art reproductions on fine art paper and canvas, but not for artist original prints, and never for inkjet prints on glossy resin-coated paper. Technological developments in large format drop-on-demand (DOD) inkjet printers have gained popularity among artists due to its practicality as compared to Iris inkjet. It has been pointed by Jurgens [4] (p. 25) that the term Giclée has also expanded to include these types of prints [4]. And although the digital or technical aspect of the inkjet print should no longer lessen the popularity of a print today, in the market, inkjet prints are still rarely called inkjet prints. Instead, a number of other terms have been invented. In producing an original artwork, an artist relies on the medium that best suits the conception of the idea based on the fact that different processes produce different end results. To produce large flat areas of colour such as that used by the pop artist Andy Warhol, one would choose screen printing. Lithography is capable of producing a delicate watercolour-like washed tones. Meanwhile, etching is also suitable to produce a very dark black line or tone. An advantage of the artist's traditional process is that it creates visual impact to their artwork through the surface topography of an image on the paper and with the density of ink on the paper surface. However, the topography is separated from the range of colour gamut that is obtainable by the processes. For these reasons, many artists choose to combine digital reprographic processes with traditional forms of print rather than directly print the image using inkjet. With inkjet, an artist has an

advantage to faithfully reproduce an image in full photographic clarity. Nevertheless, the image will always look very flat and two dimensional, regardless of the photo-realistic qualities available.

2 Inkjet Printing for Fine Art Painting Reproduction

There are perceptions that digital aspect does not seem human enough to match the manual labour involved in making a painting or drawing. Brinkerhoff [5] pointed out that during the mid to late 1990s, many galleries and art critics were sceptical about inkjet prints on fine art paper though they were widely successful [5]. As technology is becoming a norm in daily life, these points of view have been degraded. The early 1990s saw an emerging digital fine art print market sector. The fine art print has become very significant in today's printing, reproduction and art market as well as a number of different printing processes which have been adapted to its needs. The term itself is not always used consistently, but it may effectively be divided into categories: (1) a reproduction of work of art intended to be used for interior decoration (2) and an original artist print [6]. Due to its ability to print on a great number of different media, inkjet has become dominant in fine art printing. However, other processes or a combination of processes may also be used. A mixture of aesthetics can also be seen, since digital imaging software makes it technically simple to compose images from many different sources, such as photographs, drawing, paintings, line art and scanned objects. Every source or every idea is reduced to the same level: in the end, all pixels are equal. The final print does not differentiate between the sources of the image either; it simply reflects the digital image. Fine art inkjet printing roots can be traced back to the east and west coast of the United States. Cone Editions Press is now located in Vermont. It was initiated by an experiment which combined digital system with traditional printing techniques in its print shop in the mid-1980s. Soon after that, in 1991, Graham Nash and Mac Holbert established Nash Editions in Los Angeles, California, a dedicated print studio that produces inkjet prints for photographers and artists [2]. Persuaded by the capability of the inkjet proofing device, this device could be adapted in printing photographic images on fine art paper, where 2 years earlier they had seen prints made on Iris 3047. Printing on a fine art material made from pure cotton, etching-type paper was a novelty, and it appealed to those who disliked the 'slick glossy, mechanical look of most photographic papers' and preferred 'tactile and sensual papers' already known 'from among the many beautiful choices available in the fine art world' [5]. Newer techniques of image manipulation were introduced, by scanning photographs and printing them directly with inkjet. This technique has gained popularity. Furthermore, retouching images by photographers using dodging and burning techniques in the darkroom is enjoyable process as the newfound easiness of altering at will the contrast, brightness and even colour in their images. Despite an early resistance from the well-established art market and few traditional print shops, eventually, fine art inkjet printing soon grew into an important business as

digital printing studios are opened up all over the world and traditional print shops adapted inkjet printing technologies [7]. Due to its production advantage, such as speed and allowing for short print runs at comparatively low expense and inexpensive preparatory steps, issues of technology and reproducibility versus true art emerged. An article, *The glory of Giclée: Fine art Iris inkjet printmaking: Art and science meet head-on*, described a ‘negative reaction and resistance that is often directed your way once you reveal that your beautiful fine art print is made using a computer’ [5]. Many print studios adopted the typical attributes of traditional fine art printing such as using paper with deckle edges, an edition number in pencil below the image and a blind stamp in one corner defying the ‘technical appearance’ of the fine art inkjet print. The well-known capabilities of inkjet to print on a variety of surfaces and the greatest tonal range reproduction make it suitable for art reproduction. With the progressing digitisation of their collections, museums are making copies of paintings, drawing and photographs more easily available. For the purpose of archiving, colour laser printer which utilised dry toner electrophotography is favoured by a number of libraries and archives to produce valuable documents and maps for sale to the public. This is due to the fact that these prints are not sensitive to handling as most inkjet prints would be. At the same time historic negatives are being scanned and reprinted on inkjet printers. With the advent of large format inkjet, large format modern edition of historic images that are typically uncommon has now become a norm in the art galleries. These large print historic images, until recently known only as smaller vintage or modern prints, can be visually surprising and somewhat disturbing to the eye of the experts. However, if both ink and media are carefully chosen and well matched, many photographic processes such as platinotype or albumen can be imitated.

3 Technological Advancement in Inkjet Printing Technology for the Fine Art Painting Reproduction

Historically, the Iris inkjet printers had been designed to create proofs for the printing industry; they were never intended to produce the kind of long-lasting prints the art market requires. Recent scientific study by Thompson et al. in the Third International Conference on Preservation and Conservation Issues Related to Digital Printing and Digital Photography reveals that dye-based inks were known for their sensitivity to light and humidity, and this affected many digital print processes, especially inkjet printing [8]. This leads to the difficulties to the artist in selling prints and convincing museums to buy their work because the general perception is that the prints are very unstable. To address permanence issues arising from the inkjet prints, a significant improvement had been made with new ink sets. Pigment-based inks were introduced over dye-based inks. However, the high colour saturation of dye-based inks and the high stability of pigment-based inks were unavoidable. Despite this, some artists believe that the aesthetic of the print was more important

than its permanence [7]. Latest findings by Leng X. et al. reveal that pigment-based inks are able to match dye-based inks in colour range (gamut), while some dye-based inks can match pigment-based inks in stability [9]. Recently, solvent-based and UV-curable inks will become a growing trend, and this is based on the fact that these inks are known for their high water resistance, light fastness and versatility. Since the mid-1990s, artists began experimenting with flatbed inkjet printers and were impressed by the possibilities that technology offered. This includes printing on virtually any surface—smooth or rough, porous or impermeable, on a rigid or flexible substrate—became feasible [10]. As the print quality continues to improve, it is that these systems will be chosen more often for large format artistic inkjet printing.

4 The Case Study of Fine Art Painting Using Inkjet Digital Reproduction

As an adaptation from Hoskins, to gain further insight to our understanding of digital fine art, examples of an inkjet digital reproduction print of an existing painting or photograph need to be given to show how the artist approaches the problem in creating an original print. This paper will provide an example from two artists: Richard Hamilton and Martin Constable.

4.1 Case Study I: Richard Hamilton: *Typo-/Topography of Marcel Duchamp's Large Glass*

In Fig. 37.1, this print is based on a copy of Marcel Duchamp's sculptural work that Richard Hamilton first recreated in the 1960s and is a map of Duchamp's original notes to the sculpture. This print was conceived in the vector programmed 'Illustrator' and is one half of a final print that was 1.7 m wide by approximately 4 m high. The image took 6 months to construct and was made up of a hundred and two primary layers behind them. Potentially, there are up to a thousand layers in this image. The careful choices and slow build-up of layers to create the right sort of image are, to say the least, very deliberate, and the selection of colour is a thoughtful building process. Therefore, to have only four colours and lighter versions of the same colour as well as an extra black restricts the justice in printing this image. Hamilton has described the Large Glass as 'an epic poem, a technical treatise and a pictorial masterpiece'. In this print, he combines a diagram of the artwork with English translations of Duchamp's notes from the Green Box, bringing together the visual and literary elements of Duchamp's project. The Typo/Typography underlines Duchamp's desire to create a work that required an analytical response from the viewer, rather than a purely aesthetic one.

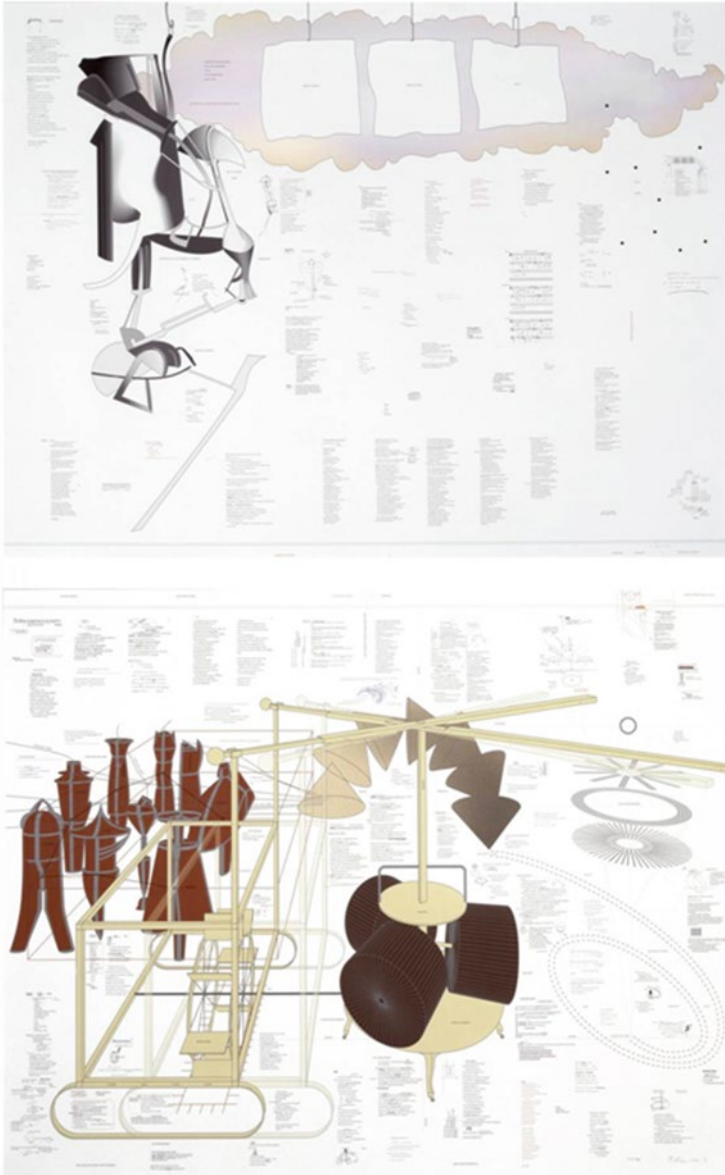


Fig. 37.1 Typo/Topography of Marcel Duchamp's Large Glass 2003 [11] (Photo: <http://www.tate.org.uk/art/artworks/hamilton-typotopography-of-marcel-duchamps-large-glass-p78916>)

4.2 Case Study II: Martin Constable: *The Exhausted Spaceman*

Figure 37.2 is the second example by the artist Martin Constable print titled the 'Exhausted Spaceman'. This print is a life-size representation of the artist himself wearing an original NASA space suit borrowed, for the purpose of the creating the print, from the science museum in London. Detailed description of this process by Paul Laidler explains that the main considerations for the printing of the file were file resolution, quality and colour. Due to the concept of the work, it was important that the scale would be determined by its source. This conjecture for the output of the image dictated the capture methods and the file sizes required to retain high image resolutions at life-size proportions. Youngblood had imported different components of the image using a range of image capture devices,

Fig. 37.2 Martin Constable: the Exhausted Spaceman [12] (Photo: http://www.cgsociety.org/stories/2004_11/spaceman/final_625_1528.jpg)



such as a flatbed scanner and both digital and analogue cameras. These were then imported into 'Photoshop' and were composed and altered so that each collaged element was unified within the file. The file size for the image was 400 MB and contained around 155 adjustment layers to create the aged image of the figure. The first proof was printed onto an HP Productivity Photo Gloss paper using both media and paper settings for this particular substrate. *Proofing* literally creates a new perspective for evaluating the image and often amplifies any imperfections. From close inspection of the printed 'proof', a rough diagram of the image was made to indicate the locations of each adjustment area. Alterations, though minor in appearance, often lead to adjusting sub-layers within layers because the image is composed with combinations of layer masks and filter effects, and minor cleaning tasks become involved. Youngblood's notes in no way offer the amount of description needed to resolve these corrections, but as visual notes they refer to print qualities and add personal dimension to the working process. 'Exhausted Spaceman' is an image of a Constable conjured up by referencing a set of staged photographs of himself to depict a bedraggled cosmonaut – an image more representative of the arduous and dangerous experience of being catapulted through the Earth's atmosphere and back.

5 Conclusion

With new digital technology, such as inkjet, the correlation between the conception and software output has been designed to be seamless. The relation between traditional technologies and digital creation has not been resolved, and it is clear that the problems lie in the area of reprographics. In fact, for the artist, this allows for greater flexibility. Traditional reprographics relied on an analogue camera capture onto a small-scale negative film. The analogue enlargement is applied onto either continuous tone positive film or a halftone intervention onto line film. Currently, the analogue negative is replaced with the digital file, and the large film positive then has to be created. Thus, it is no longer possible to create a continuous tone positive using digital means. A representation has to be created using a stochastic algorithm to randomly create a very fine tone structure.

For an artist who is used to the range of surface topography and choice of differing colour gamut offered by traditional technologies, the interplay between digital generation and traditional technology offers a much wider range of options. The hybrid print offers the best of both worlds, good photographic rendition and capture, with a wide selection of gamut and surface topography.

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Chapter 38

Waste to Wealth: The Innovation of *Areca catechu* as a Biomaterial in Esthetics Seed-Based Jewelry

Nazirah Mohamad Ba'ai and Hema Zulaika Hashim

Abstract “Seed-based jewelry” is apart of material can be differentiate from the physical factors that must be present, an art form. The shape and color of the jewelry and the materials used and blended with flows when worn all come together into an artistic statement. Within the realm of jewelry design, technology development and industrial revolution cause global environmental problems and natural resource crisis on earth. Mix material is apparently reflected to enhance resource usage sufficiency. Therefore, quite a few environmental protection policies in the world have been made to lower environmental damage. “Reduce, reuse, and recycle” definitely becomes a new life trend related to that “Recycle and Re-make new jewellery from old pieces, metal can be melted down and gemstone can always be re-used.” Firstly, this study utilizes both quality and style to be the foundation of sustainable jewelry design. Secondly, this study adopts the sustainable design model (SDM) to inspect the sustainable design factors considered for the application of “seed-based jewelry” in design appearance. Furthermore, the researcher will develop methods to ensure the achievement of “seed-based jewelry” in investigational study. By using SDM on “seed-based jewelry,” the study will provide improved results from incorporating mix material to the design. Finally, this research will be beneficial to government agencies that are directly and indirectly involved in enhancing the jewelry design business in Malaysia.

Keywords Innovation • Biomaterial • Esthetic • Seed-based jewelry

N.M. Ba'ai (✉) • H.Z. Hashim
Contemporary Metal Design, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia
e-mail: nazir858@salam.uitm.edu.my

1 Introduction

Humans have been decorating their bodies with the beauty of natural objects for thousands of years. Primitive man wore necklaces made from bones, claws, and teeth of slain animals. Today, most people think of natural jewelry as shiny pieces of corals, pearls, and precious or semiprecious stones, polished and set in gold or silver [1]. Who would ever believe that some of the most unusual and striking jewelry in the world comes from plants? With the exception of amber and coconut pearls, most botanical jewelry is made from relatively inexpensive materials. Polished wooden beads, colorful seeds, and pieces of palm, bamboo, and tropical hardwoods are strung on fine nylon filament or gold and silver chains, producing attractive necklaces and bracelets that rival any synthetic costume jewelry. In terms of esthetic beauty and intrinsic value, plant jewelry may rank as high as any gemstone. Exotic seed necklaces from native cultures throughout the world often come with fabulous tales about their origins and legendary uses.

The main purpose of “seed-based jewelry” is to improve the current constrain in jewelry design. With two main objectives of study, this paper will explain about the factors that may influence the design using seed as a biomaterial in jewelry, first, to investigate waste materials into a new form thereby achieving a huge variety of quality and style in jewelry design appearance and, second, to spawn the specialized new material among the current constrain in creating jewelry out of found or recycled objects toward new exposure in jewelry design.

In order to address the rationale, literature surveys pave the way and provide guidance to identify knowledge gaps in the biomaterial in seed-based jewelry. It helped to bring out new concepts to develop an argument related to the “biomaterial jewelry” problem. Based on a literature review and empirical investigation, sustainable design model (SDM) process is identified to enhance the knowledge toward sustainable design opportunity. The identified innovation process is integrated into a conceptual framework to evolve knowledge particularly in both the material and design fields. The integration of waste materials into the new system enhances the prevailing market innovation process strategically to gain competitive advantage and give it due recognition, promotion, and strength to generate an excellent input [2]. Finally, the integration of mix material to the design will define the results.

2 Ease of Use

2.1 *Contemporary Jewelry*

Since the 1960s, the boundaries of jewelry have been continually redefined. Conventions have been challenged by successive generations of independent jewelers, often educated at art college and immersed in radical idea. New technologies

and non-precious materials, including plastic, paper, and textiles, have overturned the notions of status traditionally implicit in jewelry. Avant-garde artist-jewelers have explored the interaction of jewelry with body, pushing the boundaries of scale and wearability to the limits. Jewelry has developed into wearable art.

Contemporary jewelry is a type of practice – understood as the contemporary offspring of a craft-based design activity that finds its origin in medieval workshops. Such a definition stresses contemporary jewelry’s historical past and finds antecedents in the British and American Arts and Crafts movements, the renewed late nineteenth-century interest in manual skills (as a last stand against industrialization), and the emergence of radical jewelry movements in the 1960s: it underlines the notions of individuality, craftsmanship, and its troubled relationship to the production mainstream.

Contemporary jewelry is well known as a type of object too: poised between high-street jewelry and art (the former glorified the other; the latter, poor relative), we know what it’s not (“just” manufactured artifacts for wearing) and what it wants to be (the expression of individual talent that reflects on, and sometimes influences, contemporary culture), much less what it is.

A few distinctive characteristics, however, seem to be beyond debate: the human body as a general working area; an open attitude to methods and material that echoes art’s own agenda, complicated by the notion of wearability; the distinctiveness we associate with individual expression; and an emancipation from consumer goods’ vocation to “just” satisfy consumer desires.

Benjamin Lignel could also be defined as a market (follow here the argument that cultural artifacts are defined less by methods of production than by distribution, accessibility, and, ultimately, potential impact on a larger consumer base). In most countries, a limited number of galleries take care of both distribution and promotion, while the designer-maker is expected (if she/he wants to make a living) to be represented by at least five galleries and complement consignment sales by direct, off-the-anvil transactions.

From my point of view, the Contemporary Jewellery market works in ways similar to the art market, but on a scale so small, that its lack of visibility questions its existence.

So then, most jewelers would agree that contemporary jewelry is a fast-evolving profession at a crossroad between craft, design, and art, currently ridged by identity concerns. However, the problem, rather than one of identity, is one of image. Although the lack of an established definition has contributed to an extremely rich range of output – personal answers to a collective question – it seems that diversity stands in the way of a more cohesive front, one that would focus on explaining to people that there is a life after Cartier, Pomellato, and Tiffany’s. And the unsuspecting public still lumps the practice together with its craft-based past, judges its production on a par with high-end (or any other) jewelry, and considers artistic ambition rather like a presumptuous fancy (unless one equates “artistic” with “skilled,” “meaningful,” or “committed to self-expression”).

2.2 *Eco-friendly Material Gives Better Life*

The substances of an eco-friendly material are easy to get. When designing a product under "Design for Environment" (DFE) standards, the designer must first take into consideration what material should be used [3]. Using natural material is good thing, but these are not always the best choice because sometimes natural materials cannot be easily recycled once they are made into a product. The eco-friendly material process system helps designers determine the best way to minimize environmental damage and maximize efficiency during the entire life of a product [4].

Eco-friendly jewelry can be defined as jewelry that was produced from materials that did not require the further deterioration of the environment. One of the materials that can be used in making eco-friendly jewelry is postconsumer recycled gold [5]. This gold was gathered from old jewelry that was no longer in use. Most of these are class rings, broken necklaces and bracelets, and the single remaining earring. This gold can be recycled to make new pieces of eco-friendly jewelry, without having to mine for raw gold. Aside from gold pieces, eco-friendly jewelry may also include beads from recycled wood, and other pieces may utilize recycled materials like nuts, bolts, washers, or old hardware parts. These types of green jewelry create unique pieces without harming the environment.

3 Preserving Seed Jewelry

Seeds often become infested with larvae of small moths (similar to grain moths) and minute beetles (called weevils). This is particularly true of relatively thin-walled seeds and fruits which are attached by lightweight line. The larvae feed on the seed tissue and can even sever the line holding the necklace together. In addition, the larvae bore through the seed coat, allowing winged adults to exit through small, circular tunnels. Evidence of insect infestation includes dust falling out of the seeds, exit tunnels through the seed coats, and broken necklace in which the seeds fall apart [6].

One method of killing the insects is to place the seed and necklaces in airtight containers with moth crystals, such as para-dichlorobenzene or naphthalene. These chemicals should not be inhaled, so the containers should be stored outside of our living quarters. Another suggestion to preserve the seed jewelry is to place the jewelry in the freezer compartment for several weeks, specifically valuable necklace, and we can repeat this freeze treatment every year or two, particularly if they are exposed to reinfestation by egg-laying adult.

3.1 *Esthetics of Seed-Based Jewelry*

Esthetics is a broad disciplinary subject. The original Greek word “aisthetika” means “that which perceptible through the sense.” The process of sensory perception of human is complex and can provoke responses in the enormous store of experiences, memories, and behavioral pattern within each of us. Esthetics is a very important element in design. Based on Lawson [7], the designer must understand our esthetic experience, particularly of the visual world. According to Vihma [8], esthetic experience can be characterized as a sense impression, a subjective appreciation of the object in which, however, also interpretations of references take part. All bodily faculties through sensation are aroused, sight, touch, taste, and smell, hearing, balance, movement, and muscular effort, and help to form an esthetics appreciation of an object or environment.

The characteristic of esthetical appearance will make the design marketable because it can capture the human interest for the end product. Xenakis [9] has distinguished the basic characteristics that express the esthetics of a product: shape, composition, and physical attributes. High-level characteristics such as style or fashion may be dealt with by expressing them in terms of the three basic characteristics [9]. For “color and trim study,” a proper understanding of the designers’ work includes the ability to process a rich and diverse language of esthetics, linguistic, and graphic elements; the methods for the design for esthetics are alternative (non-geometric entity oriented) natural input mechanisms of shape, flexible representation of the initial shape, powerful image manipulation techniques, and free-form physical prototyping techniques.

3.2 *The Innovation Process of Areca catechu*

Innovation in Color Process

This innovation relates to the esthetic enhancement of the surfaces of biomaterial. Within the range of biomaterial with which this innovation is concerned are numerous seeds based on different types such as tamarind seeds, dates seeds, saga seeds, and *Areca catechu* seeds. Still more particularly, but not exclusively, the innovation is concerned with modifying the surface appearance of such articles as items of jewelry. An important area for esthetic-appealing design is in the jewelry industry. Therefore, it is valuable to find an effective biomaterial process for esthetic-appealing object (Fig. 38.1).

Innovation Process of Areca Catechu



Waste Material



Innovation Idea



Prototype: Aryca

Fig. 38.1 Flowchart of the process from waste to wealth

4 Methodology of the Study

This study is based on a descriptive study and empirical research through design activities. It seeks answers to questions which were formulated on literature reviews through problems, issues, and knowledge gaps and on what is often practiced by

designers in automotive industry and academia by focusing on two elements such as (1) innovation of biomaterial and (2) esthetics of seed-based jewelry.

A method for enhancing the appearance of a polished surface of the material is provided in which the material is formed from a biomaterial, in particular, but not exclusively, a precious material. The surface is polished in one of the phases, followed by colored treatment to effect a phase transformation, generally to the innovation phase.

Figure 38.2 shows a flowchart of the research framework for this research activity. The domain of this research is qualitative in nature. The assessment will be on the syntactics (structure establishment) [10] and semantics (meaning carrying) [8] of form elements. These three different levels involve (1) different levels of trend development/specific trends such as explorative, explanatory, and persuasive; (2) different levels of career development such as practitioners and students; and (3) different levels of learning/work such as jewelry design institutions and industries. The process of investigation is expected to be iterative. There is continuous need to relook at the research questions and sources of data and to refine them after verifications from new findings [11, 12].

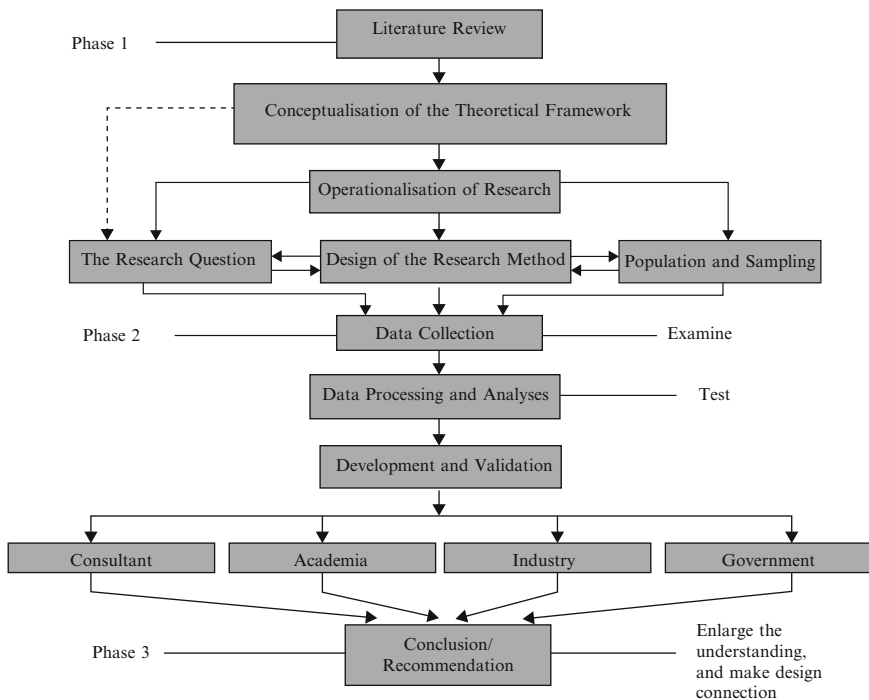


Fig. 38.2 Flowchart of the research framework [10]

5 Conclusion and Further Research

This paper has tested the theoretical underline the issues of socioeconomic factors that can affect both ethnic and national sentiments. It is noted that while ethnic factionalism and diversity have a negative impact on economic development and political stability of a country, nation-building policy efforts must be strengthened as a mechanism for integration among races. It is argued that in a country with high ethnic diversity, the minority has weaker national sentiment and feeling than the majority and this can jeopardize the national security and economic growth of the country. Rethinking nation-building concept is a policy process that promotes attachment to nation over ethnic and regional identities. More policy efforts must be undertaken to unite and integrate people together for a common identification as Malaysians.

- The research shows that the approach to “seed-based jewelry” design allows exploration on the *fabrication processes of the jewelry by adding other medium to seeds*.
- The *seed succeeds as exclusive, attractive, and yet simple and affordable to consumers*.
- *Seeds have a very good commercial value and potential as a new material in contemporary jewelry*.
- Through the exploration of the seed, there are many *possibilities to be explored in producing new items* using local natural sources in many design aspects, techniques, and market approach.

There is a need to strengthen the spirit of unity in diversity among races to abolish polarization. Policy efforts on unity should not be based on geographical factor or racial groups but should be directed to national sentiment as one nation. More efforts are needed to build trust and confidence between the government and racial groups. More policy programs that reflect the sense of inclusion to be part of socio-economic and political activities must be embarked upon by the government.

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Chapter 39

Revisited Diffusion Theory: A Conceptual Framework for International Printing Standard Adoption in Malaysia

Noor Azly Mohammed Ali, Mustaffa Halabi Azahari, Rosita Tajuddin, and Norzuwana Sumarjan

Abstract This paper discusses on international adoption of printing standards (PS) and its relation to business performance by focusing on commercial printing companies in the category of small and medium enterprises (SMEs). The current trend in the printing industry recalled the importance of trust and confidence among clients in order to achieve quality printing products. However, there are many commercial printing companies which are facing problems to meet customers' demands, especially in achieving desired printing color on printed products. At the same time, most researchers agreed that by adopting the international printing standard, they are able to provide benefits to the printers through the improvement of quality and productivity. This study will revisit and discuss the theory of diffusion of innovation, which stated the five perceived attributes such as relative advantage, compatibility, complexity, trialability, and observability in order to determine the rate of adoption and whether the organization would adopt or reject the innovation. At the end of this paper, we suggested a research framework to initiate the development of understanding and implementation of quality management through adoption of international printing standardization practices. Quantitative and qualitative methods will be used to collect data, where a survey through a close-ended questionnaire will be conducted among production employees. On the other hand, tools for investigation of the five influencing factors, the benefits and challenges of adopting the standard, and the strategies to implement PS were conducted by interviews with professionals in the same field. For future studies, it is expected that the understanding of innovation among SMEs based on this framework will bring better strategies on their recourse toward business performance.

N.A. Mohammed Ali (✉) • M.H. Azahari • R. Tajuddin
Faculty of Art and Design, Universiti Teknologi MARA, 40450 Shah Alam, Malaysia
e-mail: noora568@salam.uitm.edu.my

N. Sumarjan
Faculty of Hotel and Tourism Management, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

Keywords Innovation theory • Printing company • Quality management • Business performance

1 Introduction

The printing industry is one of the largest sectors in the world [1, 2]. Everyone needs to print products, and the business world cannot function effectively in the delivery of messages to customers without printed products. A report produced by [3] showed that the commercial printing market grew by 2.4 % in 2011, making a total revenue of \$ 383.2 billion and the market is expected to increase to 15.3 % in 2016 with a value of \$ 441.7 billion. The growth of the revenue is also in line with the changes and development in the global printing industry in terms of customers' demand and spending, new technology, and environmental concerns. The industry offers services to create and produce printing products in order to visually convey a message. The printing business is more dependent on customers' demand, as customers want and expect better products and services from a printing company [2]. In the Malaysian context, printing and publishing industries are considered as a one of the major industries in the manufacturing sector [4]. The printing industry also contributes toward the national income where the value of gross output of the printing group in 2010 was reported to be RM 7,238 million. The Malaysian printers are catering not only for the local market but also for the international market [5]. In 2008, total export for printing was RM 928 million. In Malaysia, there were only 20 % of small medium enterprises (SMEs) involved in the export activities, while the remaining focused on the domestic market.

2 Printing Industry in Practice

Rapid changes and developments in the printing industry have made the printing sector to be more challenging in executing business. Color-printed materials are an increasing trend in the printing industry compared to the past few decades, where most of the print products were printed in black and white [6]. Nowadays, the number of pages printed in color is 48 %, and it is expected to increase to 75 % by 2020 [6]. This is a great challenge to the printers in ensuring the quality of the color-printed materials as is required by the customers. Chung [7] also highlighted that commercial printers always face problems to meet customers' demands and expectations in order to match the color of the print product that uses different substrate and printing workflow. Perhaps, by having a certification and adopting international standardization practices, this would enhance the service rendered to the customers. Also, international standard practices could be used as a business strategy and tool to gain competitive advantage and customers' trust [7].

The printing industry will be able to increase its revenue and become more competitive if they can produce quality goods according to the international standard. Many companies understand the basic impact of increased productivity and profitability that depend on improving the quality of management leading to the production of quality products and services [8]. This will ensure the company's ability to survive the competition both domestic and abroad [8]. Therefore, quality is an important element to ensure that the Malaysian printing industry is able to boost their trading activities in penetrating the international market [9]. This clearly shows the importance of quality to be produced for any firms, and quality has become one of the factors to ensure survival of the business. This scenario can be related to the statement of Tee Cheong Tuan, who is the Selangor and Federal Territory Chinese Printing Presses' Association President, whom quoted that "Malaysian printers should find solutions to face the challenges, and the management should be ready to change their mindset by adopting and using the good business strategy such as compliance with the international standard in order to sustain in business locally and globally" (Malaysia Printing & supporting Industries Directory 2011/2012, 2012, p. 1).

3 Ease of Use Observation About Standard Factor

The changes in the global market show the use of the international standard for printing which has become a trend in the printing industries worldwide [5]. This can be supported by a survey conducted by Chung and Jensen [10], who mentioned that most of the printers expressed the importance of the standard and plan to adopt and implement the standard in the near future. Urbain [11] corroborated that the printing industry needs the standard to control their production process in order to meet the customers' requirements, especially to control the color consistency on the printed sheet and, at the same time, meet the customers' expectation.

The printing standard used in the printing and publishing industry refers to ISO 12647. ISO 12647 is monitored and updated by the ISO technical committee (ISO 130). The purpose of this standard is to ensure that the level of compliance with the four color offsets printing works. Generally, Process Standard Offset can be used as a standard procedure in assessing the processes involved from the beginning, which is data creation, to the final printing run. Furthermore, it ensures that the printed product produced complies with ISO 12647 and increases the efficiency of work continuously [12].

There are many benefits that can be gained by implementing the international standard for printing companies. Among those include that companies are able to gain entry into the global market [13], able to produce quality printing and operational efficiency, and able to reduce waste and production cycle time [14]. Importantly, customers are confident with the company's ability to fulfill their requirements [2]. When printing companies and customers understand the concept of the standards, both parties will enjoy the benefits.

Presently, the common international standards adopted and practiced in Malaysia's printing industries are ISO 9001, ISO 14001, and ISO 12647 (Malaysia Printing & Supporting Industries Directory, 2011/2012). International standard of ISO 12647 has been developed specifically for controlling the process to produce quality products for the printing industry. Unfortunately, international standard for ISO 12647 is rarely used in Malaysian printing industries. In Malaysia, currently, there are only four companies that are recognized as Print Standard Offset (PSO)-certified companies (aligned with ISO 12647). The Process Standard Offset (PSO) is the standard procedure for the creation of print products aligned with the international standardization series ISO 12647 [14]. By using PSO, the quality of the production of a complete print product can be guaranteed, from data creation to the finished print products [12]. Most developed countries, for example, Germany, widely recognize and implement the standards in the printing industry [15]. Almost 400 printing companies in Germany are certified with ISO 12647-2 [11], and nearly 80 % of medium and large companies have printing standard certification, which increased the rate of export through high-quality products at a competitive price [12]. Hence, it is fair to assume that Malaysia's printing industry is still lagging and there is an obvious gap compared to other developed countries in terms of adoption of international printing standards.

4 Principle of Diffusion for Adoption

The purpose of this study is to explore on the international adoption of printing standards (PS) using the diffusion of innovation theory and its relation to business performance by focusing on commercial printing companies in the category of small and medium enterprises (SMEs) in Malaysia. The printing industry needs more research to bring the industry to the next level of excellence (Malaysia Printing & Supporting Industries Directory 2011/2012, 2012, p. 2). Generally, majority of the local printing companies are in the category of SMEs. In Malaysia, SMEs form the backbone of the economy, which contribute greatly to income generation and employment opportunities. Generally, SMEs account for 99.2 % of total enterprises and employ 65 % of the workforce [16]. Based on the data from Small & Medium Industries Development Corporation [17], approximately 1,288 companies are registered in the printing sector, where 1,195 companies are in the SME category. On the other hand, SME printing companies are also associated with being unable to perform in terms of producing quality products according to the standards required. In addition, [18] pointed out that the weaknesses and challenges faced by the majority of the small medium enterprises in Malaysia are lack of technology adoption, human resources, access to loans, and competitions from global market leaders.

To be able to describe the rate of adoption of international printing standards among printing companies in Malaysia, we need to identify a theoretical model that can be used as a basis for conducting research. Thus, the framework of this study

will be based on the theoretical framework of the diffusion of innovation introduced by [19]. The basic premise of this theory is that it examines the company's adoption process of a new idea or technology that is believed to help the business to perform well and to what extent does the company can either adopt or reject the new process. For example, SME printing company is associated with disadvantages in terms of financial resources, and this may somehow limit the company from adopting a new system. The theory of innovation that has been defined by [19] refers to the innovation practices that include technology, practice, or product, which is assumed as a new idea. The theory of diffusion of innovation is based on four main elements, which are innovation, communication through a channel, overtime, and social system [19]. These elements describe the degree of adoption or rejection on the new idea (innovation) by a company. In addition, Roger's theory stated five perceived attributes of innovation, which are relative advantage, compatibility, complexity, trialability, and observability, in order to determine the rate of adoption. According to [19], these five attributes of innovation would determine the degree of adoption or rejection of the innovation.

The diffusion of innovation model has been used in various disciplines to get the evidence and to identify the adoption of innovation. For example, in the agricultural sector, this model has been applied to determine the acceptance of hybrid seed; in marketing, the model determines the acceptance of the new brand; in the economic sector, the model is used to evaluate the relationship between the implementation of ISO 9000 and the economic development in developed and developing countries [20]. In addition, in accounting, the model determines the better accounting practice based on the international accounting standards [14]. Currently, there is no study conducted using the theoretical model to explain the adoption of international printing standards. This study will replicate the model that has been successfully used to prove the theory and practice in the field of printing. The present study will also explore the adoption of a new idea or innovation through the practice of international printing standards among the commercial printing companies and the perception on the positive contribution to be gained through the implementation.

5 Current Trend of the Printing Industry

One of the vital issues discussed at the global level with regard to the printing industry is about producing high-quality print products and improving productivity in order to fulfill customers' requirements. According to Chung [21], commercial printing companies are always facing problems in meeting customers' demands and expectations, to match the color for the print product. In addition, presently, the customers' demand on color-printed products should be easily controlled, predictable, and repeatable during printing production. The trust and confidence of customers are very important in printing businesses. To ensure that customers are satisfied, printing companies need to prove their capability to produce quality printing works by having a certification on international printing standard or practicing

quality management. The printing industry resembles other industries, such as the electric and electronic, food processing, and hospitality sectors that require a process standardization to produce better quality products or services. However, in the printing industry, it has specific printing standards for controlling the production processes, so as to ensure that it can produce quality print products.

Presently, the use of international printing standard has become a trend in the printing industries worldwide [10]. This can be supported by a survey that was done by Chung and Jensen [10], who stated that most of the printers involved in the survey had expressed the importance of the printing standards and planned to implement it in the near future. In addition, for example, in the context of China, Chen et al. [22] stated that most of the printing companies in China are working toward quality management and certification and most of them have successfully obtained the certification of ISO 9001 quality management system. The above matter proves the necessity of international standards, which can give benefits to an organization both internally and externally. Thus, this indicates that the adoption of international standards can be an important issue to be considered as a strategy for business growth and development.

Based on the literature review, there is a gap in the research that was previously conducted, as the studies involved the entire industries or sectors and did not focus on the specific sectors. The studies conducted in the field of quality management were focused on the popular international standards such as ISO 9000 (documentation management) and ISO 14001 (environmental management). No known study has been conducted using the international printing standard in Malaysia. Thus, it is justified for a study to be conducted to explore about the adoption of this standard in the Malaysian setting. SME printing companies need to understand in order to adopt an international standard as a business strategy to ensure their survival and performance in the business. This situation will contribute toward the improvement of business performance for competing in both local and international markets. The weakness and failure of the printing company for not changing their mindset in business can make them fall behind and not being competitive [2]. According to Thaler [23], in a challenging business environment, in determining the quality, cost, and time spent, the standard plays an important factor in contributing toward the success or failure of a company.

Currently in Malaysia's printing industries, there are not many printers in Malaysia that practice good quality management and have international standard certification. There are only four printing companies in Malaysia that are awarded and certified with PSO (Process Standard Offset) in line with ISO 12647 [12]. Printing output produced is still below the printing standard requirement, and as a result, customers or allied printers are reluctant to give printing job to any printer that is not capable to produce good printing quality. Inabilities to produce quality printing works are always associated with SME printing companies. Perhaps this situation will affect the competitiveness of SMEs printing companies to compete in the market either locally or globally.

Hence, it is proven that adoption of international printing standards among printing companies will be able to strengthen and improve their businesses performances.

This is the reason why this study must be conducted in order to help printing companies be aware of the opportunities and barriers they will be facing toward an effective business performance through adoption of international printing standards.

6 Future Directions for Adopting International Printing Standard

As a conclusion of this preliminary study, a mixed-method approach is to be used to collect data. This method utilized both quantitative and qualitative methods. The use of both approaches in tandem will enhance the overall strength of the study compared to a single qualitative or quantitative research [24]. This study also proposes to use the diffusion of innovation theoretical framework introduced by Rogers [19]. Currently, there is no study conducted based on the existing theoretical model to explain the adoption of international printing standards.

Thus, these characteristics are tested on Malaysian printing companies focusing on small medium enterprises (SMEs) to understand their adoption of the new idea or technology of international printing standards. This study will determine the degree of adoption or rejection of the international printing standards that are influenced by perceived attributes of an innovation through the communication channel and the readiness of the adopter in the social system [19].

Through a literature search, the diffusion of innovation model has been used in various disciplines to help in getting the evidence and to identify the adoption of innovation. In the agricultural sector, this model has been applied to determine the acceptance of hybrid seed; in marketing, the model was used to determine the acceptance of the new brand, and in accounting, the model was used to determine the better accounting practice based on international accounting standards [14] (Fig. 39.1).

In this study, the mixed-method approach is used to collect the data to help the author achieve the research objectives. This method utilized both quantitative and

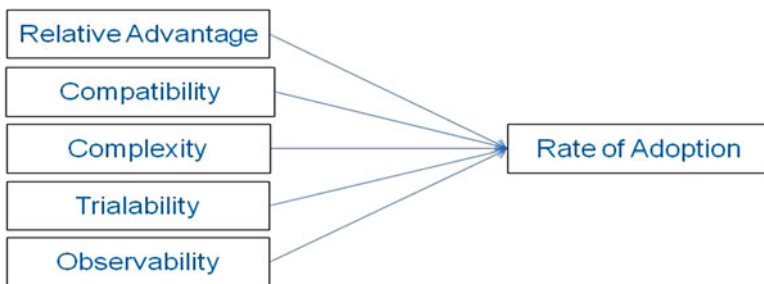


Fig. 39.1 Roger’s model: five domains that influence the rate of adoption [19]

qualitative methods. Survey is conducted among production employees that are working in pre-press and printing unit in printing companies. Personal interviews are conducted with the top management who are responsible to make decisions regarding the adoption and implementation of the international printing standard. A triangulation method approach is utilized to analyze the data. In this approach, data from the survey will be triangulated with the interview responses to validate the findings.

6.1 Groundwork Study

In the quantitative research method, a survey will be conducted by targeting the printing companies. The purpose of the survey is to get a quantitative description of trends, attitudes, or opinion of a population [24]. The questionnaire survey involved employees that are working in the production of commercial printing firm in the Klang Valley area (pre-press and printing department). The process of designing the questionnaires consisted of several phases before distributing them to the target respondents. The questions are mainly close-ended as the respondents involved are from various levels of educational backgrounds. The questions in the questionnaire are developed based on the theory domains and are also supported by literatures.

A 5-point Likert scale will be used, where 1 indicates strongly disagree and 5 indicates strongly agree. The form of these questions can facilitate the respondents to give an answer in a short time. The first draft of the questionnaire will be reviewed before they are distributed to the respondents to avoid mistakes, and weaknesses will also be improved. This study targets 200 employees to answer the questionnaire, where they are selected based on a purposive sampling from several printing companies. The best sampling number for factor analysis research requires five times from the number of measurement items in the questionnaire [25]. The companies are identified and selected from the list of companies obtained from Professional Printers Directory 2010/2011, Persatuan Pengusaha Percetakan Melayu Malaysia (PPPMM). The data will be analyzed using statistical analysis software, for example, SPSS.

6.2 Development Model and Theory

The development model should emphasize the complex transaction between the individual and their environment and between systems of influence across a period of time [26]. Meanwhile, a qualitative method through interviews will also be conducted. The purpose of the interview is to get the opinions or comments of the participants during the in-person interview [27]. The focus at this stage is the top management that is responsible in the decision-making for the operation of the firms. Ten top managements from different companies will be interviewed to obtain

their feedback and gain their opinions, experiences, and awareness in relation to the quality management practices for business performances. Interviews will be conducted in a one-on-one, face-to-face approach. The conversation will be recorded in order to obtain the right information pertaining to the investigation. Permission will be obtained before audio taping the interview where it will take approximately 45 min per interview.

The questions of the interview are based on the five influencing factors, the benefits and challenges of adopting the standard, and the strategies to implement PS. The questions will be revised by the supervisor and technical people from the printing industry. The data will be transcribed in Malay, then re-transcribed in English, coded, and analyzed for themes. Furthermore, transcribed data will go through a member checking procedure with all the informants will be done to enhance the trustworthiness of the transcripts.

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Chapter 40

Malaysian Standard Conformity on Access and Facilities for Person with Disabilities in Public Bus Terminal Buildings

Hikmah Kamarudin, Nor Rima Muhamad Ariff, Wan Zuriea Wan Ismail, Zarina Isnin, and Aidatul Fadzlin Bakri

Abstract Public bus terminal buildings are included as public buildings where providing access and facilities for everyone is crucial for both the internal and external environments of the buildings in order to ensure that every journey continues. However, literature review revealed that many of the access and facilities provided inside and outside public buildings are not disabled-friendly including public bus terminal buildings. Requirements to fulfill the Malaysian Standard (MS) code of practice related to access and facilities are clearly stated in the Uniform Building (Amendment) By-Laws (UBBL) 1991 for public buildings. Thus, this study aims at examining the MS conformity of the access and facilities for person with disabilities (PWDs), inside and outside of public bus terminal buildings. Access auditing has been conducted at three public bus terminals in Klang Valley by evaluating the existing access and facilities for PWDs with the established requirements. Results showed that improvement is still needed even though it received the highest score among the three public bus terminal buildings audited, especially upgrading elements that do not conform to the MS. Noncompliance of the MS suggests that more input of knowledge of the requirement is needed by the implementer and firmer enforcement should be engaged by the enforcement body.

Keywords Malaysian standards • Access and facilities • Conformity • Public bus terminals

H. Kamarudin (✉) • N.R.M. Ariff • W.Z.W. Ismail • Z. Isnin • A.F. Bakri
Faculty of Architecture, Planning and Surveying, Universiti Teknologi MARA,
Shah Alam, Malaysia
e-mail: hikmah@salam.uitm.edu.my

1 Introduction

In Malaysia, the need to create a built environment and public transportation that is accessible to all is recognized by the Malaysian government. “Building an Environment that Enhances Quality of Life” is one of the five strategic thrusts of the Tenth Malaysian Plan (2011–2015) as announced by the Prime Minister [1]. In enhancing public transport efficiency, one of the major priorities of the Malaysian government is to improve the public transport system. SPAD (the Malay acronym for Land Public Transport Commission) has been introduced by the government as the lead agency responsible for planning, regulating, and enforcing land public transport-related matters and operations in order to encourage more people to use public transport [1].

According to Yaacob and Hashim [2], transportation includes the use of vehicles, the use of the street environment, and the use of buildings. Hence, public bus terminal buildings need to be accessible in order to ensure that the access and facilities provided by the public transportation can practically be used by everyone especially for the person with disabilities (PWDs). PWDs usually need disabled-friendly access and facilities as they may have some physical difficulties in their daily routine. However, according to Soltani et al. [3], the level of public transportation awareness on disability issue is still lacking in Malaysia.

The Person with Disabilities Act (Act 685) (PWDA) which was introduced in Malaysia in 2008 has evolved the perspective of PWDs access and facilities from charity and welfare, based on the Medical Model, to the recognition of the Social Model [4]. PWDs should not be seen out of sympathy; they should enjoy the existing facilities as other legal citizens [5]. The main aim of the PWDA is to provide equal rights to all society. However, it is noted that Malaysia has limitations in enforcing legislation pertaining to access and facilities for PWDs [4].

According to the PWDA [6], PWDs include *those who have long-term physical, mental, intellectual, or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society*. The demand from PWDs is for facilities without creating barriers for those with special needs [4]. Inaccessible built environment will lead to stress, low self-esteem, and discomfort to PWDs when they are in public which affects them negatively [7]. Furthermore, as the hub for public transportation, access and facilities available at public bus terminal buildings must be all user-friendly so that everyone including the PWDs can fully enjoy the bus terminal services. Thus, this study aims at examining the MS conformity of the access and facilities for PWDs, inside and outside of public bus terminal buildings. Indeed, it is better for the plan of the public building to be strictly checked by the local authority prior to the building plan approval in order to achieve a more sustainable development where there will be no extra cost for later adaptation.

2 Literature Review

2.1 Accessible Related Terms

Accessible design is related to a few terms such as inclusive design and universal design. The terms inclusive design and universal design are often associated with public access and facilities. Universal design is defined as the design of products and environment which is usable by everyone, to the greatest extent possible, without specialized design for a certain group of people [8]. Universality and flexibility are among the key terms of a universal design. There is a need to promote design that does not discriminate people based on different abilities and other aspects [8].

Accurate understanding of universal design theory is still low among Malaysian societies. However, in recent years, there has been an increasing public awareness on accessibility in Malaysia [9]. Some people may have misunderstood that universal design exclusively caters the need of PWDs regarding access and facilities in the built environment. Fortunately, Bringolf [10] created the idea of *designing for the whole of the population bell curve by creating the maximum utility for the maximum number of people regardless of age, culture, and education or ability level*. Thus, the terms “universal design,” “design for all,” and “inclusive design” as derived from Bringolf allow everyone to use the access and facilities.

2.2 Access and Facilities in Public Bus Terminal Buildings

Public bus terminal buildings are included as public buildings where providing access and facilities for PWDs are crucial for both the internal and external environments of the terminals. The PWDs usually need disabled-friendly access and facilities as they may have some physical difficulties in performing daily chores especially while traveling.

For access to public transportation facilities, the PWDA states that *person with disabilities shall have the right to access to and use public transport facilities, amenities and services open or provided to the public on the equal basis with the person without disabilities and ...the Government and providers of such facilities, amenities and services shall give appropriate consideration and take necessary measures to ensure that such facilities, amenities and services conform to universal design in order to facilitate their access use by person with disabilities*. Yaacob and Hashim [2] highlight the word facilities in the clause as physical things created to serve particular functions. Amenities are physical things that contribute to physical or material comfort, while services are assistance given to someone in need [2].

Access and facilities in public transportation terminal are designed inefficiently that leads to a limited space for the PWDs to move about [3]. More improvements and redesigning of the existing facilities are required for equality so that the PWDs would not feel being left out. Report by the Department of PWDs showed that actions have been taken by the transportation industry to upgrade the implementation of universal design facilities, i.e., in the Malaysian Railways (KTMB) and the Mass Transit Train (LRT) [4]. In the meantime, the Ministry of Transportation has come up with guidelines for accessible buses, while the Malaysian Airlines is providing wheelchair services assistance with free-of-charge accommodation [4]. According to an interview with the Assistant Director of the Automotive Engineering Unit of the Department of Road Transportation in 2013, the guideline drafted is not being implemented, and any universal access and facilities provided by the transportation company are only by voluntary basis.

2.3 PWDs' Rights

Everybody has the right of equal access in order to perform daily routines and to meet social needs. PWDs have the right to participate in the society and get full access to all public services like many other citizens [11]. Some of the major social factors that contribute to the exclusion of PWDs from social and economic mainstream are inaccessible environment [12]. Inaccessibility to the built physical environment is one of the significant barriers to the full participation of PWDs in the society [3].

According to Maidin [13], Article 8(2) of Malaysia Federal Constitution 1957 declares equal rights for all citizens as *...there shall be no discrimination against citizens on grounds of religion, race, descent or place of birth in any law; or in the appointment of any office of employment under a public authority; or in the administration of any law relating to the requisition, holding or disposition of property; or the establishing or carrying on of any trade, business, profession, vocation or employment.* Despite this guarantee by the Federal Constitution 1957, PWDs are still facing problems in developing themselves as they are deprived of simple basic rights such as freedom of movement to access to facilities such as educational and employment and enjoying social life. This matter is simply due to the fact that schools, business premises, workplaces, public transport, and public facilities are beyond their reach [13].

The Malaysian Persons with Disabilities Act (PWDA) came into effect in 2008. Report by Japan International Cooperation Agency (JICA) [14] shows that the Act underlines PWDs' rights of accessibility to public facilities, amenities and services, and buildings; public transport facilities; education; employment; information, communication, and technology; cultural life; and recreation, leisure, and sport. The purpose is to support PWDs to be able to help themselves, through their rights, equal opportunities, and guaranteed social involvement. It shows that the goal is to promote the integration of PWDs into all aspects of the society [14].

2.4 The Implementation of Malaysian Standards

In Malaysia, it is mandatory for all public buildings to provide access and facilities for the PWDs since the requirements to fulfill the MS are stated in the Uniform Building (Amendment) By-Laws (UBBL) 1991. The requirements are applicable to all buildings (excluding residential) that PWDs may use as members of the general public, as visitors, or for the purpose of employment. A building having less than 280 m² of floor area per level is not required to provide vertical access for PWDs provided the ground floor is accessible [15] (Table 40.1).

Those three MS need to be implemented by local authorities in Malaysia as the service and facilities provider especially in the planning and design process by the town planners, architects, building surveyors, landscape architects, and engineers along with their technical team. It should also be implemented by other professionals related in the process of approving development applications from the PSP. However, the implementation of the regulation is always questioned by the user who feels that access and facilities provided are always not fulfilling the PWDs' needs [3].

According to JICA [14], in Malaysia, the facilities may have been built according to standards, but many of them cannot be used for various reasons such as errors in design or installation. This phenomenon is the result of non-collaboration between concerned parties and lack of knowledge among designers and lack of awareness, understanding, and knowledge of agencies and persons in charge of checking legal compliance in design review and final inspection [14].

Table 40.1 Malaysian standards code of practice related to access and facilities for PWDs

Malaysian standards	Description
Malaysian Standard 1184:2002, Code of Practice on Access for Disabled Persons to Public Buildings (First Revision)	This MS specifies the basic requirements for the elements of buildings and related facilities so as to permit access by PWDs. These requirements are applicable to all buildings that PWDs may use as members of the general public, as visitors, or for purposes of employment. This standard supersedes MS 1184:1991
Malaysian Standard 1183:1990, Code of Practice for Means of Escape for Disabled Persons	This code of practice is used as a guide for a new building construction work and modification. It is to provide the planning, action, and requirement that should be applied on buildings in aspects such as fire safety for PWDs. The provisions include a fire escape, staircase, and others
Malaysian Standard 1331:2003, Code of Practice for Access of Disabled Persons Outside Buildings (First Revision)	Specifies the basic requirements for the provision and design of outdoor facilities so that they are accessible and usable by PWDs. This standard supersedes MS 1331:1993. This MS is not included in the Uniform Building (Amendment) By-Laws (UBBL) 1991. However, the requirement to conform to this code is included for getting planning permission which is stated in the Development Order (DO) requirement

Source: Kamarudin et al. [16]

2.5 Access Audit

An access audit needs to be conducted on the existing building and the surrounding built environment in order to examine its compliance to the MS requirement. Checklists need to be prepared according to the minimum requirement as in the MS. Currently, in Malaysia, there are access audit consultants that conduct special training on access audit especially to the local authority technical staffs. The participants were thought of the needs of access and facilities in the built environment as well as simulation exposing them on how being on a wheelchair, walking with a stick, etc. There were also representatives from the PWDs, together involved in access audit training session. Therefore, the participants get a better understanding of the needs of the PWDs regarding access and facilities [17].

3 Methodology

Access auditing is the main tool for examining MS compliance of the access and facilities for PWDs inside and outside of public bus terminal buildings. Interview sessions with the management of each case study were also conducted in order to get further explanation on the access and facilities provided. The three case studies of public bus terminal buildings chosen are Pudu Sentral in Jalan Pudu, Kuala Lumpur, Klang Sentral in Klang, and Integrated South Terminal in Bandar Tasik Selatan. Two separate access audit checklists were designed based on the elements to be audited inside and outside of the building. The access audit checklists employed in this study which contain the minimum requirements of access and facilities for PWDs have been adapted from Malaysian Standard 1331:2003, Code of Practice for Access of Disabled Persons Outside Buildings (First Revision) [17], and Malaysian Standard 1184:2002, Code of Practice on Access for Disabled Persons to Public Buildings (First Revision) [15]. The access audit was conducted by evaluating the existing access and facilities for PWDs with the established requirements.

In order to identify the most MS compliant among the case study, three levels of auditing scores have been used to measure the compliance rate. Scores are given according to the audit compliance as in Table 40.2, while the elements audited are as shown in Table 40.3. The maximum access auditing score is 34 since there are 17 elements audited where the fully comply element gets 2 points each. Points accumulated from the inside and outside of each building audited are totaled to get the finding of the most MS compliant public bus terminal building.

Table 40.2 Access auditing score

Audit compliance	Score
Fully comply	2 points
Partly comply	1 point
Not comply/not provided	0 point

Table 40.3 Access auditing elements

Element	Outside building	Inside building
Footpath	✓	✓
Step ramp	✓	✓
Ramps	✓	✓
Stairs	✓	✓
Lifts		✓
Handrails	✓	✓
Escalator		✓
Guiding blocks	✓	✓
Sign and symbols	✓	✓
Parking	✓	✓
Finishes	✓	✓
Circulation spaces	✓	✓
Projection, guard rails, opening, and drops	✓	✓
Main entrance		✓
Door and doorway		✓
Toilet		✓
Announcements, signals, and warnings for visually and hearing impaired persons		✓

Table 40.4 Compliance rating

Percentage	Indicator
80–100	Very good
60–79	Good
40–59	Average
20–39	Poor
0–19	Very poor

Finally, the scores are converted into percentage in order to determine the rate of compliance for each of the case study in which the indicators are shown in Table 40.4, which according to Friedman [18] is a balanced rating scale.

4 Findings and Discussion

The series of access audit conducted is based on the elements identified to be audited for the inside and outside environments of the public bus terminal buildings. The MS requirements on the access and facilities for the inside and outside environments of buildings have been simplified through the checklist. A summary of the results is shown in Tables 40.5, 40.6, and 40.7. For the purpose of this study, only elements included in those tables are audited.

Table 40.5 MS conformity tabulation of Pudu Sentral

Elements	Pudu Sentral		
	Comply	Partly comply	Not comply
Footpath		✓	
Step ramp	✓		
Ramps	✓		
Stairs	✓		
Lifts			
Handrails	✓		
Escalator	✓		
Guiding blocks	✓		
Sign and symbols		✓	
Access to terminals		✓	
Finishes	✓		
Circulation spaces	✓		
Projection, guard rails, opening, and drops	✓		
Vehicle parking and access		✓	
Main entrance		✓	
Toilet		✓	
Announcements, signals, and warnings for visually and hearing impaired persons		✓	
<i>Total</i>	25/34		

Table 40.6 MS conformity tabulation of Integrated South Terminal

Elements	Integrated South Terminal		
	Comply	Partly comply	Not comply
Footpath		✓	
Step ramp	✓		
Ramps	✓		
Stairs		✓	
Lifts	✓		
Handrails		✓	
Escalator		✓	
Guiding blocks	✓		
Sign and symbols		✓	
Access to terminals	✓		
Finishes	✓		
Circulation spaces	✓		
Projection, guard rails, opening, and drops		✓	
Vehicle parking and access	✓		
Main entrance		✓	
Toilet	✓		
Announcements, signals, and warnings for visually and hearing impaired persons		✓	
<i>Total</i>	26/34		

Table 40.7 MS conformity tabulation of Klang Sentral

Elements	Klang Sentral		
	Comply	Partly comply	Not comply
Footpath			✓
Step ramp			✓
Ramps	✓		
Stairs	✓		
Lifts			✓
Handrails		✓	
Escalator	✓		
Guiding blocks			✓
Sign and symbols		✓	
Access to terminals			✓
Finishes	✓		
Circulation spaces	✓		
Projection, guard rails, opening, and drops	✓		
Vehicle parking and access	✓		
Main entrance		✓	
Toilet			✓
Announcements, signals, and warnings for visually and hearing impaired persons			✓
<i>Total</i>	17/34		

Generally, most of the elements audited in the three public bus terminal buildings in Klang Valley are provided. However, it can be seen that the elements provided are not fully complying with the MS, and there are also elements that are not complying with the MS at all. Findings show that the Integrated South Terminal scored the highest with 26 points, Pudu Sentral scored 25 points, while Klang Sentral scored 17 points.

Based on the tabulation in Table 40.5, as for Pudu Sentral, there are nine elements that comply to the MS while seven elements partially comply the MS. Examples of the elements that partial comply are the signs and symbols of facilities for PWDs and the footpath. The signs and symbols of the bus terminal should be placed with Braille located underneath the wordings so that the visually impaired person can also be notified with the signage. The footpaths provided should be wider and with guiding blocks. This 35-year-old terminal building which is newly renovated is said to adopt a disabled-friendly concept for the renovation which completed in 2012. The effort is considered successful; however, according to the management, some of the users complained that the facilities provided are quite far from the ticket counters.

For the Integrated South Terminal (Table 40.6), there are nine elements found complying with the MS. In this modern-looking terminal building, there are eight elements that are not fully complying with the MS. Based on the audit exercised, it can be seen that the access and facilities for visually impaired person are well provided.

However, there is no additional sign with Braille except for the landing call buttons in the lifts.

Table 40.7 shows that Klang Sentral scored the least points in providing access and facilities for PWDs even though the building is considered new which was developed in 2008. There are also elements that are not complying to the MS such as no guiding block for the visually impaired person and narrow width external footpaths which are insufficient for wheelchair access. Furthermore, the breakdown lift is unattended which also shows a lack of maintenance effort given. The management of Klang Sentral confessed that they are not aware on the MS requirements.

Finally, the access auditing scores are converted into percentage to determine the compliance rate. The Integrated South Terminal with the highest cumulative score has a compliance rate of 76.47 % followed by Pudu Sentral (73.52 %) and Klang Sentral (50 %). By referring to the compliance rating indicator as shown in Table 40.4, the Integrated South Terminal and Pudu Sentral are rated as “Good” in MS compliance, while Klang Sentral is rated as “Average.”

5 Conclusion

It can be concluded that designing accessible public bus terminal buildings is crucial in order to ensure that every journey continues since the rights to have access and facilities are for all. Audit access is one of the main tools that can evaluate the built environment’s accessibility. It can be the starting point to improve access and facilities provided in the existing building stocks. Results show that improvement is still needed even though it has the highest score among the three public bus terminal buildings audited, especially upgrading elements that do not conform to the MS. Technical papers reporting on the lack of MS compliance are recommended to be delivered to the building caretakers after each access auditing conducted.

Noncompliance to the MS suggests that more input of knowledge of the requirement is needed by the implementer and firmer enforcement should be engaged by the enforcement body. The enforcement body in local authority might need to strengthen their role especially in the planning and building approval processes. The approval should be strictly granted only to the submission parties that had fully complied the MS requirements in order to achieve a more sustainable development where no other adaptation is expected to fulfill the MS requirements after the development is completed.

A more proactive action by the designing architects, town planners, building surveyors, landscape architects, and engineers will lead to a better accessible and sustainable built environment. It is also recommended that more inputs from the PWDs should be considered in improving the current MS implementation in order to achieve “access for all.”

The outcomes of this study are expected to be useful as future reference in designing or retrofitting access and facilities for PWDs for the inside and outside components of public buildings, particularly for public bus terminal buildings. It is hoped that the accessibility issues inside and outside public buildings which are currently being

raised up by the PWDs community in the mass media would have a better solution. For further research, there is a need to discover PWDs' perception and satisfaction toward the current access and facilities provided in public bus terminal buildings.

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Chapter 41

Application of Cognitive Theory in Multimedia Technology-Based Learning: Concentration on Malaysian Cultural and Heritage

Ng Perng Jeu, Mohd Fairuz Ali, and Aloysius Yapp

Abstract This study established on developing the educational technology as a tool in improving learning performance when used in education. The hypothesis is based on the cognitive theory of multimedia learning which suggests that presenting the teaching materials in a form of interactive multimedia could enhance the learning experience. The research suggests that the interactive multimedia elements applied in the educational technology can enhance the learning process by helping to improve the ability and levels of motivation of receiving the information related to Malaysian culture of Malaysian language and Malaysian traditional games Wau and Panglima Bukit Sadok.

1 Introduction

In multimedia learning, information is presented to students with a combination of different modalities or modes such as spoken words and pictures. Mode refers to the format used to represent the lesson, such as words versus pictures. Modality refers to the information-processing channel used by the learner to process the information, such as auditory versus visual. However, Kalyuga et al. [1] suggested that

N.P. Jeu (✉) • M.F. Ali
Department of Multimedia Design and Animation, Universiti Tunku Abdul Rahman,
Petaling Jaya, Malaysia
e-mail: ngpj@utar.edu.my

A. Yapp
Department of Multimedia Design and Animation, Faculty of Creative Industries,
Universiti Tunku Abdul Rahman, Petaling Jaya, Selangor, Malaysia

some multimedia learning software can lead to cognitive overload, which affects learning performance negatively. The purpose of instructional design is to assist learners to store information in long-term memory. This implies that the way teaching materials are presented to learners is a key element in instructional design.

Attention to cognitive load is a critical concern for instructional designers when designing multimedia teaching materials, because unnecessary multimedia messages may worsen learning performance by increasing working memory load and interrupting information processing.

The massive influence has created a new pop culture which provides unlimited volumes of variety interactive multimedia applications available as to date. The mushrooming of computer technology media that have been incorporated with learning tools is designed competitively in almost all types of areas such as 2D animation, 3D animation, computer digital game, mobile phone applications, and many more.

2 Context

Multimedia instructional systems have been widely applied in teaching and learning, but the media presentation mode that is best for English listening comprehension remains uncertain, and whether unnecessary information leading to cognitive overload for the learners also remains inconclusive. According to the studies done by Jones et al. [2] and Diao et al. [3], students who learn with double mode (sound and text) outperformed students who learn with single mode (sound) and had lower cognitive load. Studies related to foreign language learning and cognitive load are mostly about digital learning environments. Besides that, scholars, researchers, and game developers have written countless of scholarly and non-scholarly articles on how multimedia-based learning can be a sufficient instrument as social agent to inculcate a sense of formal and informal learning context. Staalduin et al. [4] discovered a new wavelength in the edutainment industry. Specifically, the purposes of this study are the following:

- To explore on Malaysian identity contents that have been incorporated with interactive multimedia technology by using three Malaysian identities that have been designed previously which are (1) Interactive Multimedia Courseware: Malaysian Language (Bahasa); (2) Computer Digital Game: Malaysian Traditional Game (Wau); and (3) 2D Digital Animation Borneo: Local Legendary Identity (Warrior of Sadok Hill)
- To provide on the process of each interactive multimedia technology as stated above and its effectiveness

3 Procedure of the Study

3.1 Malaysian Language

In language learning experiment, 108 standard three students in public primary Chinese schools made up the sample for this study. All students had attended Bahasa Melayu class and had some basic understanding on different types of nouns. Participants are randomly assigned to two conditions with different versions of learning mode, 54 students had to learn with sound narration and animation (modality learning mode) and 54 students had to learn with sound narration, animation, and on-screen text (redundancy learning group). Students will be assigned to computer laboratories that could accommodate an entire class of up to 25 students at one time.

This experiment was conducted in a computer-based learning environment. All students took part in the experiment. This study is an experimental design with independent measures. The independent variables were the learning modes (redundancy group and modality group). The dependent variables were gender (male and female students) and the motivation toward the instructional modes (as measured by Keller's IMMS questionnaire). This experiment was using a one-way ANOVA to analyze the interaction between the dependent and the independent variables.

1. *Pretest Phase*: A prior knowledge test was administered to determine the participants' prior knowledge of the topic of nouns. This pretest contained 14 questions.
2. *Intervention Phase*: Immediately after the students had completed the pretest, they were given the version of the presentation mode that corresponded to the experimental condition they were assigned to. Students in all the two presentation modes were exposed to the same instructional materials but in different modes of presentation. Students in the redundancy mode were asked to learn the nouns by watching the short animation (illustration, narration, and on-screen text) on the computer. The learning environment for the students in the modality mode was exactly the same as the redundancy mode, except that the animation content on the computer only consisted of illustration and narration. Students can control the presentation of the computer-based learning material by using the computer's mouse.
3. *Posttest*: Immediately after the students completed the learning activity, they were asked to complete a test to assess their understanding of nouns. This posttest contained 15 questions.

There were two instruments in this study: (1) the Bahasa Melayu noun pretest and posttest questions (each comprising of 14 questions and 15 questions from the domain of understanding and distinguishing the type of nouns) and (2) the Instructional Material Motivation Scale (IMMS) to measure the learners' motivation toward the learning modes. The Instructional Material Motivation Scale (IMMS) was developed by Keller [5] to measure the learners' motivation toward the modes

of instruction. In this study, the original Likert-type choices will be changed to emoticons which are much more suitable for students. The IMMS questionnaire will be comprised of 36 emoticon statements (adapted version) that are based on four components of ARCS model: Attention, Relevance, Confidence, and Satisfaction.

3.2 *Malaysian Traditional Game “Wau”*

In digital game “Wau” research activities, mixed methods were used in conducting this research using four different stages – (1) data gathering and collection by distributing 100 questionnaires with 66 respondents from SEGi College University (30 respondents) and University of Selangor (UNISEL) students (36 respondents), respectively, to test their general knowledge on Wau with no access of playing the game on computer. (2) A pretest is administered at SEGi College University Kota Damansara with 20 respondents. (3) A posttest was conducted at UNISEL with 26 respondents. The idea of conducting two different universities was not to compare the respondents’ playing skills and understanding level of the game; rather the limited access to the university and computer lab has pushed the researchers to find another location to conduct the game play with the small number of respondents. University students were chosen as a focus group in this research as they represent the mediocre views in between adults and the younger generation. In the pretest and posttest, different respondents were given the same set of questionnaires to analyze their attitudinal changes toward the Wau computer game. The questions were distributed to the respondents upon the completion of the Wau game to Level 2.

3.3 *2D Digital Animation Borneo: Local Legendary Identity (Warrior of Sadok Hill)*

The researchers used random sampling methods in river Saribas, Entanak up to Saka. With the information obtained. Other than their own efforts, the researchers used school boys as research assistants to collect information from their respective long houses.

After obtaining the information from a variety of sources from respondents, the researchers used qualitative methods to interpret these data. The finding of the various data acquired new status quo. The information is generated based on the opinion of three rivers. This is the area that witnessed the war of freedom launched by PBS toward the Brooke regime in the 1860s. Next the researchers will use the information, which has been interpreted to be the initial framework for the creation of the PBS synopsis construction. After the character design, background, and screen breakdown, the researcher proceeds with the stage which looks into the production of storyboarding. In the visualization process, the researchers obtained the original drawing and PBS.

4 Results

The goals of this experiment were to investigate (1) the effects of cognitive theory of multimedia learning on the learning of Bahasa Malaysia as the second language among primary Chinese school students, (2) application on edutainment as a game-based learning for students, and (3) the 2D animation learning.

4.1 Result 1: Comparison on the Learning Outcome Based on Redundancy and Modality Learning Mode

Table 41.1 presents the number of learners, means of IMMS score, standard deviations, and standard errors for male and female students in the two learning modes (redundancy and modality). Values of standard deviations for learners in the redundancy learning mode and modality learning mode were $SD=4.953$ and $SD=6.735$, respectively. That means that genders in the learning mode had a mean effect on the IMMS score. Female students (mean = 124.888, $SD=4.492$, $p=0.000$) significantly are more motivated than male students in the redundancy learning mode (Fig. 41.1).

4.2 Result 2: Investigation Result on Students' Attitude Toward Learning Traditional Game in Educational Game by Computer

The posttest was conducted at the University of Selangor (UNISEL) with 26 respondents that participated in a computer lab. The same method used in the pretest is applied in the posttest with the distribution of same questionnaires toward the end of the game. Twenty-two respondents (84.6 %) were able to complete both levels.

Table 41.1 Number of learners, means, standard deviations, and standard error of IMMS score and gender by learning mode

Gender	IMMS score			
	<i>N</i>	<i>M</i>	SD	SE
Redundancy learning mode				
Male	27	106.370	5.414	1.042
Female	27	124.888	4.492	0.864
Total	54	115.629	4.953	0.953
Modality learning mode				
Male	27	111.481	5.308	1.021
Female	27	105.037	6.536	1.258
Total	54	108.259	6.735	0.961

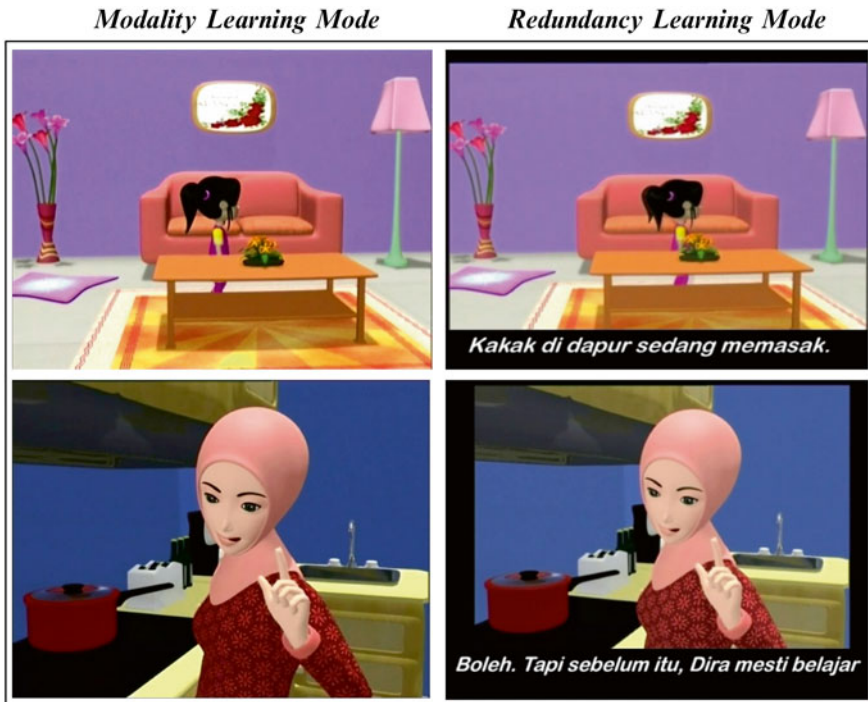


Fig. 41.1 Example of screen caption on multimedia instruction

Only one respondent was having a problem while playing the game. Eight respondents (30.8 %) found that Level 2 was not easy to accomplish, while four respondents (15.4 %) felt that the music was too loud. Similar with the response in the pretest, majority of the respondents found that the character design was suitable and attractive and the background, choice of music, and sound effects are suitable with 26 respondents (100 %) that gave a positive feedback that the game is able to educate people on Wau. The researchers took immediate action by reducing the music volume to an average level of acceptance (Fig. 41.2).

4.3 Result 3: Applying the Theory of Fidelity in Producing Visual Art

Through the adaptation theory of fidelity of transformation, it is very important to practice the give-and-take method. The art elements that got involved are those lines, dots, shape, form, and texture. The combination of art elements creates an atmosphere which includes the outcome of the authentically local form and shape. Dots and lines formed the texture in between the form and shape. The status quo is



Fig. 41.2 Screen captures of Wow the Wau! game

a localization character with originality constricted visual setting. The principles of design such as balance, contrast, and emphasis have been carrying a lot of weight to deliver the design-based visual construction. From the outcome of formation of form and shape, the balancing point is the most important factor before the other principles [6]. By using exaggeration as the principle to construct the character, there is a lot more to study from the figure construction until the poses or gesture (Fig. 41.3).

5 Conclusions

This study has shown that the application of cognitive theory of multimedia learning in language learning courseware, computer-based game learning, and new media visual presentation has a positive outcome and intends on helping to improve the learning process and students' performance. For future research, the test questions can be designed based on the content of instructional multimedia, and it can directly measure the performance and test whether the design principle really fulfills the existing teaching material. It is suggested that future research can be executed covering Malaysian culture and heritage in a form of new media.



Fig. 41.3 Screen capture of PBS 2D animation

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Chapter 42

Cultural and Intrinsic Value of Ornamental Tiles on the Facade of Traditional Straits Chinese Shophouses in Malaysia

Wang Cheng Yong, Ruzaiika Omar Basaree, and Rafeah Legino

Abstract During the British colonial rule in Malaya (now Malaysia) in the nineteenth and early twentieth centuries, the Straits Chinese or *Peranakan*, as they are locally referred to, rose to social prominence and enjoyed significant economic power with the financial ability to inter alia deck their homes with imported ornamental tiles, reflecting their taste and wealth. Nowadays, some of the ornamental tiles on the facade of *Peranakan* shophouses in Malacca have been lost either through apathy and neglect or sheer ignorance, despite the fact that Malacca and George Town were inscribed as United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Sites on 7 July 2008. Much has been written and researched on the architecture of Straits Chinese shophouses in Malaysia without detailed study into the tiles of these houses. The specific focus of this study is the design characteristics of tiles on the facade of traditional Straits Chinese shophouses in Malacca in order to inculcate an appreciation of their origins and cultural and intrinsic values by conservation authorities, scholars and the general public. The iconography, characteristics and features of the selected samples of the tiles' designs are analysed so as to understand the source of the motif designs used. The origins of the tiles are explored to determine the cultural influences, and relevant approaches are discussed in classifying the characteristics and features of the designs. Related literature on motifs and designs from the earliest records are reviewed to provide interpretive tools for cataloguing the designs of selected samples of the tiles. A digital camera and suitable softwares such as Adobe Photoshop, AutoCAD and Adobe Illustrator are the primary tools used in tracing motifs from the collections of tile samples to facilitate the process of analysis and to determine inherent influences. This research attempts to provide a community resource in

W.C. Yong (✉) • R.O. Basaree
Cultural Center, University of Malaya, 50603 Kuala Lumpur, Malaysia
e-mail: cywang2142@gmail.com

R. Legino
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia

Malaysia about ornamental tiles of Straits Chinese shophouses for both the national and historic merit. It will highlight the cultural and intrinsic value of the ornamental tiles which warrant urgent conservation attention as an integral part of the *Peranakan* heritage in Malaysia.

Keywords Cultural • Intrinsic value • Ornamental tiles • Facade • Straits Chinese shophouses

1 Introduction

From as early as 200 BC, Chinese merchants and traders stopped at ports along the Straits of Malacca intermittently for shelter from the monsoons en route to the West [1]. The earliest Straits Chinese or *Peranakan* communities were formed as a result of intermarriages between some of these Chinese merchants with womenfolk from Aceh, Sumatra, Bali, Batak, Burma and Siam [1]. The habits and lifestyle of the *Peranakans* were influenced by the colonial powers in Malacca since the sixteenth century firstly from the Portuguese, followed by the Dutch and eventually the British. They became acculturated into a syncretic composition of Western lifestyle, local customs and at the same time maintaining traditional customs and practices from China. In the late nineteenth and early twentieth centuries, during the British colonial period, the *Peranakans* rose to economic prominence playing their role as commercial go-betweens linking the Chinese community and the European settlers [2]. The wealthy *Peranakan* families in Malacca lived on several streets adjacent to the river and oceanfront in magnificent houses [3] mostly exquisitely decorated with imported ornamental tiles.

The aim of this research is to provide an inaugural community resource in Malaysia about ornamental tiles of *Peranakan* shophouses for both the national and historic merit. This study will focus on the design characteristics of tiles on the facade of traditional *Peranakan* shophouses in Malacca in order to inculcate an appreciation of their origins and cultural and intrinsic values by conservation architects, scholars and those responsible for the maintenance and management of historic artefacts and buildings. During the course of this study, a diverse range of designs of wall and floor tiles are photographed, traced and analysed using relevant literature to determine the historical development and influences leading to the choice of the said tiles. Unfortunately, most of these rich and ornate tiles are either in a dilapidated state or appear to be depleted from the facades of the Malacca *Peranakan* shophouses as they are prone to theft and vandalism for which they are natural targets. The wall and floor tiles might have been stripped off from their rightful places by the owners themselves for sale at high prices despite the fact that Malacca and George Town were inscribed as UNESCO World Heritage Sites on 7 July 2008.

It is hoped that a catalogue from the detailed analysis of the motifs and designs of the tiles from this study would facilitate future digital reconstruction of the



Fig. 42.1 Examples of wall tiles from the facade of Malacca *Peranakan* shophouses (Source: photos by Wang Cheng Yong in May 2014)

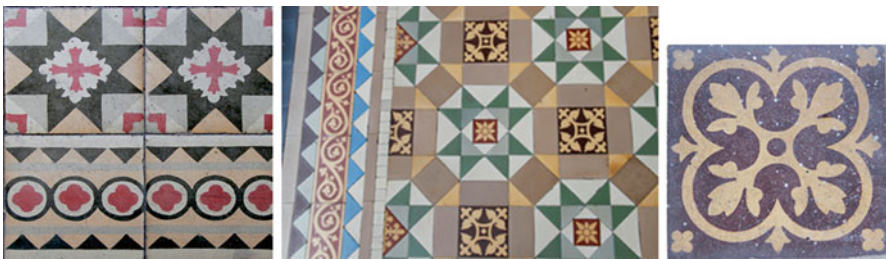


Fig. 42.2 Examples of floor tiles from the five foot way of Malacca *Peranakan* shophouses (Source: photos by Wang Cheng Yong in May 2014)

facades of the Straits Chinese shophouses in Malacca. From this study digital tools can be made available to assist in the reconstruction of relevant spoilt or missing tiles on the facade of selected *Peranakan* shophouses in Malacca. Comparisons will be made between conservation efforts in Singapore and Malaysia with a view to highlight the need for urgent conservation attention on the ornamental tiles in Malacca. Figures 42.1 and 42.2 are digital photographs of exquisite decorative wall and floor tiles on the facade of *Peranakan* shophouses along Jonker Street and Heeren Street in Malacca. These tiles have seen better days and deserve better conservation management.

2 Statement of the Problem

Ghfar [4], in a previous study, expressed regret that the identity of *Peranakans* had degenerated after World War II and became diluted. He advocated that efforts should be made to conserve their unique architecture including the shophouses, association buildings and colonial bungalows [4]. In Malaysia most of the traditional *Peranakan* shophouses are situated in Malacca and George Town. Much has

been written and researched about the unique architecture of *Peranakan* shophouses in Malacca, but no holistic in-depth research study has been conducted on the exquisite ornamental tiles installed on the façade walls and paving of the floor fronting the shophouses known as the five foot way. A research proposal to conserve these tiles as an integral part of the *Peranakan* cultural heritage is surely a step in the right direction towards the conservation of Malacca's cultural heritage site. Figures 42.3 and 42.4 should serve to warn of the current danger of cannibalisation of the ornamental tiles from the façade of *Peranakan* shophouses in Malacca.

In order to capture the attention of heritage conservationists, credible information about the tiles would need to be provided by analysing the design motifs in order to identify the origins as well as to inculcate an appreciation of the intrinsic value of these ornamental tiles as Malacca's cultural artefact. Wornum [5] advocated that an ornament gratifies the mind and that it has been discovered as an essential element in commercial prosperity [5]. Thus, the application of the exquisite ornamental tiles on the façade of *Peranakan* shophouses had the dual purpose of protecting the surface walls and floors and signifying the element of prestige and prosperity of the *Peranakans* at the peak of their social prominence during the late



Fig. 42.3 Telling signs that tiles could be ripped off the façade wall of a *Peranakan* shophouse in Malacca (Source: photos by Wang Cheng Yong, 2014)



Fig. 42.4 Evidence of excavated tiles for sale and a collage of different tiles on the floor (five foot way) of a *Peranakan* shophouse in Malacca (Source: photos by Wang Cheng Yong, 2014)

nineteenth century and early twentieth century. It is indeed a shame to witness the dilapidated state of these tiles representing the splendour of the *Peranakan* culture. What is now required is to urgently stop the decline by researching, recording and producing a catalogue of whatever tiles that are intact on the façade of the *Peranakan* shophouses in situ for effective conservation. Analysis of the design motifs of the tiles helps to understand values placed on the tiles by particular cultures at specific periods of time [6] and would thus facilitate in establishing the origins of the tiles. This research using primary sources should either confirm or prove otherwise the common beliefs that the *Peranakan* tiles in Malacca were commissioned from China and England or introduced by the Dutch.

Both Malacca and George Town have been inscribed as UNESCO World Heritage Sites on 7 July 2008, in recognition of their status as historic cities of the Straits of Malacca. Both cities are specifically listed under the Cultural Sites category. Within Malacca town, the World Heritage Site comprises 38.62 ha core zone and a 134.03 ha buffer zone [7]. Most of the *Peranakan* houses, i.e. along Heeren Street and Jonker Street, are within the core zone area. The urgency to look into conservation of the façade of *Peranakan* shophouses in Malaysia is further justified by the report from the Advisory Board Evaluation of the UNESCO Heritage List which specifically states that efforts are required to ensure conservation of shophouses of both Malacca and George Town [7]. The gazetting of Malaysia's National Heritage Act of 2005 (NHA) should provide a good opportunity and channel to promote efforts in conserving the façade tiles of *Peranakan* houses. Malaysia is also not short of conservation organisations, namely, Malaysia Heritage Trust or *Badan Warisan Malaysia (BWM)*, a non-governmental organisation, the Museum and Antiquity Department (MAD) of the National Museum and Conservation and Townscape Unit (CTU), both of which are government bodies. It is hoped that the results of this research would be of interest to some if not all of the conservation organisations as mentioned. Singapore is not listed under the UNESCO Heritage List, and yet the façade of the *Peranakan* shophouses in Singapore is conserved and kept in sterling condition. The *Peranakan* shophouses in Malacca are pale in comparison as they can be deduced from the images in Figs. 42.5, 42.6, 42.7 and 42.8 inclusive below.

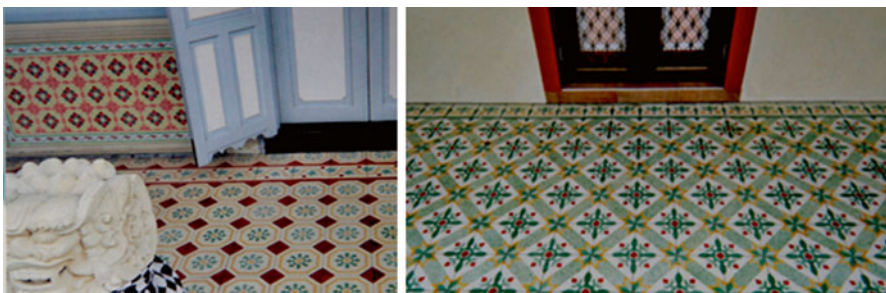


Fig. 42.5 Façade wall and floor tiles of shophouses at Blair Plain in Singapore (Extracted from *Singapore Shophouse* by Davidson ([5], p. 56). Singapore: Talisman Publishing Private Ltd)



Fig. 42.6 Façade wall and floor tiles of shophouses at Blair Plain in Singapore (Extracted from *Singapore Shophouse* by Davidson ([15], p. 57). Singapore: Talisman Publishing Private Ltd)



Fig. 42.7 Façade wall and floor tiles of shophouses along *Heeren Street* in Malacca (Photos by Wang Cheng Yong in October, 2014)

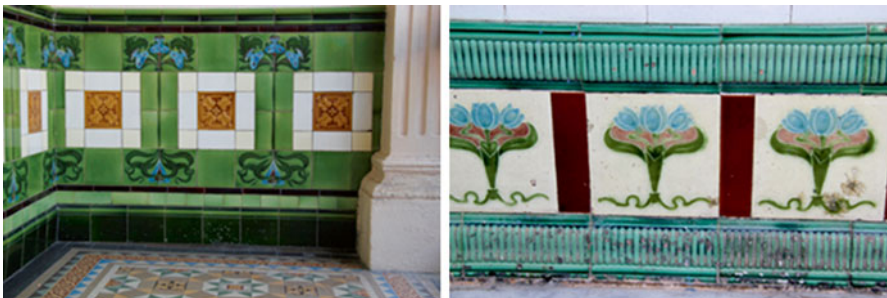


Fig. 42.8 Façade wall and floor tiles of shophouses along *Heeren Street* in Malacca (Photos by Wang Cheng Yong in October, 2014)

This research will investigate the course of actions and efforts taken by the National Heritage Trust of Singapore which can be emulated and applied in the Malaysian context in preserving the façade of *Peranakan* shophouses. The scope of this study is limited by the fact that a great percentage of the tiles on the façade of the *Peranakan* shophouses are no longer in existence. Most of the existing tiles were either not maintained or cleaned, and they were photographed as basis to portray their credible status.

3 Aims

The aim of my research is to provide a community resource about ornamental tiles installed on the façade of traditional Straits Chinese or *Peranakan* shophouses in Malaysia for both the national artistic and historic merit.

4 Research Objectives

- To study the designs of ornamental tiles on the façade of traditional Malaysian Straits Chinese shophouses in order to inculcate an appreciation of its origins and cultural and intrinsic value
- To analyse the iconography, characteristics and features of the selected samples of the tiles' designs so as to understand the source of the motif designs used
- To emphasise the cultural and intrinsic value as well as the significance of the said tiles as a national heritage of Malaysia

5 Research Questions

- Where did the ornamental tiles originate?
- What were the cultural influences leading to the installation of the said tiles?
- What is the relevant approach to classify and analyse the iconography, characteristics and features of the tiles?
- How to demonstrate the values placed on the tiles and the significance of its preservation as the national heritage of Malaysia?

6 Research Scope

This research includes studies on the myriad of wall tiles specifically applied on the external surfaces of the walls and paving of the floors, known as five foot way of the *Peranakan* shophouses in Malacca. The focus of this research is dedicated to *Peranakan* shophouses along Jonker Street and Heeren Street in Malacca. The diverse range of tiles for each of the selected shophouses will be investigated, categorised and catalogued as a resource for the Malaysian heritage archive. The absence of tiles from the façade of *Peranakan* shophouses due to theft, apathy and neglect is a major limitation of this research. It is hoped that this research will pave the way for further similar research on other *Peranakan* shophouses, bungalows and association buildings in Malacca as well as in George Town.

7 Research Design

The research design for this study is planned in such a manner so as to ensure that the evidences obtained are aligned to the research objectives and answer the initial research questions as unambiguously as possible.

8 Research Methodology

The methods employed in this research include a range of qualitative approaches using both primary and secondary sources.

8.1 Phase 1: Literature Review, Location and Site Visits

Phase I involves review of literature and text analysis in the process of determining the potential or relevant framework for the research as well as identifying the research gap and problem. Site visits are made with focus on the façade of *Peranakan* shophouses along Heeren Street and Jonker Street which are within the core zone of Malacca's UNESCO Heritage Site.

8.2 Phase 2: Data Collection, Image Archival and Interviews

Primary source of research data includes digitalised photographs of wall and floor tiles on the facades of *Peranakan* shophouses in Malacca, particularly those along Jonker Street and Heeren Street. Other primary sources of information are gathered through interviews with personnel of heritage conservation authorities and organisations, *Peranakan* shophouse owners in Malacca and local shop retailers offering ancient *Peranakan* tiles for sale to inter alia determine their source of tile supplies.

8.3 Phase 3: Observation of Site Status and Comparative Studies

Observation of the status of the sites using digital camera to record the current conditions of areas of focus of the study, i.e. Heeren Street and Jonker Street in Malacca. Observations are also made on the ancient tiles on sale at the retail shops in Malacca to obtain primary source of information on the origins of the tiles, production dates as well as names of manufacturers. Comparisons are made from observations of the

façade status of *Peranakan* shophouses in Singapore. Comparative studies are made between conservation efforts in Malacca and Singapore with a view to improve conservation management of the facades of *Peranakan* shophouses in Malacca.

8.4 Phase 4: Categorise and Analyse Tile Samples

Phase 4 is the process of classifying, categorising and analysing the tile samples. First the tiles are classified into two broad categories, i.e. wall and floor tiles. Thereafter, the design motifs of the various types of wall and floor tiles are organised and traced facilitated by computer programmes, namely, Adobe Photoshop, AutoCAD and Adobe Illustrator. These two broad categories of tiles are further classified into the different types of tiles, ornamental styles and forms by investigating the principles of ornamental art as illustrated by Wornum [5] in his *Analysis of Ornament*.

The design motifs are then analysed based on relevant literature on ornaments and identified within various periods of art styles, i.e. ancient, mediaeval or modern. A chart depicting art styles from the prehistoric era until the twentieth century is assembled and adapted from text in pages 29–30 of Wornum [5] in his *Analysis of Ornament*. The chart is extended by the author to include the additional ‘Art Nouveau’ style within the nineteenth century in view of similar art styles of the *Peranakan* tile samples collated for this study. Art Nouveau is not included in Wornum [5] as it was a late nineteenth-century and early twentieth-century stylistic phenomenon [6]. Figures 42.9, 42.10 and 42.11 are examples of ornamental designs from various literatures identified as ancient, mediaeval and modern art styles in the context of Wornum’s *Analysis of Ornament*.

- Example of Ancient Art Style
- Example of Mediaeval Art Style
- Example of Modern Art Style

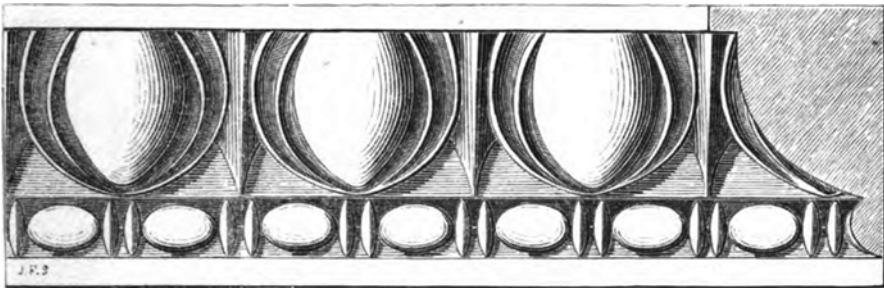


Fig. 42.9 Echinus and astragal (egg and tongue) from Pantheon, Rome (From *Analysis of Ornament* by Wornum ([5] p. 52). London: G. Barclays, Castle St., Leicester Sq)

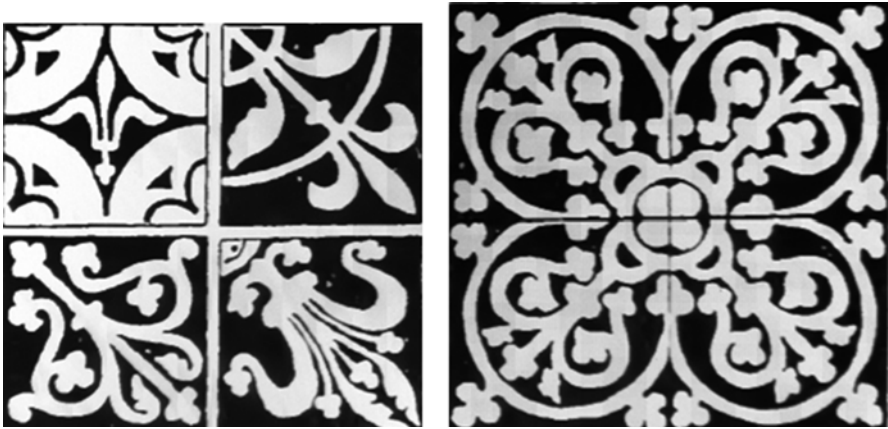


Fig. 42.10 Fourteenth-century encaustic tiles with Gothic ornaments (From *Styles of Ornament* by Speltz ([19], p. 263). Translated by David O Connors. Germany: F.A. Brochhaus, Leipzig)



Fig. 42.11 Dust-pressed raised-relief tiles featuring Art-Nouveau stylised compositions (From *5,000 Years of Tiles* by Lemmen ([6], pp. 216–230). China: Toppan Leefung Printing Limited)

For the purpose of a catalogue, each of the sample *Peranakan* tile design motifs is classified as ‘symbolic’ or ‘aesthetic’, ‘flat’ or ‘relief’. The relevant tiles are also indexed for identification within each of the addresses in Malacca for a credible set of records to facilitate maintenance and conservation of the tiles in situ.

Digital images of the tile designs are documented as a community resource to enable more effective conservation of the tiles as part of the *Peranakan* heritage in Malaysia. This study hopes to facilitate conservation and reconstruction of the façade of the *Peranakan* shophouses to do justice as well as to maintain Malacca’s status as a UNESCO Heritage Site. This research is limited by various factors, namely, the absence of tiles from many of the *Peranakan* shophouses due to theft, apathy, neglect or sheer ignorance. There is also a lack of record on the physical historical status of the façade of the *Peranakan* shophouses for a comparative study to determine the extent of damage in this aspect of the *Peranakan* heritage.

9 Statement of Significance

Various studies have been carried out regarding the architecture of colonial houses and Straits Chinese shophouses in Malaysia. However, there is a lack of research and literature specifically on the ornamental tiles on the façade of the Straits Chinese shophouses. This research will provide evidences in order to eliminate misconceptions on the origins of the said tiles. The findings of this research will highlight the cultural and intrinsic value of the tiles apart from providing information and data for future research in this area. The design motifs will be analysed and recorded according to theories on principles and elements of ornaments in order to determine their origins and inculcate an appreciation of its aesthetic value by those responsible for heritage conservation. A catalogue with detailed information on the tile samples which includes drawings of the tile designs to scale using the AutoCAD programme would serve as a useful reference for future researchers as well as future reconstruction of the facades of the *Peranakan* shophouses in Malacca.

It is hoped that this research would stimulate awareness of conservation authorities and the public on the need to conserve the exquisite ornamental tiles on the facades of *Peranakan* shophouses in Malacca, as an integral part of Malaysia's built heritage and cultural history. Recommendations from this study on more effective management and conservation of the said tiles are in conformance with the call by UNESCO for efforts to ensure conservation of shophouses by Malacca and George Town being sites under the UNESCO Heritage List. The study will provide information on actions taken by other countries in preserving facades of their Straits Chinese shophouses for Malaysia to emulate from. It is also the aim of this study to convince conservation authorities on the merits of conserving the tiles on the facades of the *Peranakan* shophouses in Malacca to reflect its past glories and as an added feature towards Malaysia's cultural tourism.

10 Review of Literature

10.1 *Historical Trade in Malacca and the Straits Chinese or Peranakan Community*

It is pertinent, in this research regarding tiles on the façade of *Peranakan* shophouses, to first dwell on the historic developments leading to the emergence of the *Peranakan* community in Malacca. Extensive research has been done on the historical trading activities in Malacca and the development of the Straits Chinese or *Peranakan* community. Craig [3] in *The Sea Common to All* gave an account of trading network in Southeast Asia constructed by Chinese merchants and sailors from the Fujian province of South-Eastern China since 1,400 leading to the beginning of the *Peranakan* community arising from marriages between Chinese sailors who settled in Malacca and local indigenous women [3]. Whilst Craig did not

discount the fact that trade activities by the Chinese could have taken place earlier than 1,400, Tong [1] in *Straits Chinese Gold Jewellery* suggested that intermarriages between local indigenous women and Chinese merchants who stopped at ports along the Straits of Malacca could have taken place intermittently as early as 200 BC [1].

Historical accounts about the rise of Malacca as a trading port and/or the development of the *Peranakan* community were written by many other authors, namely, Dellois [8], Frost [2] and Stoddart [9]. Most of the successful *Peranakan* families lived along streets adjacent to the river and oceanfront in Malacca, in magnificent houses reflecting Dutch or Chinese architectural styles [3].

10.2 Western Influence on Peranakan Lifestyle

It is also necessary to study the influences on the *Peranakan's* tastes and lifestyle leading to the installation of the type of tiles on the façade of their shophouses.

Frost [2] in his *Transcultural Diaspora* stated that the *Peranakan* leaders played an active role as commercial agents between the Chinese community and European settlers [2]. He also highlighted the significant impact of policies, ideas, practices and attitudes developed by the British in India, on non-European colonies, including Malaya. Frost's view is confirmed by Poh [10] who reiterated that the wealth generated by the Chinese as intermediaries in maintaining commercial links between the Chinese empire and European merchants has led to the growth of an *Asian nouveau-riche class* in the nineteenth and twentieth centuries [10]. Poh added that this trend has generally led to the adoption of Western style living by *nouveau riches*, as a symbol of their new socio-economic status. It is to be noted that in 1826, Singapore, George Town and Malacca in the then Malaya were brought under a single administration by the British known as the Straits Settlements [8]. However, long before this, by 1819 following the silting of its river, Malacca lost its position as a trading port of call to George Town which led to the migration of some *Peranakans* from Malacca to Singapore and George Town [3]. *Peranakan* loyalty to British colonial rule and their inevitable adoption of the Western style of living corresponds with the formation of the Straits Chinese British Association (SCBA) in 1900 in Singapore. In the *Ethnic Boundaries and Structural Differentiation* laid down, the aims and objectives of the SCBA are the following:

- (a) To promote among the members an intelligent interest in the affairs of the British Empire and to encourage and maintain their loyalty as subjects of the Queen
- (b) To afford facilities for the discussion of all questions relating to the social, intellectual and moral welfare of the Chinese British subjects in the colony
- (c) To promote the general welfare of the Chinese British subjects in any other lawful or constitutional manner

- (d) To appoint a representative committee in London to watch the interests of the association
- (e) To encourage higher and technical education for the Chinese in some practical way
- (f) To take any requisite lawful step for the defence of the rights and privileges of British subjects [11]

Similar branch of the SCBA was set up in the same year in Malacca and in 1920 in Georgetown [12].

10.3 *Origins of Peranakan Tiles*

Apart from its functional values, tiles are decorative objects bearing fascinating designs and intriguing images worthy of academic study and aesthetic appreciation. Early tile making processes using natural materials were experimented and improved throughout the ages, ranging from the glazed Egyptian tiles during the period of the New Kingdom of Egypt from 1550 to 1086 BC until the mass production following the Industrial Revolution which began in Britain in the middle of the eighteenth century [13]. Industrial production of tiles proliferated in the nineteenth century, and it was the decorative tiles of the late nineteenth century and early twentieth century that were exported and found their way to *Peranakan* shophouses in British Malaya.

This study seeks to clarify the following quotation by the online *Peranakan* Resource Library website [14]: ‘It is not known whether it was the Dutch or the Chinese who first brought or introduced ceramic tiles to Malacca’ [14]. Whilst Lemmen [6] in his book, *5,000 years of Tiles*, stated that the history of tiles from China is dominated by glazed roof tiles and not wall tiles since the interiors of their homes are divided by mere screens [6]. Lemmen’s statement suggests that the *Peranakan* wall tiles are not likely from China in contrast to beliefs that they could be commissioned from China just as other ceramic wares used by the *Peranakans*.

Except for two illustrative chapters in the *Singapore Shophouse* by Davidson [15] regarding floor and glazed ceramic tiles of *Peranakan* houses in Singapore, there is hardly any literature on a study of *Peranakan* tiles, in particular the tiles on the façade of *Peranakan* shophouses in Malacca. The patterned encaustic floor tiles with geometric designs of *Peranakan* shophouses in Singapore were imported from Europe, being a popular ornamental floor material during Victorian England from the 1860s [15]. In the early years of the twentieth century, decorative ceramic tiles with floral motifs, commonly used in British houses, were used for external surfaces of the *Peranakan* shophouses in Singapore [15]. Although the same conclusion could hold true for origins of tiles of *Peranakan* shophouses in Malacca, further research using primary source would need to be done to confirm this fact.

The claim that the origin of the *Peranakan* tiles were from England could be reinforced based on the fact that the British has between 1651 and 1775 in an effort

to protect its developing ceramic industry that embargoed the amount of non-British earthen wares from reaching its colonies with the exception of tiles [16]. Further literatures from Samford [17], Yoshimura and Miyagigakuin [18] and Lemmen [6] are useful in establishing the origins and dating of the tiles used by *Peranakans* on the façade of their shophouses in Malacca.

10.4 Tile Analysis and Catalogue

In line with the aim of this study, tiles on the façade of *Peranakan* shophouses in Malacca, in particular, those along Heeren Street and Jonker Street, were photographed using a digital camera, as the initial step in the process of analysing the tile design motifs. Hans van Lemmen, the tile historian, advocated that the cultures by which tiles were made can be determined by exploring the iconography and decorations of the said tiles [6]. Most of the designs of wall tiles on the façade of the *Peranakan* shophouses appear to belong to the Art-Nouveau stylistic phenomenon of the late nineteenth and early twentieth century. Art Nouveau which started in Europe was a movement inspired by nature and design sources outside Europe such as Japan, and it was an attempt to give a new direction to architecture and design to replace the nineteenth-century Gothic Revival and neoclassicism styles [6]. Whereas design motifs of the *Peranakan* floor tiles appear to be similar to the nineteenth-century British encaustic floor tiles with designs associated with the Gothic Revival movement [6]. Speltz [19] in his *Styles of Ornaments* mentioned that French influence on the Gothic ornament in England was discernible since the twelfth century [19]. Furthermore, the *Analysis of Ornament* advocated that ornamental expression of every age or nation has been distinguished by their individuality or taste which could either be original or borrowed. Comprehension of individual tastes of people at various times exhibits essential quality of the social character of the people in relation to art, general culture and religion [5]. *The Grammar of Ornament* by British architect and theorist Jones [20] advocated nature as the primary source of inspiration for a generation of artists seeking to break away from past styles [20]. Literature by Owen Jones which is effectively an encyclopaedia of patterns, contrasts and colour harmony and Wornum's *Analysis of Ornament* provide useful interpretive tools for cataloguing the designs of the selected *Peranakan* tiles.

10.5 Sustaining Peranakan Culture and Heritage

Malacca and George Town were inscribed as UNESCO World Heritage Sites on 7 July 2008 for their outstanding universal value as historic cities of the Straits of Malacca. These two towns constitute a unique architectural and cultural townscape reflecting the coming together of cultural elements from the Malay Archipelago, India, China and Europe [7]. The Advisory Board Evaluation of the UNESCO

Heritage List highlighted that efforts are required to ensure conservation of shophouses by both Malacca and George Town, although both towns generally exhibit an acceptable state of conservation [7]. The shophouses referred to by UNESCO include the *Peranakan* shophouses along Heeren Street and Jonker Street in Malacca. This report from the Advisory Board Evaluation of UNESCO should serve to intensify perception on the significance of urgency to conserve *Peranakan* shophouses in Malaysia, in particular its facades. Dellois [8] highlighted a quote by Templer that emphasised the importance of cultures which have contributed in the building of the Malayan nation in the past and the future [8]. The *Pinang Peranakan* Mansion and the Straits Chinese Jewellery Museums in George Town and Malacca, respectively, are privately owned and administered by Mr Peter Soon [1]. In contrast, the National Heritage Board (NHB) which is a statutory board under the Ministry of Culture, Community and Youth in Singapore is fully funded by the government of Singapore and responsible in the administration of the *Peranakan* Museum in Singapore. NHB carries out biannual Heritage Town Award scheme to encourage the community to promote local community ownership of their heritage [21]. Malacca could emulate the initiatives of NHB similar to its Town Award scheme to encourage current owners of *Peranakan* shophouses to maintain the aesthetic value of the facades of their premises. In his paper on *The Architectural Style of the Peranakan Cina* by Dr A. Ghafar Ahmad, he stated that after World War II, the identity of *Peranakan* had degenerated and became diluted and that efforts should be made to conserve their unique architecture including the shophouses, association buildings and colonial bungalows [4].

It is hoped that the catalogue compiled from the analysis of the *Peranakan* tiles in this research would provide useful resource to enlighten those responsible for the conservation of Malaysian heritage on the urgent need to maintain and conserve the exquisite ornamental tiles on the façade of traditional *Peranakan* shophouses in Malaysia.

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Chapter 43

The Art of Panglima Bukit Sadok: The Process of Developing Web-Based Media Through Illustration and Graphics in Preserving Its Culture

Mohd Fairuz Bin Ali, Aloysius Yapp, Wirawani Kamarulzaman,
and Goh Kiang Kuan

Abstract This study is established on developing a web-based media process through the use of illustration and graphics as a platform to channel the identity and information background of the Panglima Bukit Sadok (The Hero of Mount Sadok). Emphasis on the application of new media through up-to-date web media technologies could be seen as a resounding approach in preserving culture and heritage as its ability is undisputable being able to create responsive features that enrich human interactions towards the desired information in the fastest and easiest way. Furthermore, it is a technology which has been shaped with a value that demands continual technology growth especially on its diversity in handling the applications in cross platform devices such as mobile devices and computer devices. The waterfall model from the Multimedia Instructional Model was used, and discussion on the overall process that leads to the final website produced was made from pre-production until post-production. Thus, the idea of promoting the legendary figure, namely, Panglima Bukit Sadok from Sarawak, Malaysia, would be a great breakthrough in preserving and introducing its identity locally and globally.

Keywords Culture preservation • Web media • New media • Panglima Bukit Sadok

M.F.B. Ali (✉)

Department of Multimedia Design and Animation, Faculty of Creative Industries,
Universiti Tunku Abdul Rahman, Shah Alam, Selangor, Malaysia

e-mail: fairuza@utar.edu.my

A. Yapp • G.K. Kuan

Department of Multimedia Design and Animation, Faculty of Creative Industries,
Universiti Tunku Abdul Rahman, Petaling Jaya, Selangor, Malaysia

e-mail: aloysius@utar.edu.my; gohkk@utar.edu.my

W. Kamarulzaman

Department of Early Childhood Studies, Faculty of Creative Industries,
Universiti Tunku Abdul Rahman, Shah Alam, Selangor, Malaysia

e-mail: wirawani@utar.edu.my

1 Introduction

The new media has posed new analytic challenges in the world of technology today still reinforcing the new and traditional media. According to Silverstone [1], there are a few distinct characteristics of new media such as digital convergence, many-to-many communication, interactivity, globalization, virtuality, and arguability. These characteristics have enabled people to access it for free and thus far and can be very specific to a user's preferences when compared to the old media [2]. Furthermore, Krekovic [2] added that in the new media, every individual or institution is allowed to use it in two ways: as a recipient and as a content creator [2].

Since achieving a well-functioning cultural sector through the traditional or old media previously was too expensive, the use of the new media can solve the cost factor problem [2]. Moreover, a recent research found that young people use the new media as much and as often as possible [3] which seems to be a good reason to preserve the culture for the young through this media [3]. Therefore, the purpose of this research is to promote the process of developing the web-based media through illustration and graphics.

2 Context

An easy way to comply with the conference paper formatting requirements is to use this document as a template and to simply type your text into it.

2.1 *Panglima Bukit Sadok: The Hero of Mount Sadok*

Once ago, there were Dayak (Iban) warriors well known as Panglima Bukit Sadok that fought over their freedom at the peak of Mount Sadok at Saribas territory, Borneo. They were Dayak (Iban) freedom fighters in Sarawak, Malaysia, during the Brooke White Rajah era. This made them the hero for the Iban Dayak in the state of Sarawak, Malaysia, located at the western part of the Borneo Island. Panglima Bukit Sadok in Iban means the "Warrior from Mount Sadok." They were proclaimed by their followers as "The Warrior of Mount Sadok" at the height of their power at Mount Sadok fort. They became well known when they were selected to be one of the leading fighting troopers for a great war leader, Orang Kaya Pemancha Dana "Bayang," who led war expeditions to the areas around the mouth of Kapuas River in West Kalimantan, Indonesia. This by chance prepared the young warrior with war experience in fighting James Brooke later at the peak of Mount Sadok known as The Ultimate Fight of Sadok.

2.2 *Web Media as a New Media Tool to Preserve Culture*

New media is a term used to new ways of representing the world, from printed-based media such as photography to a screen-based media such as computer games, website, or the Internet. New media has the characteristics of digital, interactive, hypertextual, virtual, networked, and simulated [4]. In the current life of digital techno-culture, clearly new media has become a powerful approach in spreading the information as it consists of interaction design. According to Gillian Smith, the director of Interaction Design Institute Ivrea, interaction design through computer technologies, telecommunications, mobile phones, and other interactive media is shaping our life in many ways such as for work, for play, and for entertainment [5].

Web media applications are one of the new media-offered platforms to channel and bridge information in a fast way. Its existence has been widely used in today's life. It has been continuously and rapidly evolving as for now it brings the ability for users to reach data or any desired information in a high level of interactivity in which continuous application of media data such as multimedia elements like graphics, audio, and video can be integrated in achieving better mechanisms in capturing, processing, communicating, presenting, and storing. Hence, numerous studies viewed that it can be used as a resource or platform to facilitate the broad public awareness towards the appreciation and awareness of a cultural heritage. The accessibility of the information it provides can be channeled efficiently to the public, for example, "The Hibulb Cultural Center & Natural History Preserve" website which creates a possibility to preserve, revive, restore, protect, interpret, collect, and enhance the history cultural values and spiritual beliefs of the Tulalip Tribes [6].

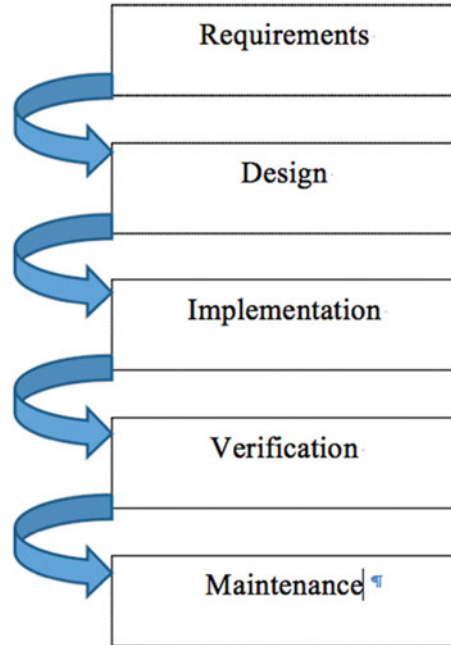
3 Procedure of the Study

3.1 *Website Model*

In developing the web media in order to preserve the art of Panglima Bukit Sadok, a few steps have taken place. The methods used in the data collection are (1) random sampling methods in river Saribas, Entanak up to Saka, (2) obtaining the information from a variety of sources from respondents, (3) referencing methods through reference books and old writing, (4) designing a framework for creation of Panglima Bukit Sadok synopsis construction, (5) visualization process, and (6) decoding process with the information obtained. From the information gathered through the data collection process, it is then brought forward to the web development process. The waterfall model was used as the development model of the Panglima Bukit Sadok website as it brings the most applicable streamline of the website development process as shown in Fig. 43.1 below.

However, since the whole other processes before this process of creating web media are still under constructions, therefore, only the first three steps will be included in this research.

Fig. 43.1 Screen capture of the waterfall multimedia instruction model



3.2 *The Website Development Process*

This is where we define our work as, for example, the title of the project, the concept and theme, the contents that we want to have for each webpage, and the structure of the website (how we want to bring the user from one page to other pages).

1. *Information architecture* (Fig. 43.2)
2. *Building the wireframe* (Fig. 43.3)

3.3 *Designing the Website*

In designing the Panglima Bukit Sadok website, there are three components which need to be considered. The three components are:

1. *Working with Images*

The most important aspect when dealing with graphics is to make sure that they have been optimized. The benefit of having them optimized is that it can minimize the overall file size of the website, and so the user can retrieve or load the webpage faster. This technique can be applied by using the Adobe Photoshop software.

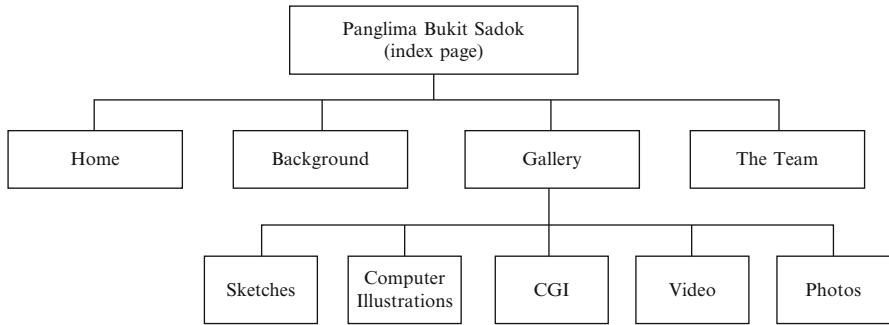


Fig. 43.2 Sitemap of the Panglima Bukit Sadok website

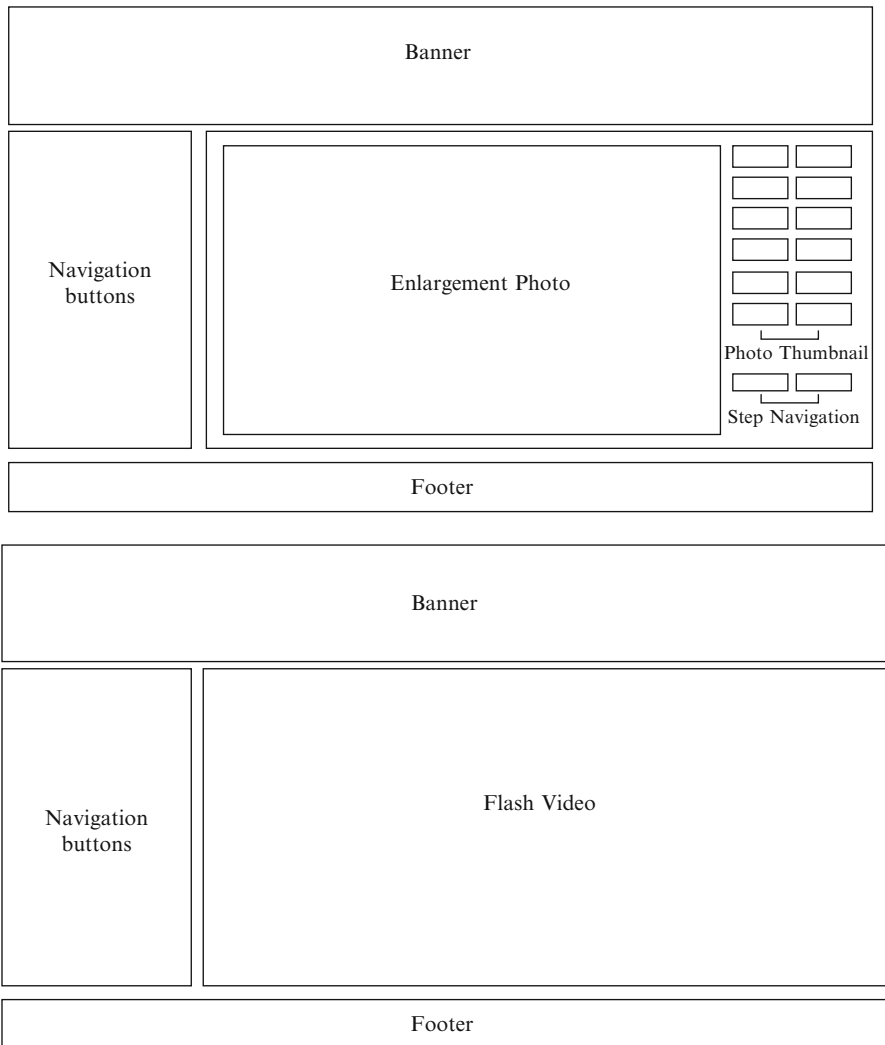


Fig. 43.3 Wireframe of the Panglima Bukit Sadok website

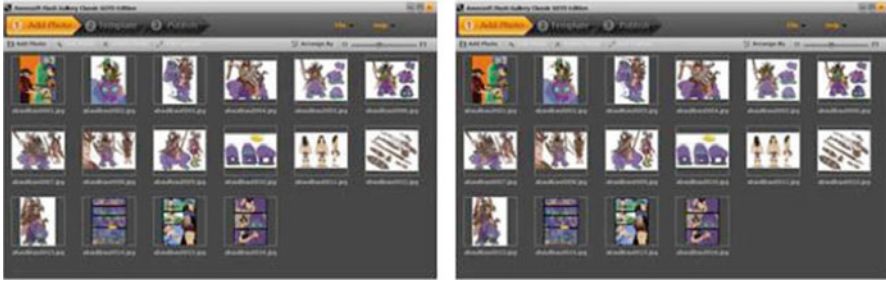


Fig. 43.4 Creating photo slideshow for the Panglima Bukit Sadok website

2. Working with Text

There are few things that required consideration when choosing the type for the text that will be placed on the webpage which includes the size, the space, the contrast, and the typeface.

3. Working with Multimedia Elements

Multimedia elements can be incorporated in making the website more interesting and more alive. As for the Panglima Bukit Sadok website, the multimedia elements of a flash photo slideshow and a flash video are applied. There are many ways on creating a photo slideshow. We can achieve that by using jQuery which is a type of a JavaScript library or Adobe Flash, but both required the user's ability in handling basic programming language. There are also applications that do not require any programming background such as Aneesoft Flash Gallery. It is a software that allows the user to create a creative photo slideshow presentation in a flash format (Fig. 43.4).

3.4 Website Development

For the development of the Panglima Bukit Sadok website, Adobe Dreamweaver has been used for the development of the Panglima Bukit Sadok website. The main processes involved during this stage are:

1. *Creating the web structure* (Fig. 43.5)
2. *Inserting image* (Fig. 43.6)
3. *Inserting multimedia elements* (Fig. 43.7)
4. *Designing navigation system* (Fig. 43.8)
5. *Save and publish* (Fig. 43.9)

4 Results and Discussions

With the current development in progress, the Panglima Bukit Sadok website has been successfully developed by going through the several progression and stages as discussed earlier. It now consists of nine webpages in total (index page, homepage,

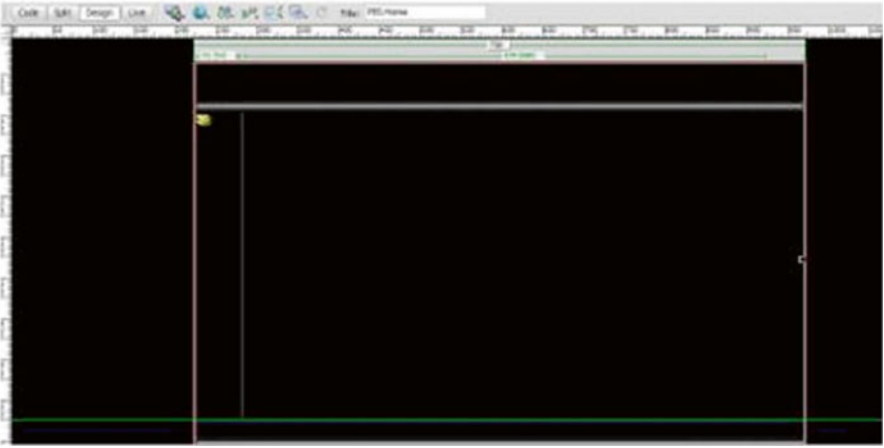


Fig. 43.5 Creating the web structure for the Panglima Bukit Sadok website



Fig. 43.6 Inserting image process



Fig. 43.7 Inserting multimedia elements

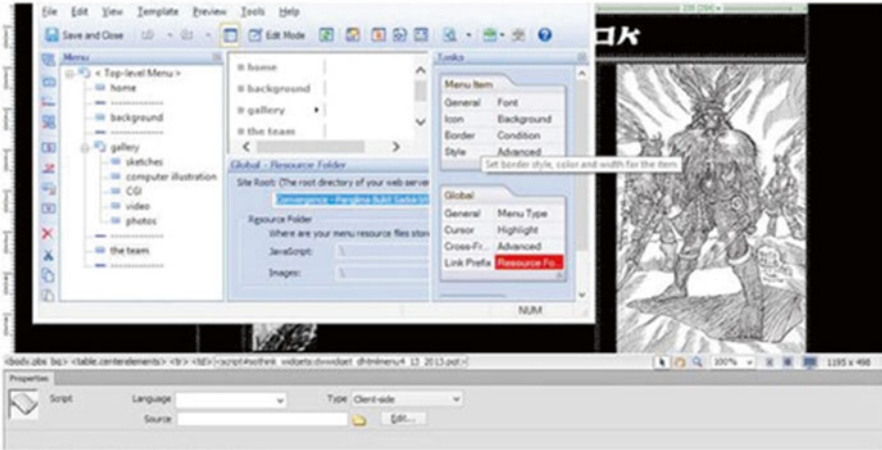


Fig. 43.8 Designing navigation system

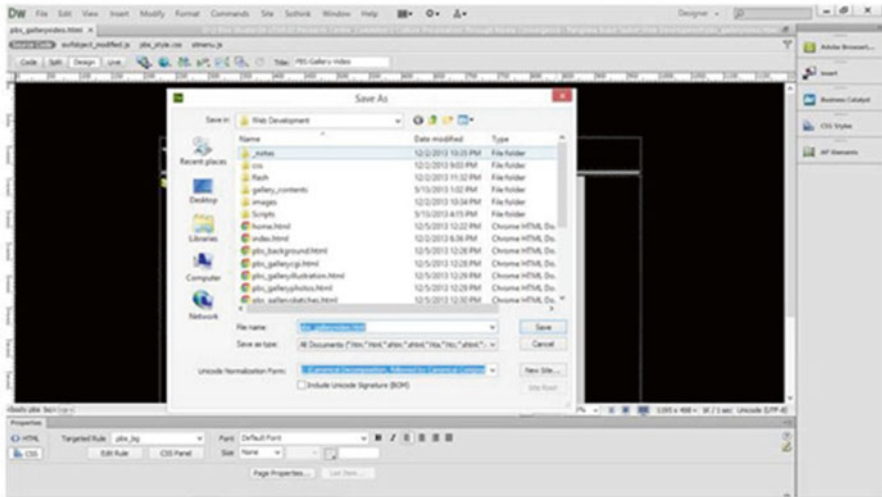


Fig. 43.9 Saving and publishing the webpage

background page, sketches page, computer illustrations page, CGI page, video page, photo page, and the team page). Below are some of the final screen captures of the Panglima Bukit Sadok website (Fig. 43.10).

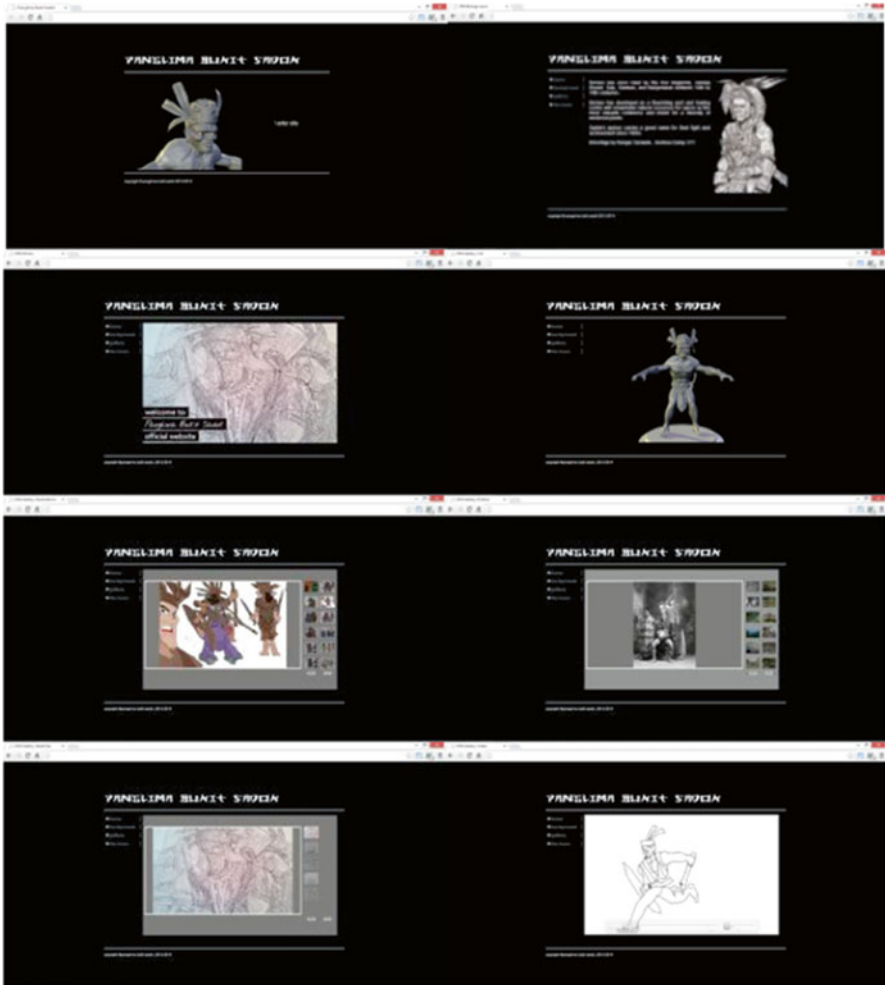


Fig. 43.10 Screen captures of the Panglima Bukit Sadok website

5 Conclusions

This study has contributed towards a significant breakthrough on the application of developing a web-based media process with multimedia elements especially on illustration and graphics as a new approach in preserving the culture of the Panglima Bukit Sadok. The idea of promoting its background through web media would be a great milestone in preserving and introducing its unique identity locally

and globally. It is suggested that a continuous research could be conducted in studying the acceptance of the Panglima Bukit Sadok through new media platforms. Besides, more future research can be executed and explored covering the culture and heritage especially from Malaysia.

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Chapter 44

Stoneware as Replacement Material for Modern Ventilation Wall

Mohd Fadhi Yakub, Verly Veto Vermol, Rusmadiyah Anwar, and Oskar Hasdinor Hassan

Abstract Air ventilation is the basic theory where the air movement depends on the process of infiltration and exfiltration of air. Infiltration in this study means the involvement process of air moving to a conditional space inside the wall, while exfiltration means the involvement of the hot air from the inside of the house flowing to the wall. The inconsistency of airflow is the major problem of this case study. According to C. H. Saunder (Batiment Int Build Res Pract, 2008), air movement in the house is now recognized as a major factor both in condensation risk and in energy efficiency, yet conventional test methods have limitations. The aim of this research is to study the potential of ceramic stoneware ventilation wall created from extruding technique as conceptual modern ventilation wall taking into consideration the Tebar Layar design in Malay Traditional House. The new improved wall of air ventilator will result in a well-ventilated home, creating healthy air inside the house and helping control moisture problem.

Keywords Airflow • Ceramic extruded • Air movement • Air circulation • Ventilation

1 Introduction

Today's world is facing the effects of global warming tremendously. This paper will be discussing about channeling proper ventilation in creating a soothing and comfortable environment in modern home, taking into consideration the design from traditional ventilation system in a traditional Malay house using stoneware as a medium base. One of the key elements of a ventilation system in a traditional Malay house is called Lubang Ang which is normally located on top of a traditional wooden Malay house wall.

M.F. Yakub (✉) • V.V. Vermol • R. Anwar • O.H. Hassan
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: mohdfadhi2772@yahoo.com

Airflow is one of the basic theories which states that the movement [1] of air is influenced by the process of infiltration and exfiltration. Infiltration is the process of air moving to a conditional space inside the wall, and exfiltration is the process of air moving out of the wall. Ventilation is the process of changing the noxious air with the fresh air. This is to provide high indoor air quality. Its main function is to control the room temperature, replenish oxygen, and remove the moisture smoke, heat dust, airborne bacteria, and carbon dioxide. The other function of ventilation is to remove the unpleasant smell. The general purpose of ventilation is that it provides healthy air to breathe by both diluting the pollutants originating in the building and removing the pollutants from it [2, 3]. There are two methods of ventilation process which involves mechanical force and natural ventilation. This paper will be focusing on natural ventilation which is the cheapest and natural wind power generated. Natural ventilation can be attained whether by open windows or holes created in the house. This natural ventilation of buildings depends on climate, building design, and human behavior [4]. Natural ventilation of the original traditional Malay house takes influences from the natural culture and space. Figure 44.1 shows the design of ventilation in the Malay house. The concept idea of its ventilation is by taking warm air on the inside of the building will rise and out through the holes thus cool air of the outside pulled by warm air. This system used less energy to give the people more comfort, and the room temperature will be cool without the mechanical process.

Ceramic is considered as any product made up of nonmetallic inorganic raw materials (whether mineral or artificial), which from incoherent powdery state are which, through firing process and becomes solid object of partially crystalline and vitreous structure [5]. Ceramics are the material commonly used to create the product such as a pottery, functional product or more on the industrial ceramic and engineering. Its material is used differently according to their purpose in daily life. Literally, the transformation of hard ceramic is from raw material to a very solid and hard surface through a firing process. It is also fired in high temperature to get the solid rock and hard surface. The clay is formed by using the extruding techniques. This extruding technique is used to keep the form in actual scale and accurate. This framework is designed for a soothing environment on modern houses by using ceramic materials for ventilation. Also it will study the esthetic design of the ventilate structure to give more function in the future.



Fig. 44.1 (a) Example of transaction of ventilation. (b) Malay house ventilation

2 Methodology

Anwar developed this research methodology by introducing empirical study on CSWD research methodology [6]. Referring to this framework, the methodology covers four stages of manufacturing process: ventilation design, extruding technique, material composition, and design composition. Overall, the process of studying the concept of ventilation was basically identifying the actual context of ventilation theory. There are two types of ventilation, which are natural ventilation and mechanical ventilation. This study will use natural ventilation because it is more sustainable and safe for humans. The main element of the ventilation design focuses on the airflow and its circulation. This will study the circulation and the flow of air on the current product. The current product does have many multiple uses. This ventilation is designed to keep the air flowing, and it also has other functions. There are four elements that can be identified as the core of this research which are the airflow system, esthetic design, multifunction, and eco-friendly. These are the core elements of the ventilation process in modern houses. Based on Fig. 44.2, the prototype of the ventilation components is divided into three which are on ventilation holes, parts of racks, and vase planting. All three parts are assembled upon installation. For the first component, it is designed to create airflow. This small tiny hole is

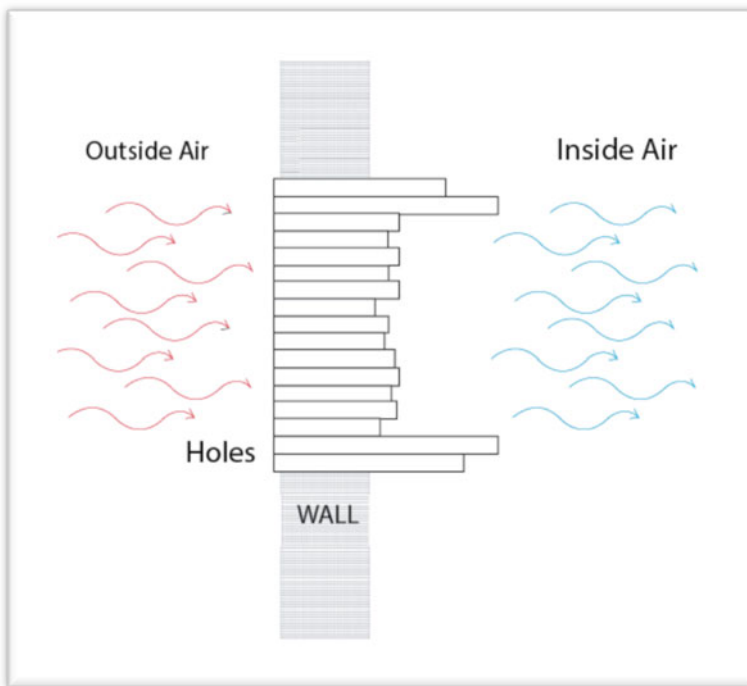


Fig. 44.2 Design on airflow

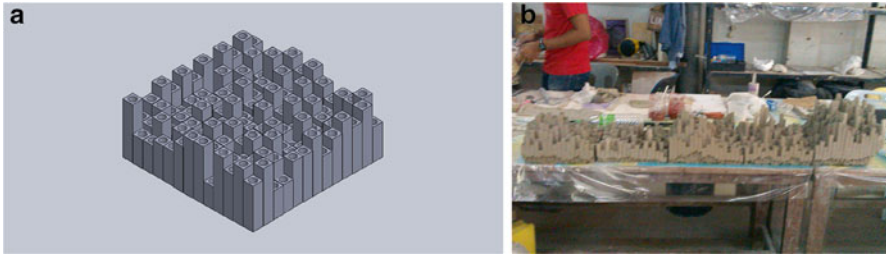


Fig. 44.3 (a) Partial installation of this ventilation. (b) Complete installation of this ventilation using ceramics

used for the air to enter inside the house. This process can create a natural ventilation of the house because the warm air will absorb the cool air to enter the house.

Figure 44.2 shows the process of ventilation of this wall. This wall is designing the tiny holes of the cube. This cube can be used to absorb the outside air and the fresh air into the house. This process will be show that this wall are circulation of the outside and inside air are circulate to convert it into the nature ventilation. As discussed, this ventilation would turn into natural ventilation, and this will save cost. A complete prototype will be connected to the other components. Once it installed it will be can be used and change according the usage of the house for example if make the plant in the indoor it can be change the parts A to the parts label of b. This will be used randomly. Figure 44.3 shows the complete installation on these ventilation works. Figure 44.4 shows that the artist's impression of the whole house complements this prototype.

For this research, the material that was used is ceramics. Ceramic stoneware was selected as the base material for this research. Stoneware is one of the ceramic clays, also known as semi-refractory clay, with a dense, vitrified body of high strength when fired [7]. The purposes of used the clay because it can be fired in high temperature and the clay characteristic is having porosity. This porosity is good for ventilation because it can store water inside its body. This can contribute to the ventilation process giving a comfortable atmosphere. On this preparation of clay it the parameter of the body will segregate into four group and labeled stoneware one to five. Stoneware 1 is called master formulation. The formulation of the material on sample 1 is basic formation of the production of tiles in general. This sample will control the comprising standard industrial parameter of stoneware formulation in product manufacturing. Each formulation differs by the amount of kaolin, ball clay, potash feldspar, silica, and calcium carbonate. This research aims to identify an ideal stoneware body which has the potential of lower breaking strength, lower shrinkage, and lower water absorption. Final formulation parameter will be applied to components A, B, and C. Tables 44.1, 44.2, 44.3, and 44.4 show four ranges of stoneware parameter formulation for experiment. From this experiment, it will change the certain material such as calcium carbonate. This chemical is used to give

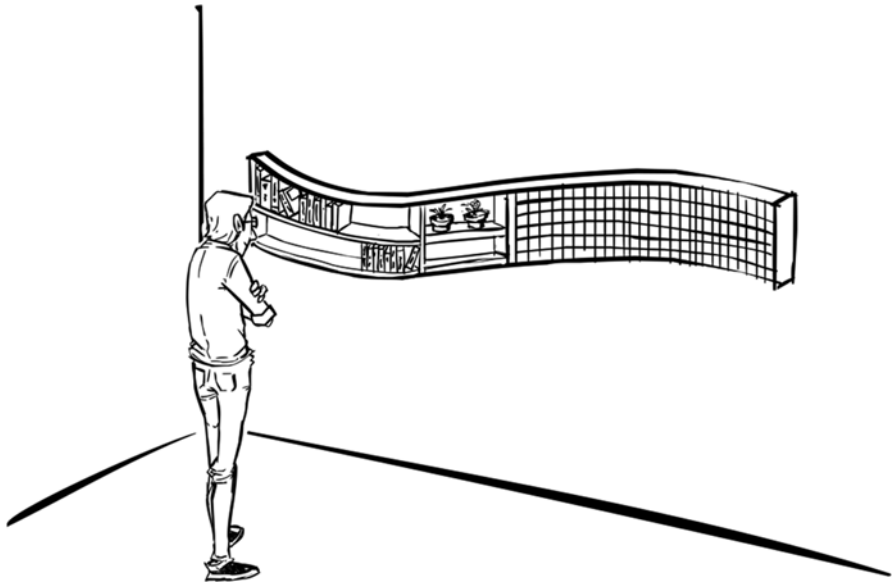


Fig. 44.4 Artist’s impression of ventilation design

Table 44.1 Stoneware body parameter formulation, a master formulation of test bar 1

Material	Percent %
Kaolin	40
Ball clay	15
Potash feldspar	30
Silica	15
Calcium carbonate	2
Water	45
Sodium	0.3
Specific gravity	1.69

Table 44.2 Stoneware body parameter formulation A (test bar 2)

Material	Percent %
Kaolin	40
Ball clay	15
Potash feldspar	30
Silica	15
Calcium carbonate	5
Water	45
Sodium	0.3
Specific gravity	1.69

Table 44.3 Stoneware body parameter formulation C (test bar 3)

Material	Percent %
Kaolin	40
Ball clay	15
Potash feldspar	30
Silica	15
Calcium carbonate	10
Water	45
Sodium	0.3
Specific gravity	1.69

Table 44.4 Stoneware body parameter formulation D (test bar 4)

Material	Percent %
Kaolin	40
Ball clay	15
Potash feldspar	30
Silica	15
Calcium carbonate	15
Water	45
Sodium	0.3
Specific gravity	1.69

higher strength to the ceramic body. It will be the change in the formulation from the master formulation in sample 1. Other material used is kaolin. Kaolin is used to create the white body after firing. This will control the entire color of the substances. This clay will be adjusted on the kaolin to give the ceramics material a white color. For the changes of this material it will effect on the other process, which is the firing process. This firing process is very important to the ceramic product. From the previous research, ceramics fired with high temperature are very strong, and its porosity is on the lower ranges: 0.2, 25, 50, 100, 300, and 500 μm .

All these materials are then sieved, batched, and mixed using an electronic mixer to form the plasticity clay. Then the stoneware clay is left in 30 min with 30 C for 5 h. Next, it will use the extruding technique for the next process. For implementing the physical test on the body, this test bar will be constructed using the press molding technique. This press molding technique is used to create the accurate size of the entire test bar. The standard test bar is $120 \times 40 \times 4 \text{ mm}^3$. The test bar surface will be marked 100 mm for easier measuring process after fired [8]. The entire bar will be tested and studied on their potential. Water absorption test and modulus of rupture (MOR) will be conducted to measure the test bar's performance. Figure 44.5 shows a complete test bar dimension for a physical test. Modulus of rupture (MOR) test procedure is conducted to measure the necessary force to break a given substance across which is a test bar. The force imposed is normally 18 times the load which is required to break a 1 in.² bar, supported flatwise at two points with one foot apart and loaded in the middle between the points of support.

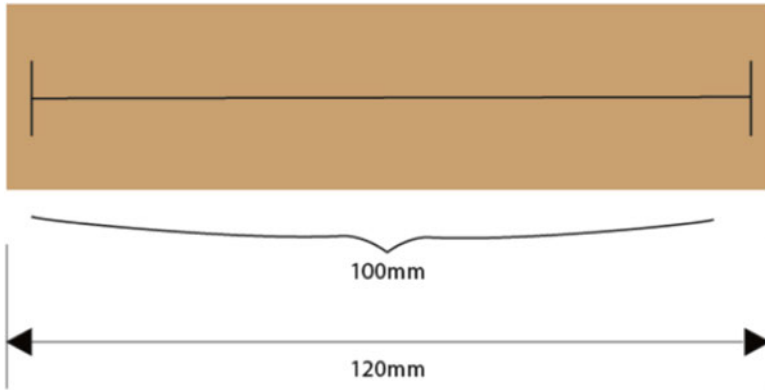


Fig. 44.5 Standard test bar

Table 44.5 Type of ceramic body classification in ceramic manufacturing [10]

Type of body	Density	Water absorption (x),%
Non-vitreous	Low density	$X > 7.0$
Semi-vitreous	Medium density	$3.0 < x < 7.0$
Vitreous	High density	$0.5 < x < 3.0$
Impervious	Extreme density	$0.5 > x$

Water absorption rates are referring to the amount of moisture on a specific ceramic body, which is likely to absorb on an ongoing basis. Crack might occur with the presence of excessive moisture on the ceramic body. Over certain extent of firing graph and heat during the sintering phase, stoneware body porosity level and porosity level and maturity will be predetermined [9]. The testing procedure will consist of boiling the test bar in water and measuring its weight again comparing it from its original dry state. Table 44.5 shows the types of ceramic classification from the water absorption test procedure in ceramic manufacturing. Source was taken from the American National Standards Institute (ANSI) [9].

From this analysis, we will know the best result and parameter for the formulation of the clay. The process of making clay is done using the extruding technique. By using extruding technique it will give more accurate during the forming of clay. It is also cost saving and rapid and saves time to produce the straw of clay. Extruding technique is also known as extrusion. The function of the extruder is to develop sufficient pressure in the material through the die [10]. Figure 44.6 shows the rectangle shape of the clay by using the extruding technique. The rectangle shape is hollow. The shape dimension is 2×2 mm and the die used is rectangle as shown in Fig. 44.6. The die design will influence the output during the extrusion [11].

Figure 44.7 shows that clay is arranged into its position. For its technical the clay was attached and it will be come out with some pattern and it also give variation of form at the wall in the house. For the next process, the clay will go through a drying

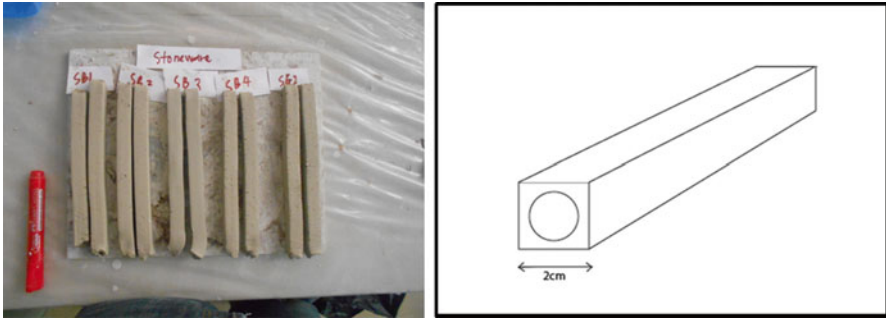


Fig. 44.6 (a) Clay on rectangle shape. (b) The diameter of the cube



Fig. 44.7 The clay is arranged into its position

process within 3 or 4 days. The clay was fired at 900 °C to solidify it as rock. The next process is to install this wall in the house or apartment.

The design on the wall depends on the customer’s taste. The design is planned to add esthetics to the wall ventilation. This ventilation and wall serve multiple functions such as a bookshelf, wall for planting, and hanging wall. From this idea, the

installation of this wall can give lots of benefits, such as it can be used for other functions while circulating air naturally and it will innovate the composition on mathematical arrangement. This is mathematically influenced by the honeycomb structure, which is very stable in terms of the structure. The structure of the honeycomb will study and add this arrangement into its innovation. This honeycomb is sometimes desirable either for esthetics or mechanical reasons [12]. The structure is very complex and stable for the safety of the user. The final prototype of this ventilation will go through all this process as it will give more benefit for safe and comfortable environment.

As shown in Figs. 44.1, 44.2, 44.3, 44.4, 44.5, 44.6, and 44.7, the design is clearly functional. This shows that the holes created by the clay are able to circulate the air from the outside. The result shows that the hot air from the inside can circulate and enter the house through the wall. This shows that the design of the wall is very suitable in terms of its function because the holes can generate air movement from the outside to the inside. The main function of the holes is to absorb the wind as it passes to the wall. The circulation of air will move to the inside of the house so that it can provide fresh air from the outside and give a soothing and cool environment on the building or house. For its analysis, the data show that the materials used are suitable as shown in Table 44.1 that presents the master formulation. The analysis shows that the use of ceramic materials is very suitable because it is porous, thus able to store the water on its body [13, 14].

This material is very strong and porous. Its porosity is suitable for ventilation because it can be an agent for water molecules to enter into the house and drastically change its temperature. The water molecules inside the porous body will react with wind; in other words, it can function as a bookshelf (Fig. 44.2). This design can create other functions such as a pot for an indoor plant and hooks for hanging something such as keys, coats, etc. This compartment is designed separately according to its function. This is because the compartment can be changed by the user depending on its use and their taste. Due to this variety of design, it can be an attraction wall on the house and at the same time it can perform multiple functions such as ventilation and others.

3 Conclusion

This framework explains the human behavior in terms of factors that will give the soothing environment of the house. As we know recently, green technology can be implemented by natural forces such as natural ventilation. This framework to find the suitable usage of the ceramic material as an addition to engineering technology can be implemented for modern housing in the future. This study also provides the consistency of the air movement on the house. Further research will focus on the exploration of the design of the ventilation and the aerodynamics of the ventilation process to create better life and give healthy air circulation on the house.

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Chapter 45

The Investigation of Raku Temperature Extension for Artificial Wall Panel

Syaza Abdul Rahim, Rusmadiyah Anwar, Wan Md Al Amin,
Oskar Hasdinor Hassan, and Mohd Rizal Salleh

Abstract Raku is one type of traditional ceramic firing method which originated from Japan, and it is widely used in Japanese tea ceremony. Recently, raku only can obtain spontaneous effects, and these effects cannot be repeated. The objective of this research is to produce the hidden effect in raku firing by distinction of firing temperature and time, so that at the end of this study, all the effects can be controlled by others especially ceramic artists. This research will use an experimental instrument, which is of different firing temperature and time. The process also included the differences between the vertical and horizontal condition of the specimen in the firing process. The firing ranges of this study are 750, 885, and 1,020 °C. Those three temperature ranges gave different hidden and interesting effects to the wall panel. At the end of this study, the hidden effect finished from raku firing which control and use by others.

Keywords Ceramic • Raku • Temperature • Wall panel

1 Introduction

The development of Malaysian ceramics has become widespread throughout the many other disciplines [1]. The opportunity in ceramic technology can be transfer into a new dimension of indoor decoration that can give a new experience for the viewer. The artworks such as wall panel and lighting decoration with the combination of today's technology can create a new perspective in ceramic. The color and effect that have been applied on the products can give a meaning to the subject, rather than just a standstill product. Yet the perception from the community to

S.A. Rahim (✉) • R. Anwar • W.Md.Al. Amin • O.H. Hassan • M.R. Salleh
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: syaza9526@salam.uitm.edu.my

ceramic still can be rated as low, as *Labu Sayong* (a Malay traditional water vessel) [2] will appear in the head as well as the word ceramic being said. The lack of exposure and information regarding the ceramic, in which the technique and method of *raku* firing is so strange to the public.

In Malaysia, the combustion method and *raku* firing are no longer being used in industrial mass production. *Raku* firing is derived from the ancient Japanese technique and used by Japanese society as one of the burning techniques for ceramic production. *Raku* could produce an interesting and hidden effect to the subject.

Temperature plays an important role in the firing process. Each level of temperature will result in different effects on the glaze. Constantly, the effect is based on different temperatures of the *raku* firing processes. Life Tips move up in life [3] “The speed at which the temperature climbs during a firing is critical, especially during the first 600 °C of a biscuit firing, as it is during this period that most of the physical and chemical changes occur. Once 600 °C of temperature reached, the clay has changed to a ceramic material. Continuation of the firing to a higher temperature increases both the strength and durability of the ware. Gloss firings do not usually require the initial slow firing rate needed for biscuit, but they offer an opportunity to vary the glaze through using a range of atmospheres and techniques, such as *Raku*, oxidation and reduction.”

2 Firing Temperature

Each ceramic glaze has its own temperature range. If the glaze was fired under low temperature, the glaze will not mature. If the temperature goes too high, the glaze will melt and run off against the surface of the pottery [4]. Intended for an excellent result, a potter must understand their glazes’ temperature ranges and time desired to become mature [5]. When potters talk about ceramic firing ranges, they are usually referring to the three most common ranges: low-fire, mid-range, and high-fire ranges. In regard to glazes, we need to add two other ranges: very low-fire and lower mid-range firing ranges.

3 Raku Firing Effect

Firing is an imperative process that concerns with producing a ceramic product and becomes the last process to declare a finished product or artwork. Firing also divided into all sorts of firing practiced based on the artwork or product. The types of firing are oxidation, reduction, salt, wood, *raku*, and others. There are many techniques used in *raku* firing [6–8]. Even though the same method is used during *raku* firing, it is difficult to control the result especially when the effect needs to be repeated [4].

4 Methods

Figure 45.1 shows the flowchart in investigating the effect of raku firing. It started on the secondary and primary data to find important information. An interview with UiTM Artist in Residence Mr. Masaki Shibata becomes more reliable in concern with firing, temperature, and techniques.

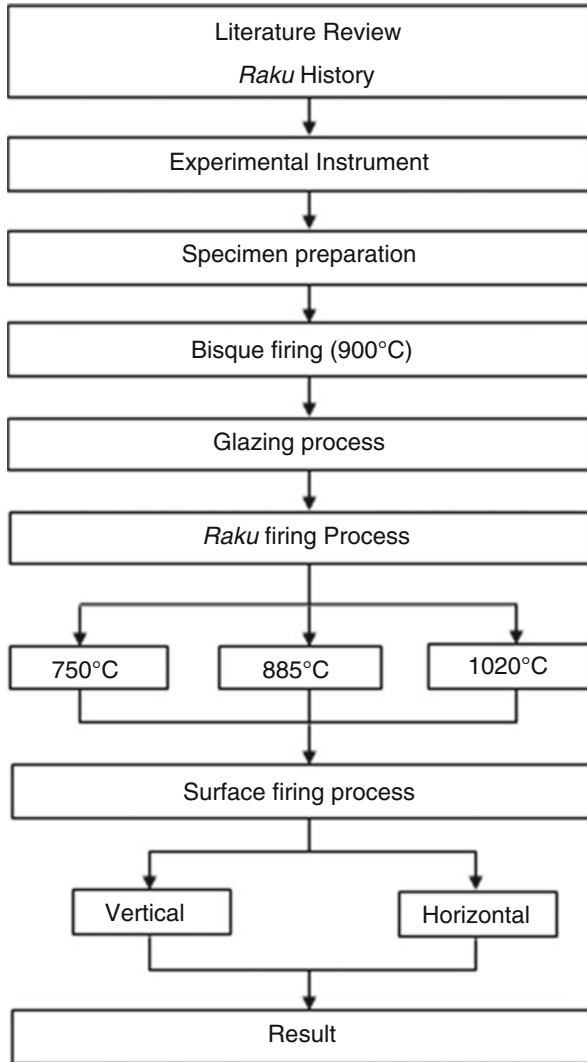


Fig. 45.1 Flowchart

Stoneware body was chosen as the main body for this study due to the popularity of its usage among ceramic artists or designers [9, 10]. The subject matter which butterfly used as artist impression and the actual purpose is to show the relief pattern on the surface, finally can be as effect after the raku firing executed.

After laboratory testing had been done, this study used stoneware body as the main material because of its strength and it can be fired to very high temperature. It based on report by Anwar where any ceramic body developed indicate with calcium based component will increase the body strength [11].

The firing process was started with bisque firing. All the specimens were fired in 900 °C. Then, the glazing process continued. The glaze was dipped for different thickness based on the time it was dipped, which were 5 and 10 s. This dipping method was applied based on the glaze density [12].

The specimens then were placed in two ways, which are horizontal and vertical. All the specimens were fired into three different temperatures, which were 750, 885, and 1,020 °C. At the end of this experiment, the different hidden effects can be seen.

5 Result and Discussion

Figure 45.2 shows the result of firing on a kiln at 750, 885, and 1,020 °C developed by own construction. The top loading kiln designed with a method of reduction firing. It was developed based on the expert kiln construction in this raku firing practice [13, 14]. Physically, the specimen looks gray and dull in experiment 1. The butterfly design successfully gave a black color at this temperature. The white line on the specimen was based on the overlapped effects of the glaze. It is clearly seen that vertical and horizontal placed do not give any effects and reactions, same as the thickness of the glazes. It also can be seen that the glaze did not mature and the surface is rough.

The specimen turned burnt black and did not mature at 885 °C. It looks like the glaze began to burn. The vertical specimen dipped in glaze for 5 s showed burnt effects rather than the horizontal firing which gave the crack effects. Meanwhile, the specimen dipped for 10 s showed thin cracks on vertical firing. The horizontal firing only showed the burnt effects. The surface of the specimen is still rough and not matured.

Physically, it can be seen in experiment 3 that the specimen appears white and black. For a vertical specimen, the glaze looks thin and thick cracks reduced. The differences in thick and thin glazes are the same if we look after the combustion process. Glaze thickness appears to make a difference in the combustion process at a temperature of 1,020 °C compared to those burned vertically. The surface of the product is no longer harsh than before. The temperature of 1,020 °C, the product is thick and burned glaze vertical is better. The glaze with a temperature of 1,020 °C is already matured, where the glaze has resulted in color and rough surface. However, at the temperature of 1,020 °C, the glaze that is on the product began splash in bad.

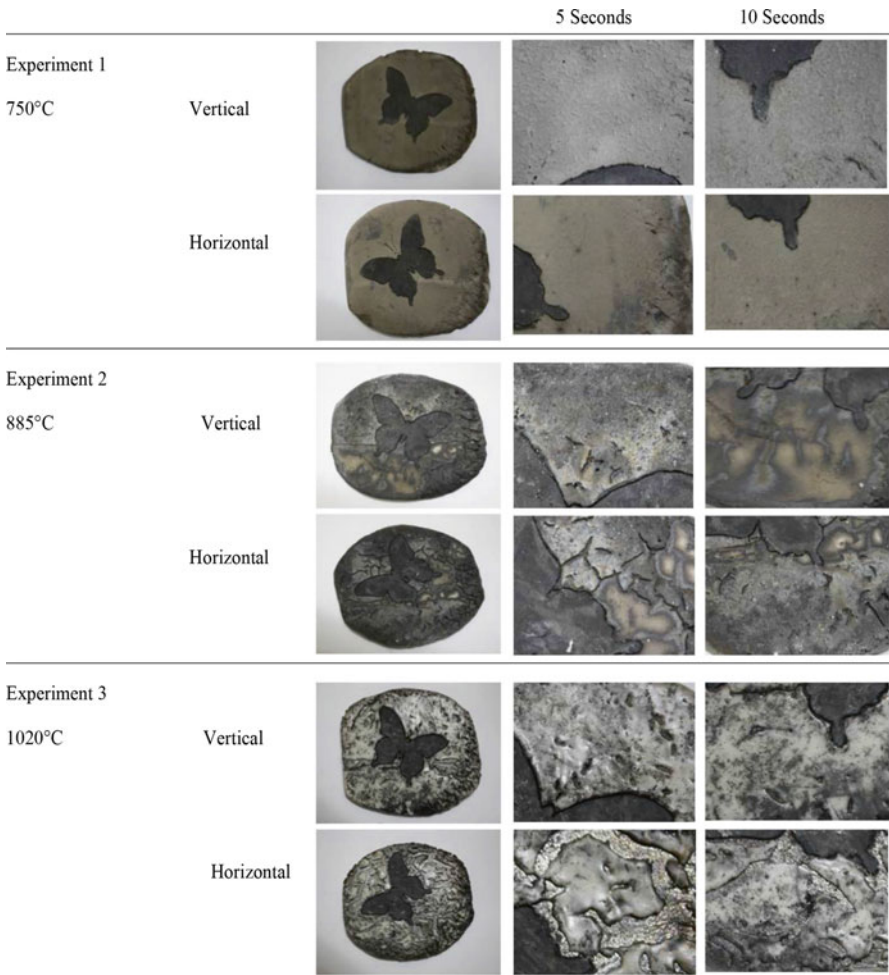


Fig. 45.2 Result of 750, 885, and 1,020 °C of firing temperature

It can be deduced that the temperature of 1,020 °C is also suitable for the glaze has exceeded the level and cause the glaze splash in bad.

6 Conclusion

In sum, experiments were carried out and have obtained satisfactory results and outcomes. The thickness of the glaze, the temperature, and the condition (vertical or horizontal) of the specimen will give the different effects. It can be concluded that



Fig. 45.3 Artificial wall panel series

the thickness of the glaze plays an important role in the combustion of the product, and how the product is placed during combustion also plays an important role. For product that is burned to lie, the cracks that we see are more and clearer than the product that is burned vertically.

In other views, at 750 °C of temperature, the specimen did not mature and the effects cannot be seen, while at 885 °C of temperature, the glaze started to melt and is still rough and not matured. A temperature of 1020 °C shows the best effects. It can be seen that the glaze has matured and has crackle effects. The artist's impression based on Fig. 45.3 provides evidence about the significance of firing segment need to be controlled in order to get a similar raku effect.

Acknowledgement We would like to acknowledge the generous participation of the interaction designers in the research. This study was conducted in Formgiving Design Research Lab established by Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to Malaysia Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 46

Alternative Compact Sate Dishware Design Based on Malaysian Utilization

Siti Zaharah Zahari, Adibah Ali, Verly Veto Vermol, Rusmadiyah Anwar, and Mohd Fazli Othman

Abstract Sate is one of the most popular dishes in Malaysia. A complete sate dish comes on bamboo skewers served with a bowl of peanut sauce, a plate of ketupat (rice cake) and a plate of sliced cucumber and onions. This paper discusses on the design process of a sate dishware through habitual usage amongst Malaysians. The objective is to improve the conventional sate dishware that will accommodate the Malaysian needs for sate eating activity that suits compact, simple and budget factors. The study conducted aims to obtain design for sate dish which features compact and safety elements. It is also an eco-friendly design that complies with the standard of dishware using ceramic as its base material for fabricating the product. As time goes by, in the current situation, when people are sitting and ready to enjoy their meal, it's not only about the flavour or the taste of the food that matters, but having a good quality and best design of tableware can make the delicacies an enjoyable meal. Therefore, this paper covers the design process taking into consideration ergonomic and safety elements for the sate dishware, hence educating consumers on its enhanced practicality usage.

Keywords Sate • Dishware • Design • Ergonomics • Ceramic

1 Introduction

Dishware has occupied a special place in our kitchens for thousands of years and continues to enchant us today [1]. However, the changes in behaviour and the way the dish is prepared have led to the changes of the usage or function of the tableware itself. In designing, interpreting and understanding consumer's behaviour and decisions through their interaction with scenarios, products or prototypes are crucial [2].

S.Z. Zahari (✉) • A. Ali • V.V. Vermol • R. Anwar • M.F. Othman
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: sitizaharahzahari@gmail.com; verly@salam.uitm.edu.my

Based on that, this research focuses on the modern tableware with the influence of human behaviour on eating sate as an approach on how to design the sate dishware itself.

A compact characteristic is an important aspect that was applied to the dishware as the design concept. Safety should be considered in the earlier stage of design in order to avoid risks in the future design [3]. Consequently, this research also considered the safety aspects of the product due to the dish itself which include sharp edges particularly the bamboo skewer which might pose as risk to consumers.

Based on the existing product used for sate dish as shown in Fig. 46.1, the complete sate dishware comes with a bigger plate for sate, a smaller bowl for peanut sauce, a bigger bowl for *ketupat* (rice cake) and also a smaller plate for sliced cucumber and onions. It is comprised of four pieces of items usually. Nowadays, there are few sate ceramic dishwares designed specifically for the function of serving that particular dish. Consumers are also facing problems with pulling the sate meat from the bamboo skewer. Therefore, the objective of this research is to improve the conventional sate dishware that will accommodate the Malaysian's need for sate eating activity that suits compact, simple and budget factors and hence to obtain a design for sate dishware which features compact, ergonomic and safety elements.

The methodology of this research is qualitative method which was done generally to gather primary data by observation such as data on sate dish eating habits of Malaysians and secondary data such as ergonomic and dishware information to develop the product design. A quantitative method was used mainly for the production process to produce the compact sate dishware.



Fig. 46.1 Basic sate dish serving

In this work, the researcher produces a more ergonomic dishware design that will serve a more practical usage for sate dish serving and eating. The design framework developed based on CSWD research methodology where observing the consumer behaviour on serving, even using the dishware, did the implementation [4, 5].

2 Understanding Ergonomics in Design

Ergonomic design is defined as a safe, comfortable, economic, and pleasing product design based on physical ergonomic parameters and ergonomic knowledge as well as the premise that meets the need of essential function [6]. Ergonomics can also be defined as the process of designing according to the human needs in order to optimize well-being and overall system performance [7]. Ergonomics is very much related to the researchers' design process of taking into consideration user interface with current sate dishware. Idea searching is the process of designing according to the human needs in order to optimize well-being and overall system performance [8]. Therefore, the combination of idea searching and ergonomic factors was considered to design an alternative product that will be most practical for consumers' use to eat sate dish based on the consumer's usage with the current sate dishware product. Understanding consumer demands for design purposes is a key to fulfil consumer needs [9].

3 Methodology

3.1 Design Development

1. *The study of ergonomics as a principal approach to design a compact sate dishware*

Ergonomics traditionally referred to ease of use and physical fit between a product and its user [7]. Effective use of ergonomics will make the customers feel more comfortable while enjoying their meals. However, wrong manual handling can pose ergonomic hazards which can affect human thumbs, fingers, hands and also other parts of the body [9]. This all depends on how consumers use the product.

2. *Study of practicality and safety elements of compact sate dishware*

In order to achieve the objective of the research, it is necessary to identify the usual habits of eating sate dish and the products used. The products were designed according to the problem stated by the customers as well as including the practicality and the safety elements. It is up to the designers to come up with a good idea of design or products; however, designing can be easier by identifying the problems first [2]. In the planning of this design development, it is important to recognize the close relationship between design and construction [10].

The idea behind the sate gripper comes from the problem analysis that was found by the researcher whereby there are several customers facing problem with biting or pulling out sate meat from the bamboo skewers. The idea behind the sate gripper as shown in Fig. 46.2a also arises due to the safety issue of the dish whereby the skewers are sharp. Injury might happen while customers are trying to pull the meat out with the skewer inside or close to their mouth as shown in Fig. 46.2b.

3. *Experiment on form and design*

The analysis is about the compact sate dishware based on the regular habits of Malays. The compact sate dish can reduce the usage of space in which the sate plate and peanut sauce bowl are combined. In designing a product, the ergonomics part is important to increase the customer's satisfaction and also to ensure the customer is comfortable with the product and enjoys their meals. A successful product design is recognized by its performance first then appearance, price, reliability, maintainability and safety towards consumers [11].

4. *Study of forms and design concept*

The form of the compact dishware is determined by understanding the concept of modern tableware which leads to a more simple but practical design. The main focus is on the form of the dishware which is organic and also on the ergonomics of the product. Besides modern tableware, observation on the existing products that are used at sate restaurants is also important to understand the concept of sate dishware that is used to serve sate dish. The form of the existing products is modified with the influence of modern elements, hence decreasing the amount of items used for the current sate dishware. This helps to reduce the amount of space used as well as simplifies the process of serving and eating the dish (Fig. 46.3).

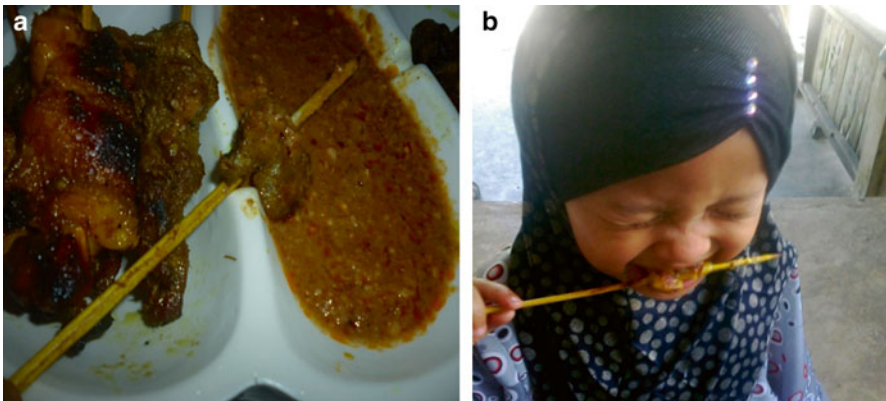


Fig. 46.2 (a) Usage of sate gripper to pull the sate meat from the bamboo skewer. (b) A child having difficulty pulling the sate meat

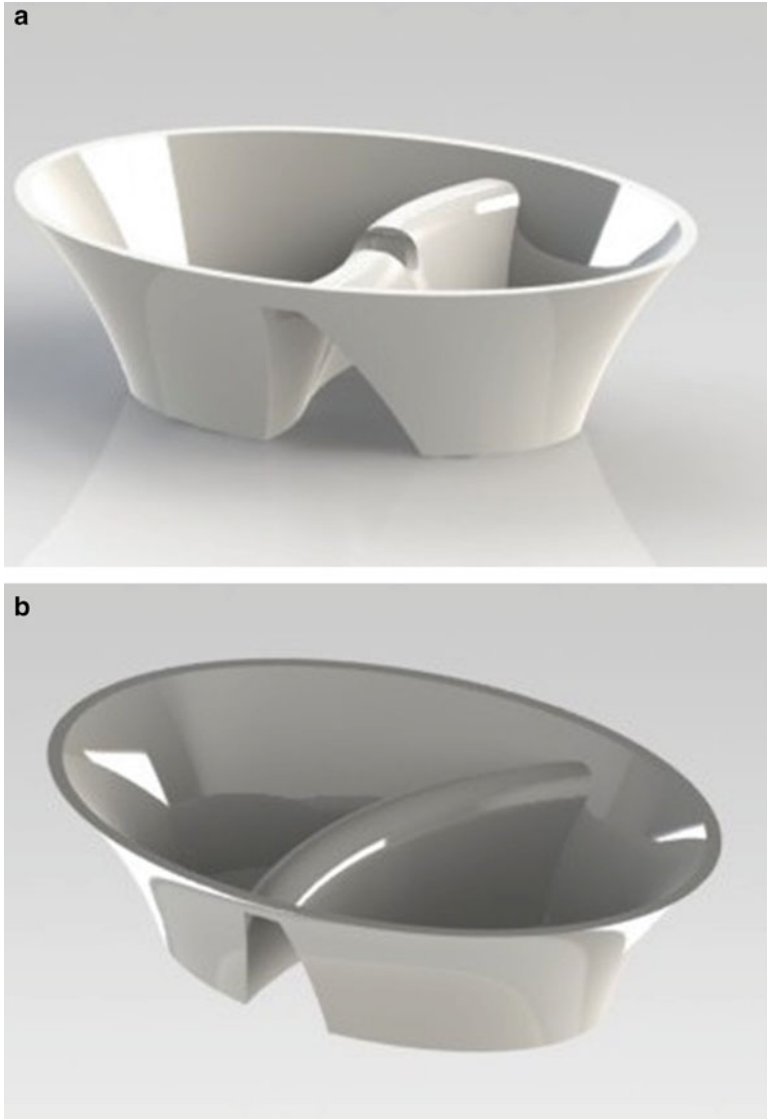


Fig. 46.3 (a) Compact sate dishware with sate gripper design in between the sections. (b) Compact sate dishware with sections

3.2 *Manufacturing*

The compact sate dishware was produced by solid slip casting technique. There were two moulds used for the production of this product. Each mould consists of two parts which are the top and bottom to produce a dishware for placing sate with peanut gravy and another for *ketupat* (rice cake) with cucumber and onions.

Slip casting is an advanced ceramic production technique whereby it is done by pouring slip into a mould [12]. Material used for casting is the mixture of marble dust and porcelain slip. Marble dust gives the strength but produces thin and lighter products. The more marble dust added to the porcelain slip mixture, the higher the strength [13]. The body strength is one of the factors that ceramic artists focus in their artwork production process [14].

Slip was left in the mould for 5 min to gain approximately 4 mm of product thickness. It is then refined with ceramic tools and left to evenly dry. The drying process needs to be evenly distributed to maintain the shape of the product [15].

The dried product was bisque fired using an electric kiln at the rate of 5 °C/min up to the temperature of 900 °C and was soaked for an hour. The bisque ware was then glazed and fired again at the same pace and soaking as bisque firing previously but up to the temperature increased to 1,200 °C for glaze firing using the standard process. Standard firing process indicates that samples are consistent and glaze melting point can be adapted to the factory heat work [16].

4 Results and Discussion

A modern dishware was created using ceramic material. The design has achieved its entire objective and solved the issues related to safety as well as ergonomics aspect as shown in Fig. 46.4. The combination of sate plate with its peanut sauce including sate grip as well as *ketupat* (rice cake) combined with cucumber and onions have



Fig. 46.4 Final design of compact sate dishware

created an innovative compact dishware that changes the practice of how to serve and eat sate dish.

A product can change how consumers use a product. Eating sate dish can be more practical way which saves space, and allows safer way to eat sate dish just by using the sate grip hence avoiding the usage of the mouth and teeth in pulling away the sate meat from the skewer. Therefore, consumers would have a more presentable dishware and enjoy their meal as a whole without having to feel burdened eating their all time favourite dish.

5 Conclusion

Overall, this research concludes that in designing a compact sate dishware, the ergonomics and safety give significance to people. This is because the interaction between people and ergonomic is the focus of the design itself. Therefore, this idea of compact sate dishware can substitute the existing products for sate dishware and reduce the number of items used to serve the complete set of sate dish. The design of the sate gripper helped consumers enjoy their sate dish especially for those with dental problems and also for children.

Acknowledgement We would like to acknowledge the generous participation of the interaction designers in the research. This study was conducted in Formgiving Design Research Lab established by Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to Malaysia Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 47

Color Cognition Framework for Autistic Children Development

Nurdalilah Mohd Rani, Siti Hajar Abdul Rahman,
and Muhamad Fairus Kamaruzaman

Abstract Investigation on special education and treatment for individuals with a learning disability, such as autistic children, has long played a significant role in many domains such as children developmental, psychoanalysis, and visual learning. At present, there are scanty investigations that have been made pertaining to color cognition for autistic children's development. Literature has shown that autistic children were characterized by deficits in certain aspects, but it is believed that they have a special talent in capitalizing on confidence and self-determination, especially on color. Hence, our study plans to explore the visual color cognition for children with autism that will hypothetically support counselors and facilitators to create appropriate instrument and instructional programs to nurture their daily activity environment. A theoretical model for color categorization for autistic children's development will be proposed. The next phase will be to validate the assimilation model planned via a cycle of hypothesis analysis, which leads to enhance the quality of life particularly on color cognition.

Keywords Autistic • Children • Color categorization • Cognition • Awareness • Perception

N.M. Rani

Formgiving Design Research Group, Design and Creativity Communities of Research,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

S.H.A. Rahman

Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor Darul Ehsan, Malaysia

M.F. Kamaruzaman (✉)

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: fairuskamaruzaman@ieee.org

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1 Introduction

As a multifaceted neurobiological syndrome of advancement [1], autism precedes every part of an individual's life, and currently it is still not curable. It is a type of developmental disability as it usually starts before age three, which is an age where a child is in his/her developmental period [1]. This kind of disability causes setbacks in several various abilities that happen since babyhood to adulthood. Autistic children were characterized by deficits in social and communication [1, 2], repetitive behavior [1], and delayed speech [3]. Autism is classified under pervasive developmental disorder (PDD). PDD suggests that the result of the disorder virtually affects all aspects of the individual's life [4]. In autism's case, the impact of the disorder does not concern just the individual himself/herself but the members of the family as well. The deficits will influence virtually all aspects of the parent-child relationship [4]. Often caused by gene heredity, autism spectrum disorder (ASD) affects more boys than girls. Statistic shows that boys are three to four times more likely to be affected by ASD than girls [1, 3]. According to the National Autism Society of Malaysia (NASOM), 1 in every 150 children born these days has typical autism and the number of children with autism has risen by an astounding 30 % over the last 3 years in Malaysia. *Mingguan Malaysia* (2013) stated that there are about 47,000 children born in Malaysia that were autistic. Although autism cannot be cured until a single cause or a set of causes is known [5], several treatments have been developed and initiated to be helpful in reducing the symptoms as well as improving their behavior over time. The aim of this study is to explore the visual color cognition for children with autism that will hypothetically support counselors and facilitators to create appropriate instrument and instructional programs to nurture their daily activity environment.

2 Literature Review

2.1 *Cognitive Functioning of Autism*

The term "cognition" is used by the psychologist to illustrate the way people reflect of things [4]. Common cognitive functioning allows people to comprehend the world around them well enough to behave well [4]. Cognitive abilities include perception, memory, and language [6]. For children with autism, the cognitive skill may be delayed if compared to other children of the same age without autism. In the context of theory of mind, the ability to impute mental states to the self and others and make reasoned decisions based on this information might be challenging to children with autism as individuals with autism fail to "impute mental states to themselves and others" [6]. Rather than hearing, many autistics are better at understanding what they touch, smell, and see [4]. However, autistics can be trained to

react to their senses more normally, which helps them to be more sensitive to what they hear and better organize the information they receive through all senses [4].

2.2 *Color Categorization*

Color categorization has been put forward as an excessive case of linguistic influence on cognition [7]. Based on a research, it is found that children with autism were substantially less precise at color reminiscence and tended to rummage around than children without autism [8]. The investigation of cognition and observation of persons with autism has initiated variation compared to control groups [8]. In this research, color category and the cognition of autistic children were connected with each other. There are possibilities that the autistic children find it challenging to determine the color terms and category. It is believed that Franklin et al. [8] have recommended that the gap in children's color phrase learning echoes dissimilarity in adult linguistic input from another analogous theory [7]. However, color perceptions of autisms were found to be different from those without autism. One of the challenges in this investigation would be the difference in color perception of autistic children as aberration of color acuity in children with autism has been broadly reported anecdotally [2]. Though, it is believed that related studies have publicized that colored superimposes reduce symptoms and enhance analysis velocity in these individuals.

Children with autism often have odd response to certain color or, maybe in other cases, are too obsessed with only one color. For instance, parents have reported that their child declined to look at black color as it looks as if it is evil or there is a child that loves pink too much that everything around her including her clothing has to be in pink. However, there are limited investigations that have been made pertaining to color cognition for autistic children's development. Autistic children were characterized by deficits in certain aspects but are believed to have a unique talent in capitalizing on confidence and self-determination especially on a color. In a research, it is found that autistic children are poor in color discrimination compared to control group but possess good reminiscence color [9]. As a PDD, the impact of autism does not only affect the autistic individual but all members of the family as well [10]. The family members especially the parents may be juggling with the difficult task and routine activities in daily life, and participating in the early intervention for the sake of a child seems to be burdensome.

Color is also a cognitive phenomenon that can be researched through color naming or categorization [11]. It is also a fundamental aspect of human perception, and its effects on cognition and behavior have intrigued generations of researchers [12]. Color theorists believe that color inspires cognition and behavior through learned associations [12]. However, the effect of color to the cognition happened unconsciously. It is important to note that the activation of the color association, as well as its influence on affect, cognition, and behavior, is viewed as occurring without the

individual's conscious awareness or intention [13]. For cases in autism, it has been widely reported on the peculiarity on the responses toward colors [2]. For instance, educators reported how autistic student declines to look at the black color as it is believed to be evil. Given these reports, it is surprising how little research has been made relating to color perception in autism. Plus, only a few have investigated the effects of color on students' cognitive achievement although researchers have for years been interested in the effect of color in learning at the nursery, primary, and postprimary institutions [14]. Individuals with autism commonly experience hypsensitivity and hypersensitivity to visual stimuli. Of the autistic children tested, 85 % saw colors with greater intensity than neurotypical children and a small proportion of the children (10 %) saw the color as neurotypical children do and 5 % saw muted colors [15]. However, a report stated that color overlays using *Intuitive Overlays* (colored plastic sheets suitable for placing over a page of text without interfering with the clarity) were effective in increasing the reading ability of persons with autism [2]. Thus, the majority of individuals with autism appear to show positive effects with the use of colored filters [16].










Studies of color perception in children with autism have demonstrated differences in color memory, discrimination abilities between colors, and detection of color when presented on achromatic backgrounds [17]. Firsthand reports stated tinted lenses have benefited some individuals while some practitioners have reported that syntonic phototherapy in which viewing of certain light frequencies may improve physical and emotional functioning [17]. However, research to establish syntonic effect has not yet been completed. Categorization is said to be a fundamental property of the human condition [7]. Cognitive categories for color appear to be tightly tied to the linguistic terms used to describe them [7]. Therefore, there is a possibility where color categorization will affect the cognition of children as the delay in children's color term learning reflects differences in adult linguistic input from other comparable concepts (such as size) as claimed by Roberson [7]. The following table shows Berlin and Kay's seven-stage evolutionary/developmental order in universal color categorization (Table 47.1) [18].

Figure 47.1 shows the conceptual framework of color cognition for autistic children development and how categorization, cognitive functioning, and visual therapy are related to one another.

3 Scope and Limitation of Study

The area of investigation will cover up only in Shah Alam as there is a community service center, named "Pemulihan Dalam Komuniti (PDK) Mutiara Hatiku," that is willing to give their full cooperation in carrying this research. The limitation of age is between 7 and 12 years old, and a close observation on their behavior will be made. This investigation will be focusing on the color categorization study by using an application developed specifically for autistic children development.

Table 47.1 Berlin and Kay’s seven-stage evolutionary/developmental order

Set	Color	Terms	Relations with terms
1		Black	All languages contain terms for white and black
		White	
2		Red	If a language contains three terms, then it contains a term for red
3		Yellow	If a language contains 4 terms, then it contains a term for either yellow or green
4		Green	
5		Blue	If a language contains 5 terms, then it contains a term for blue
6		Brown	If a language contains 6 terms, then it contains a term for brown
7		Orange	If a language contains 7 terms, then it contains a term for either orange, pink, purple, or gray
		Pink	
		Purple	
		Gray	

4 Methodology

4.1 Theoretical Study

First, a preliminary study will be conducted in the process of augmenting the research aims. A thorough understanding of embedded device-based color and cognition of autism will be conducted in this stage. The investigation will look into the involvement of color cognition as part of therapy that would hopefully enhance the quality of life of individuals with disabilities, particularly in autisms.

4.2 Expert Consultation

In order to provide the study with an empirical proof, expert consultation will be carried out from professional educator and instructor in the field. The motive of such activity is to pinpoint modules, stages, and steps concerned in color cognitive skill treatment for autism.

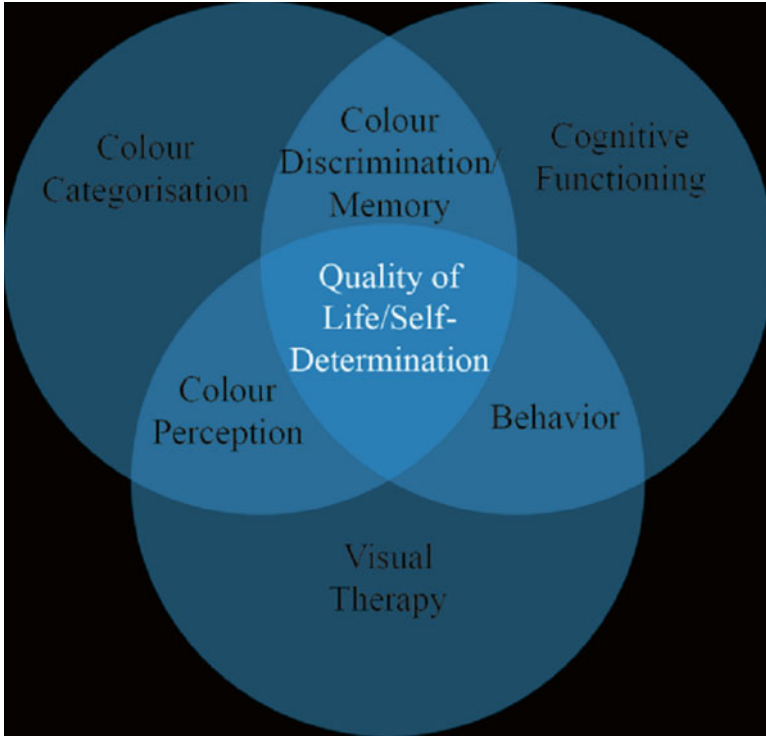


Fig. 47.1 Conceptual framework of color cognition for autistic children development

4.3 Model Design

As a means to validate and analyze the effectiveness of proposed design for color cognition for autistic children, a conceptual model will be designed. The prototype is to be used as a tool for therapy in learning disabilities among children, specifically for children with autism.

4.4 Experimental Study

Experimental study is to be performed on a real project to measure from the aspect of feasibility and thus to aid in validating the proposed design model recommendation. To gain feedbacks from a variety of respondents who are related to autistic

children such as parents, family members, teachers, and experts, questionnaires will be used in the investigation.

5 Significance of Research

People with autism have the best chance of using all of their individual capabilities and skills if they receive appropriate behavioral and other therapies, education, and medication [1]. Thus, this research will be a significant endeavor for the execution of the Law of Malaysia, Act 685 – Persons with Disabilities. In the act, it clearly stated in Part IV in Promotion and Development of the Quality of Life of Person with Disabilities as well as in Chapter I stated on the right for accessibility in number 28) to education and number 30) to information, communication and technology. Plus, it will also benefit other researchers, educators, facilitators, and application or technology developers to create appropriate instrument for the use of the disabled especially those with autism.

Acknowledgment The authors would like to thank Malaysia Government, Universiti Teknologi MARA under the Research Entity Initiative Grant Scheme, and Research Management Institute for the administrative support.

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Chapter 48

Synthetic Material from Sugarcane Bagasse as an Alternative Relief Print Block

Khairul Zikri Abdullah, Siti Hajar Abdul Rahman,
and Muhamad Fairus Kamaruzaman

Abstract Printmaking is a form of fine art progressing in tandem with other forms of contemporary arts. At present there are an assortment of methods and procedures in conventional printmaking that artists can choose to express their ideas. It is believed that in Malaysia, eminence products can be created via obtainable natural fiber wastage. Essentially, this research is more to the technological procedure that has been done in the laboratory. This investigation is more to invention of an alternative finding to the relief print block industry. The alternative finding is shaped from the local waste natural fiber. In this framework, the synthetic alternative relief print block that created from the local waste natural fiber which Bagasse through the laboratory procedures will be the preeminent characteristic during carving process and the surface is non-absorbent through the inking process. Simultaneously, the outcome will be more cost-effective than the existing print block comparable to linoleum and wood based. A highly technological innovative research towards printmaking alternative invention will be set up to accomplish the needs of society and the industry in essence.

Keywords Synthetic material • Printmaking • Alternative print block • Cost-effective

K.Z. Abdullah (✉) • S.H.A. Rahman
Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor Darul Ehsan, Malaysia
e-mail: zikri@salam.uitm.edu.my

M.F. Kamaruzaman
Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

1 Introduction

Printmaking is a form of fine art progressing in tandem with other forms of contemporary arts. There are various ways and techniques in traditional printmaking that artists can choose to convey their ideas [1]. It is believed that in Malaysia, the existing natural fiber wastage can create the eminence products. Several of these natural fiber wastages consist of rice straw, wood dust, and bagasse (sugarcane fiber). Nonetheless, in order to fabricate quality products using natural fiber, systematic research and development has to be undertaken. Bagasse, for example, after research and treatment through a process of extraction and de-containing can be made into a product of soft, durable surface that would be suitable as a substitute for relief print block [2, 3]. This final invention is vital since an artist needs to carve the block in order to create a relief print. Nevertheless, since the bagasse is weightless, it can also be blended with the other materials [4]. Hence, this research aims to examine ways to turn waste to wealth or specifically natural fiber wastage into quality products such as an alternative for relief print block.

2 Literature Review

Essentially in Malaysia, there are only two out of five sugar factories which use sugarcane as raw materials for refined sugar production. The plants are “Kilang Gula Padang Terap” in Kuala Nerang, Kedah, and “Kilang Gula FELDA” in Chuping, Perlis. The other plants solely use brown sugar as raw materials for sugar production. This brown sugar is imported from Australia, Thailand, and Brazil. The sugar plants have been operating since the 1970s. The main purposes of the industry are to ensure food security and supply, to provide jobs, and to reduce foreign exchange. The plantation area is 9,215 acres in Perlis and 25,245 acres in Kedah. That gives the total plantation area in Malaysia to be nearly 34,500 acres. Out of this, about 1,111,500 tons of sugar cane is produced in 2002 [3, 5]. It is believed that the sugarcane fiber called “*bagasse* or *begesse*” is the pulverized or shredded outer fiber of the sugarcane. This process removes the fiber during the milling process when the juices of the canes are extracted [6]. Usually, this fiber is used to manufacture paperboards, for application in the construction industries, writing paper, packaging, and composed table food services plates and bowls (Fig. 48.1).

3 Scope and Limitation of Study

Only locally existing natural fiber waste was used in this investigation in order to be in line with the technological “waste to wealth” research concept. This research also involved semi-scientific procedures conducted at the Laboratory in Polymer

Fig. 48.1 The product of wood plastic composite – sugarcane fiber (Illustration taken from <http://www.edraecosisternas.com>)



Department, Faculty of Applied Science, Universiti Teknologi MARA, Shah Alam. The laboratory procedures were necessary, and the findings will hopefully be considered a milestone for the industry as well as for further. The size of the prototype is similar to the size of the original product, measuring 150×150 mm. This is because the mold available in the laboratory measures that specific size.

4 Research Design

Information for this investigation is acquired from answers to a series of questionnaires of 5 printmaking artists and 20 students who embarked on the printmaking subject in Universiti Teknologi MARA (UiTM), Shah Alam. It is a research which describes the role of synthetic material from sugarcane bagasse as an alternative relief print block. The fundamental underlying principle was that this method is mainly useful for research that aims to accumulate facts involving the frequency of a phenomenon and also for investigation of the existence of relationships involving variables of interest. This synthetic material enabled printmaking artists to exploit the new era of sustainable relief print block as it is convenient and pragmatic to illustrate and engrave [7]. Test and observation session were tape-recorded for documentation purposes [8]. Hence, with such evidence, it can explain the printmaking artist's action, motion, and behavior. It is believed that the printmaking artists who used and experimented the synthetic material from sugarcane bagasse as an alternative relief print block were gratified and inspired of the said print block. After gathering all the information, analysis of the investigation was conducted to complete the research. The findings of this research paper bestow the experimental approach of synthetic material from sugarcane bagasse as an alternative relief print block. This innovation and achievement has reached another level of expansion in the

printmaking arena, which permits the printmaking artists and students to use up the alternative relief print block which is more sustainable and economical.

5 Significance of the Study

This research can benefit many parties including researchers, printmakers, fine artists, art students, designers, entrepreneurs, and others in the printing and art industries. The synthetic relief print block has the potential of producing fine art print in terms of its quality.

6 Results and Discussions

The role of synthetic material from sugarcane bagasse as an alternative relief print block has been experimented and assessed. Observation was done in location and also through exploration of videotape [9]. This study therefore initiates that the alternative relief print block is promising in producing relief print artwork. It is also believed that the alternative block is convenient and practical in creating organic lines and carving sharp line and emits a nice texture on block surfaces. Hence, it is able to be an alternative print block (refer to Figs. 48.2 and 48.3) towards the existence of the linoleum print block.



Fig. 48.2 Prototype of synthetic material from sugarcane bagasse as alternative relief print block

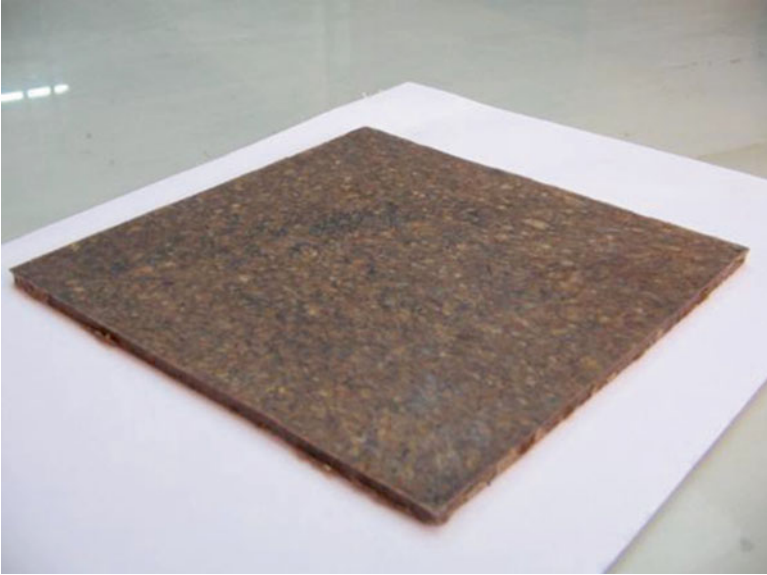


Fig. 48.3 From another side view, the alternative print block prototype

It is an outcome in which enclosed data collection in the previous section was concluded (refer to Table 48.1). Majority of the printmaking artists and printmaking students agreed that the synthetic material from sugarcane bagasse has reflected the same quality towards linoleum relief print block. It is also believed that the alternative print block makes it look easy to craft a straight and curve line (please refer to Figs. 48.4, 48.5, and 48.6). The ink of imprint on prototype's surface is perfect and nonabsorbent. It is made to understand that respondents were exciting and mesmerize during the experimentation towards the alternative print block as there is no graze and damage on the surface on printing block after the whole process is completed. Hence, it can be substituted with the linoleum block. From the total number of printmaking respondents, twelve of them were male, and the remaining eight were female.

7 Conclusion

Based on the analysis and the research findings, it is found that the synthetic material from sugarcane bagasse will be an excellent medium to acknowledge the present linoleum print block. It is also believed that the alternative relief print block which is more cost-effective will benefit the printmaking environment as a whole as it has unique qualities compared to linoleum as a relief print block.

Table 48.1 Data analysis collection

No	Gender	Respondents' response towards synthetic material from sugarcane bagasse as alternative relief print block					
		Printmaking artist			Printmaking students		
		Poor	Average	Good	Poor	Average	Good
1	Male			✓			✓
2	Male			✓			✓
3	Male			✓			✓
4	Male			✓			✓
5	Male		✓			✓	
6	Male						✓
7	Male						✓
8	Male						✓
9	Male						✓
10	Male					✓	
11	Male						✓
12	Male						✓
13	Female						✓
14	Female						✓
15	Female					✓	
16	Female						✓
17	Female						✓
18	Female						✓
19	Female						✓
20	Female						✓



Fig. 48.4 Carving process



Fig. 48.5 Inking process



Fig. 48.6 End result

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Chapter 49

Basic Production Control in Magazine Production at Ultimate Print: A Case Study

Mahadzir Mohamad, Muhammad Yusuf Masod, and Ridzuan Ahmad

Abstract Nowadays, quality control is involved in all aspects of print production, from testing and control of printing inks, substrates, and other raw materials used to produce the finished printed articles to the testing and control of the main processes used before a particular job reaches the printing press, for example, process control. In the operation of a printing press, production control process such as color control depends very much on the operator's skill and experience. However, with the development of the production control system, the conventional operator's skill is being replaced by numerical evaluation of process and quality control, and productivity is greatly enhanced. Recently, it has been attempted to measure the whole print image and develop a production control system for the next generation based on a new concept of controlling the print color tone. This system guarantees the quality of the image of the merchandise and presents a new solution for digital system of print workflow that is rapidly advancing in the directions of print standardization and color management in magazine production. This paper will study on the basic application of the system and standard for magazine production in order to get the best result.

Keywords Printing production • Magazine print production • Printing standard

M. Mohamad (✉) • R. Ahmad
Department of Printing Technology, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: mahad476@salam.uitm.edu.my

M.Y. Masod
Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

1 Introduction

In prepress workflow, printing quality control is a must in the prepress workflow to create, color correct, optimize, verify, and convert content. The prepress workflow would benefit from a commitment to better educate the customer on why they need to create a good file and why everyone in the prepress workflow is responsible to ensure printing quality control.

Printing is a personalized industry producing products and supplying services in a tremendously wide range of printed matter from business cards to large posters, from leaflets to case-bound books, and from plain packaging to complex multicolored cartons. The range of printed products and services is endless and continually increasing. Printing fulfills this wide range of needs as well as adapts to ongoing developments in response to print-related opportunities and changes in circumstances. There is not one aspect of the world economy that does not come into contact with the printing industry and its wider role in the developing communication and media industries [1].

The industry is dominated by five separate and distinct processes, such as lithography, letterpress, flexography, gravure, and screen printing. Each printing process can be divided into three major steps, which are prepress, press, and post-press. The main objective is to elaborate the importance of quality control process in prepress process for magazine production at Ultimate Print Sdn. Bhd. The objectives of this study are:

- To identify the procedures that have been used in quality control measurements by Ultimate Print Sdn. Bhd.
- To study the process standard tools that are being used in Ultimate Print Sdn. Bhd.
- To find out how the quality control system of the production process is done in Ultimate Print Sdn. Bhd.

1.1 Prepress

Prepress is the operations or processes that include the series of steps during which the idea for a printed image is converted into an image carrier such as a plate, cylinder, or screen. Prepress is a very important process toward obtaining high-quality printed products especially in magazine production. It is because nowadays people seek for information about their self-interest such as politics, economics, business, fashion, music, and even culture through it. In order to be sure that the magazines produce good-quality printed products, the company or the publisher needs to have some means of measuring and controlling the manufacturing variables also known as “quality control” [2].

1.2 Quality Control

Quality control is a process by which entities review the quality of all factors involved in production. Besides that, quality control in print production is a form of inspection of a process or product, and it involved all aspects from the testing and control of the printing inks, substrates, and other raw materials used to produce the finished printed articles. Today, more and more people within the printing and associated industries are being involved in some aspect of quality control [3].

1.3 Magazine

The first periodical to use the word magazine in its title started in London by Edward Cave in 1731. Cave used the word magazine in the name of his “Gentleman’s Magazine” to suggest that this new publication was a storehouse of information, providing all the news that a civilized person needed in order to keep up to date on what was going on in the world [4]. Cave’s magazine was tremendously successful, and within a few years, several spin-off publications began to appear in London and in the United States. On the one hand, magazines are a mechanism for providing people with current information on a broad range of topics on a regular basis – usually monthly but in some cases even weekly [5].

2 Research Questions

The research questions for this study are:

- How is the quality control system being done in Ultimate Print Sdn. Bhd.?
- What is the equipment and software that are used in order to fulfill requirements for quality?
- What is the quality check undertaken at the prepress process?
- Is the quality control important in prepress process in magazine production?

3 Methods

3.1 Personal Interview

For collecting the primary data, the researcher conducted a one-to-one interview. The respondents were selected based on their role and expertise in related field such as marketing, print production, and quality assurance. An open-ended question was used to conduct the interview to get the specific data for the research. The interview

has been done by personal interview, which is a two-way conversation to obtain information from interviewing Puan Raja Syuriani as quality assurance (QA) manager in Ultimate Print Sdn. Bhd.

The company that has been chosen to get the primary data is Ultimate Print Sendirian Berhad which is located in Lot 2, Jalan Sepana 15/3, Off Persiaran Selangor Seksyen 15, Shah Alam. This company has attained international consensus as a good-quality management organization when it was rightfully awarded the ISO 9001: 2000 Quality Management Standard. Ultimate Print Sdn. Bhd. is the largest commercial printer in Malaysia and prides itself as the number one printing solution provider, boasting the latest printing technology and expertise, offering its services to multinational companies, and providing quality and timely service; it provides a wide range of services to meet the needs of today's much customized orders. Their service does not end at just the printing but also extends to the delivery to the desired destination or users.

The interview was only conducted twice due to time constraint and interviewer availabilities. The respondent that is chosen is Mrs. Raja Syuriani Binti Raja Ali who is quality assurance (QA) manager from Ultimate Print Sdn. Bhd. She graduated with a degree in Bachelor of Science (BSc) Industrial Chemistry at Universiti Teknologi Malaysia.

With more than 20 years of experience, Ultimate Print has progressively expanded and contributed tremendously toward the development of printing industry in Malaysia. This company is currently using a variety of high technology machines, such as computer-to-plate (CTP) process since 2006 and print on demand (POD) to produce a small quantity of printed product, four color sheet-fed offset printing process with high-quality machines. The company produces many types of products such as books, magazines, newspapers, and so on.

Ultimate Print Sdn. Bhd. has attained international consensus as a good-quality management organization when it was rightfully awarded the ISO 9001: 2000 Quality Management Standards. This is testimony of their commitment to quality. Their commitment to work culture and staff benefits are exemplified with the implementation of the highest standards of occupational safety and health procedures, manifested evidently through Ultimate Print's commitment to pursue the attainment of the OSHAS 18001 Certification, the international recognition for safety and health standards. Besides that, the company also has been certified with Process Standardization for Offset (PSO) since August 2011.

The interview was conducted based on several chosen questions that emphasize on that topic of the research. All of the questions were designed to achieve the objectives of the research. The data collected from the interview were then analyzed.

Some of the questions used during the interview are:

1. *How is the quality control system being done in Ultimate Print Sdn. Bhd.?*
2. *What are the equipment and software that are used in order to fulfill requirements for quality?*
3. *What are some of the quality checks undertaken at the prepress process?*
4. *Is the quality control important in prepress process in magazine production?*

According to Mrs. Raja Syuriani, Ultimate Print (UP) quality management system is certified under ISO 9001: 2008. ISO 9001: 2008 is the International Standard for Quality Management System, and it provides the company with a set of principles that ensure a common sense approach to the management of the company activities to consistently achieve customer satisfaction. She cited that the company has also been certified with Process Standardization for Offset (PSO). UP has identified PSO certification as one of the continual improvement programs that help improve the print product to meet the international standards. The international standard that is classified under the PSO is ISO 12647.

In order to fulfill the goals of ISO 12647, other standards shall be included such as:

- ISO 15930: Prepress digital data exchange: use of PDF/X.
- ISO 12646: Display for color proofing.
- ISO 12647-7: Defines process control for digital proofing.
- ISO 3664: Viewing conditions.
- ISO 13655: Color measurement.
- ISO 12647-2: Offset lithography processes and parts of ISO have to be fulfilled.

Steps of getting PSO (ISO 12647-2):

1. *Step 1: Calibration of the colorimeter*
Instrumental error affects the final results. So the calibration of the colorimeter, the density meter, and the gross meter are very important.
2. *Step 2: Selection of paper, ink, press, and others*
Papers need to meet the ISO requirements. Printing condition should be the same in all trials.
3. *Step 3: Preprint trial*
It is important to understand the relationships between optical density and lab value with actual print to decide the proper optical density of each color.
4. *Step 4: Preparation of print samples*
After adjustment of CTP curve, make samples with the proper optical density of each color.

Besides that, ISO 12647-7 (proofing) is also another standard that has been certified at Ultimate Print Sdn. Bhd. ISO 12647-7 was published in 2007 and defines internationally agreed upon aimed values and tolerances both for a proofing system and the contract proof creation. The proofing was certified by using Ugra Proof and Print Certification Tool Analysis Report.

Ultimate Print Sdn. Bhd. is using the specific equipment or tools such as TECHKON SpectroDrive, a spectral measurement device which is a very important tool in prepress process. The main function of SpectroDrive at prepress section is for measuring the color. SpectroDrive is the perfect solution to substantially increase press productivity by ensuring consistent print-to-print color accuracy throughout the press run.

She stated that before using SpectroDrive device, pressman at press unit did the color adjustment based on their experience, skill, art, and human perception

(eye judgment). Then, the customer will have to come by to approve the color based on his expectation.

In order to see the result, TECHKON ExPresso software has been installed in PC. The scan-measurement device SpectroDrive and software ExPresso form a complete quality control system for increasing productivity and quality of a printing press. SpectroDrive and the related PC-software ExPresso are practical utilities that adhere to the print quality standards as defined by ISO 12647.

Prepress workflow at Ultimate Print Sdn. Bhd. can be narrowed down into three steps, which are publishing house, preflight, and platemaking. It started from publishing house where they provide design or artwork (PDF file) for customers. After that, the process will be through the preflight: preflighting is a simulation exercise that checks for any problem, faults, and inconsistencies, which might occur in the designated workflow.

The artwork must be in PDF file (PDF/X-1a) because the purpose is to match with printing requirement and standard.

The person in charge will check the file and ensure that all fonts must be embedded and the color must be grayscale, CMYK, or named spot colors and check for the bleed, bleed size, low-resolution photo, text trimmer, etc. Then, digital proofs are printed by ink-jet, and the purpose is to give a good approximation of what the final printed piece will look like. According to Mrs. Raja Syuriani, the main purpose of proofing is for pressman to check the color matching.

Quality assurance or quality control is the most important and “must do” step in the company because every printed product should meet the customer requirements and satisfaction especially products that involve imposition such as magazine and special color.

She also said that it is important because all printed products must be exactly what customers want. Besides that, Mrs. Raja Syuriani explains that quality is everybody’s business, meaning that all units from prepress, press, and post-press should be involved and take note during the printing process. The quality control process should not be taken lightly by all staff at Ultimate Print Sdn. Bhd.

4 Conclusions and Recommendation

Prepress is a very important step toward obtaining high-quality printed products. If the professionals perform prepress process skillfully, it allows either avoiding or correcting many different mistakes that entail wasting time, efforts, and substantial funds. Quality control is assuming a greater importance to the printing industries. Quality control is involved in developing systems to ensure products or services are designed and produced to meet customer’s requirements.

Besides that, measuring techniques and quality control are a must in order to reach and respect a fixed standard such as ISO 12647-2 and ISO 12647-7. The researcher found that an appropriate control system ensures a good printing process and avoids complaints from customers. In conclusion, both quality control and

prepress are very important elements in the company in order to meet the customer satisfaction. Without quality control in prepress, there is no guarantee for quality in print. The customers need to know the quality of the printed products they received from the company. The customers must have some knowledge on the quality to prevent from being cheated by the company that provides the products printed in less quality. In addition, when customers know the quality of the printed products they received, they will be satisfied. As we know, customers will be satisfied when they receive high-quality printed products.

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Chapter 50

A Survey of Offset Lithography Print Defects

Muhammad Yusuf Masod, Ridzuan Ahmad, and Mahadzir Mohamad

Abstract Offset lithography printing, given the multitude of material choices, produces more frequent print defects, relating to nonconforming materials. The International Organization for Standardization has developed several standards to define the quality of graphic images, based on various perspectives such as tone, colour, resolution, contrast, etc. The evaluation of image quality traditionally has been one of the methods of visual defect detection, as assessed by the customer. The presence or absence of undesired visual print attributes within a final product would lead to the rejection or acceptance of a job. In this survey, the highlighted print defects on the visual aspects of a print are inclusive of banding, colour cast, colour non-uniformity, colour variation, ghosting, graininess, hickies, mis-registration, moiré, mottle, poor line quality, poor trapping and poor text quality. The research revealed that the quality of the end product in printing will normally be judged by its visual impression but the visual impression of printing will be determined to a large extent by the sum of the quality of work at each stage of production. Quality control is concerned with ensuring that the materials worked upon or with at each stage of production are within defined limits.

Keywords Offset lithography • Print quality • Print defects

M.Y. Masod (✉)

Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
e-mail: yusuf595@salam.uitm.edu.my

R. Ahmad • M. Mohamad

Department of Printing Technology, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

1 Introduction

Printing remains as an important component in today's industry [1]. High-grade, multi-colour presswork is getting more and more popular among the public. The requirement for print quality has also increased, and this trend put forward higher requirements on print quality inspection [2]. Offset lithography printing, given the multitude of material choices, produces more frequent print defects relating to non-conforming materials. The International Standards Organization has developed several standards to define the quality of graphic images, based on various perspectives such as tone, colour, resolution, contrast, etc. The aim of this study is to discover the current situation of quality issues regarding printed product printed by offset lithography printing by investigating offset lithography print defects based on ISO standardization and to determine the frequency and seriousness of offset lithography print defect and its root causes.

2 Offset Lithography Print Defects

Printing quality issues refer to how the recipient of the product or service views the product or service and challenges faced in producing printing products. The problems can either be found in material or in the machines. To manage the print quality issues in order to publish a good product, worker and operator have/need to be alert since any problems may occur in printing process [3]. Minor defects are slight imperfections which, if noticed, would not be the source of any complaint. A minor defect does not fall outside of any specified numerical tolerances. Major defects are defects which seriously affect the overall visual appearance of the product. Examples of these defects are hickeys, streaks, and mottle [4]. Major defects fall outside of specified tolerances. Critical defects are serious deviations from specifications which jeopardize the integrity of the product. Standards address common needs by defining parameters that are quantifiable, practical and achievable. The major shortcoming with an in-line print quality measurement and control system is their capabilities of resolving the geometry and colours of the print image, work fast enough to record and process data on the run, and position the printed sheet for measuring purposes on the cylinder [5]. Such systems are technologically complex and do not meet the measuring quality required for automated colour and register control purposes. Systems still have to be developed specifically for this purpose. ISO 13660 (2001) provides definitions and measurement methods for line width, raggedness, large area graininess, darkness, background haze and extraneous marks. The major shortcoming of ISO 13660(2001) is its inability to describe or address the visual significance of most measured values obtained following the proposed procedures. ISO 19751, even though in development, will hopefully expand the definition of print attributes which allow for an easier implementation of the measurement. In this paper, image quality is evaluated on minute details and characteristics that build up a print, using recommended tools and equipment [4].

2.1 *Banding*

Banding is a break-up of a smooth blend into stair-steps in a gradient; also known as false contour; one dimensional, periodic lightness and/or chromatic variation. Banding issues in gradients can be a problem in offset print and large format printing [6]. The issue tends to be more prevalent when gradients are created in Illustrator for output to large format printers. Certain colour schemes also can be more prone to banding such as dark blue to light blue.

2.2 *Colour Cast*

An overall tendency within an image toward a hue direction; the most noticeable area of colour cast is in neutrals and near neutrals in a colour image. Several types of lights can cause film and digital cameras to produce a colour cast [7]. In general, the human eye does not notice the unnatural colour, because our eyes and brains adjust and compensate for different types of light in ways that cameras cannot.

2.3 *Colour Non-uniformity*

Subjective impression of colour constancy in lightness, hue and saturation goes across a large area of a single print. To achieve this limit, individual colour elements (or pixels) with a pitch of 250 nm are required, translating into printed images at a resolution of 100,000 dots per inch (dpi).

2.4 *Colour Variation*

Subjective impression of colour constancy of lightness, hue, is a result of saturation from multiple printed sheets. Colour variation is an excess of one shade or hue in a subject for reproduction or in a printed subject. It is also changes that occur in the density of a colour during printing as a result of deviations in the amount of ink accepted by paper or the amount of ink fed to the paper.

2.5 *Ghosting*

Ghosting is a problem in quality issue. Ghosting is a term used to describe a fault in the quality of a print, in which a second lighter image appears on the print as a ghost image. This due to the blanket is having an engraved image from a previous run.

The print on the reverse side of the sheet is affecting the trapping and drying of the ink, thus leaving an image of reduced gloss as a ghost. It is a transfer of a printed image from the front of one sheet to the back of another, not through the sheet, and it is not a set-off [8].

2.6 Graininess

Graininess is a non-uniform or granular appearance within the imagery of a printed product. The printed image has a grained or sandpaper-like appearance with white specks. Graininess is also subjective perception of a mottled random pattern apparent to a viewer who sees small local-density variations in an area of overall uniform density.

2.7 Hickeys

A small solid area sharply defined and surrounded by white halos and sometimes referred to as ink skin hickeys. However, any source of dirt such as the press, the pressroom and raw materials can also cause hickeys. Moreover, it may come from ink skin, pieces of paper or coating from the stock.

2.8 Misregistration

Misregistration happens when printed images are incorrectly positioned, in reference either to each other or to the sheet's edges. Another definition for misregistration is misalignment of one printed element to another. Typically this refers to how precise one printed element overlays another printed element with the same dimension. Misregister occurs if the paper's moisture content changes during a pressrun.

2.9 Moiré

Unwanted pattern effect created by the screen angles of halftone dot or the angles of line patterns, when they are superimposed. The overprinting of two or more halftone or line subjects may produce distinct patterns with the light and dark areas.

2.10 *Mottle*

Uneven appearance of a uniformly printed area which may be caused by uneven inking or uneven adherence of ink on substrate; variation in density, typically defined as large, low-frequency variations in solid areas.

2.11 *Poor Line Quality*

Inability to resolve fine lines due to either addressability or resolution limitation produces poor line quality. Line work should be submitted on a good quality, pure white, nonreflective art board.

2.12 *Poor Trapping*

Occurs when one film of ink is printed over another which has dried. The second colour fails to lay evenly on the first and produces a mottled appearance. Poor trapping also occurs when the nondrying oils in the first ink film sweat out onto the surface to prevent the adhesion of the second wet ink film.

2.13 *Poor Text Quality*

Occurs due to the lack of quality of the text (serif, thin strokes vs thick strokes) and variation in type density. In this situation, text or font 'lost' and not fill the requirement of its font and it became distorted.

3 Research Methodology

To complete this research, a survey was conducted by distributing a questionnaire to selected respondents. The list of the respondent was based on the mailing list of companies compiled by the researcher since there was no proper directory or readily available mailing list of print company in Malaysia. The questionnaire was divided into three sections: The first section is about the printing company's capabilities and products. On the second section and the third section respondent need to fill regarding the print defects and quality assurance practices.

4 Analysis and Findings

As for analysis and findings, questionnaire distribution and secondary data were used in completing the research. The questionnaire was distributed to selected company to answer the question. Survey is the chosen method for this research since it could generate reliable data from the respondents. Secondary data was used to fulfil the research objectives and to support the research. Data came in the form of books, Internet sources and observation. It is important to collect secondary data as many as possible in order to meet the objectives of this research.

4.1 Data Collection in Questionnaire Section A

1. *Company main areas of activity*

Based on the first question on the first section, all respondents confirmed that their company's main area of activity was publication and commercial printing. The size of their company is medium and they are involved in large industry.

2. *Size of company*

Three companies identified that they are for a small and medium industry and the other two were of large industry with paid-up capital above 2.5 million.

3. *Size of company*

Based on the responses, only two companies have a total of 10<20 of printing units. Three companies reported 1<10 printing units were used at their company.

4. *How many years has your company provided offset printed products?*

Question four focused on the duration of time of the companies' operation in providing an offset printed products. Two companies have provided offset printed products for more than 20 years. Three other companies are in the business for more than 14 years.

5. *What is the average run length for your company's offset jobs?*

Average run length of each company depends on what press they used in printing at their company. Respondents provide mixed answers for this question. Only one of the respondents reported that they provide all kinds of printing services. Hence they have all kinds of jobs from long-run to medium-run and short-run jobs. As for large job run, it has about 30,000 impressions. Short and medium machines run at the average of 5,000–20,000 impressions.

6. *Indicate whether your company prints a lot, occasionally or not at all.*

Result shows how often the product was printed using offset machines [9–10]. The results from majority of the respondents were majoring in informational product types such as books, annual reports and legal.

4.2 Data Collection in Questionnaire Section B

1. Overall print defect result from the respondent

Based on the result from respondent, they found that some defects have undecided frequency while running machines at their company: colour cast, ghosting, graininess, moiré, mottle and poor trapping. This entire problem occurs while machines are running because some machines play a main role in printing. Checking process is needed the most to avoid such minor problems in printing in order to produce a good product. Sometimes the operator faced these problems and they keep showing up in printing. Solutions to these problems are changing the ink to get a perfect colour and checking the image register especially the front lay (Figs. 50.1, 50.2, and 50.3).

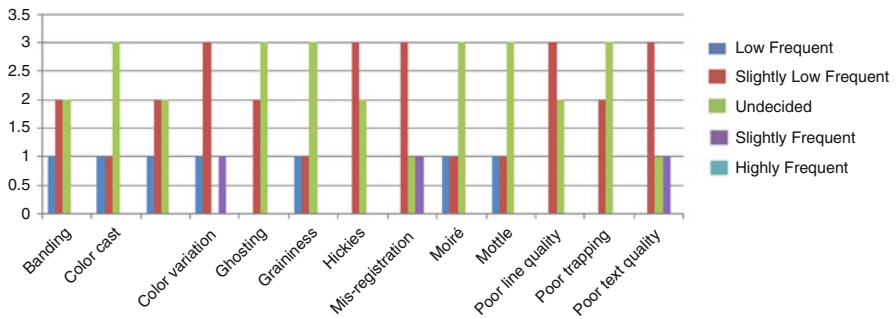


Fig. 50.1 Overall print defect result from the respondents

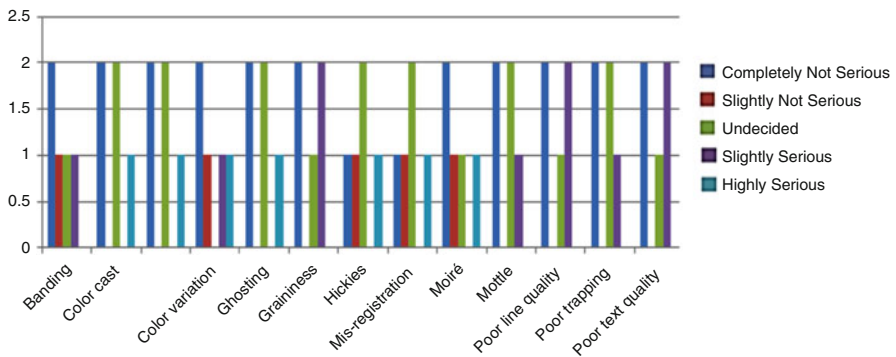


Fig. 50.2 Overall print defect result of the seriousness in offset printing from the respondents

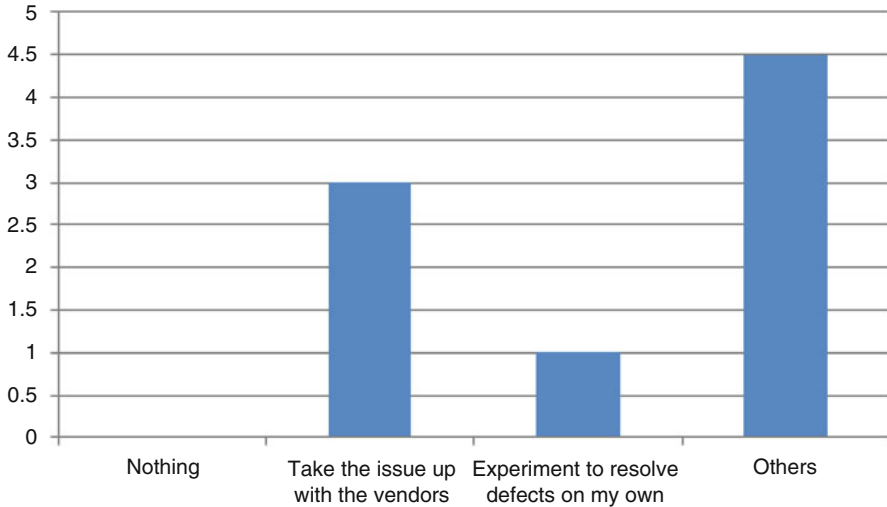


Fig. 50.3 Demand of the respondent company

2. *Overall print defect result on the seriousness in offset printing from the respondent*

From the result, on average, all companies have their own problems. Based on the chart, Ultimate Print has main problems in colour cast, colour non-uniformity, colour variation, ghosting, hickeys, misregistration and moiré. In printing, colours change during the run without changing inks or paper. It happened because of increasing temperature of the inking systems as the run progresses.

4.3 Data Collection in Questionnaire Section C

1. *What do you do about offset print defects that are deemed frequent and are severe to your print quality?*

Result shows that two companies chose 'other' for this question. The first answer is the company stated that they used continual improvement program to overcome this problem. The other company stated that print defect is usually due to old machinery which needs repair or caused by the machine operator, for example, human mistake. In this case of old machinery, they just replace the faulty parts involved or repair what is necessary.

5 Conclusion

Quality control is concerned with ensuring that the materials worked upon or at each stage of production are within defined limits. The quality of the end product in printing will normally be judged by its visual impression but the visual impression of printing will be determined to a large extent by the sum of the quality of work at each stage of production. To overcome the seriousness of defect in printing, operator should be aware of the cause of the problems and monitor the printed product when printing machines are running. To achieve the target, they should print and try to reduce defect by applying the ISO standard. They must try to improve production, produce less waste and improve production efficiency.

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Chapter 51

The Innovation of Biomaterial in Jeweler Design

Nazirah Mohamad Ba'ai, Hema Zulaika Hashim,
Asliza Aris, and Rusmadiyah Anwar

Abstract “Seeds-based jewellery” is a new embedded invention process which is an “eco-friendly jewellery” product that reflects the use of organic elements in jewellery design. Therefore, a few appropriate seeds are resolved and used with metal to create a unique style of urban fashion. The research puts emphasis on the type of seeds that is available in the tropical climate as a form of material for jewellery fabrication. The purpose of this research is to conduct a viability study on whether the identified organic seed has the aesthetic elements and is significant to be explored as the main material for the “seeds-based jewellery”. The laboratory process conducted on *Areca catechu* (betel nut) seeds involved rigorous exploratory and experimental testing activities. The research findings showed that the material has the durability and quality to withstand the “seeds-based jewellery” status. The research hypothesis concluded that the “tested” tropical seed material has the potential to be used for jewellery making and fabrication.

Keywords Innovation • Biomaterial • Jeweler • Design

N.M. Ba'ai (✉) • H.Z. Hashim
Contemporary Metal Design, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Malaysia
e-mail: nazir858@salam.uitm.edu.my; hemazulaika23@gmail.com

A. Aris
Formgiving Design Research Group, Faculty of Art and Design, UiTM, Shah Alam, Malaysia
e-mail: aslizaaris@yahoo.com

R. Anwar
Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450, Shah Alam, Selangor, Malaysia
e-mail: rusma935@salam.uitm.edu.my

1 Introduction

Improving the current styles in jewellery, the research considers using beads with brass, silver and copper. In particular, seeds of organic form from nature can be mixed with metal that has sharp and geometric characters. A combination of the two can produce creative, innovative and very interesting style of jewellery. The research predicts the best of contemporary jewellery design for the research shall focus on producing seed necklaces, earrings and bracelets. The result is a design that has a classic touch and an even more unique appearance, such as the silver charm bracelets with seeds. Realizing the potential and growing popularity of “nature-based jewellery” concept, this research focuses on how its application can be further extended to seeds such as *Areca catechu*, which is traditionally close to the Malay community culture, a dominated population of Malaysia.

The research methodology was constructed based on Anwar's model [1], the main objective of which is to execute probable “seeds-based jewellery” using the identified organic seeds. This will directly discover the aesthetic elements and its potential as an alternative material replacing the use of precious stones in jewellery design.

Luxury jewellery from precious stones, diamonds, gems and crystals used with gold, silver and platinum often shows identity and symbolizes status. This type of jewellery is only affordable for elitists due to its expensive price. Thus, there is a need to explore other materials as such to suit current trend and to consumers. Amongst other common jewellery fabrication are various types of beads such as wooden, plastic, bamboo, shell and seeds. The research attempts to explore *Areca catechu* seeds, which is commonly found in Malaysia, as an alternative material for innovation of biomaterial in jewellery design.

2 Innovation of Biomaterial

Biomaterial is any matter, surface or construct that interacts with biological systems, that is, referring to the subject from nature or man-made. Seeds are related to beads as beads are one of the world's oldest craft. In Malaysia, the first beads were made from seeds. Seeds are the grains or ripened ovules of plants used for sowing [2]. Seed is a plant's unit of reproduction, from which a new plant of the same kind can grow. A seed is a fertilized grown ovule of plant containing an embryo and capable of producing a new plant. It is a significant factor responsible for the dominance of seed plants.

The basic principles for material technology innovation are intelligence, multi-functionality, environment-friendly, composite, low carbon and low cost [3]. According to Ramona Solberg, a good design preserves the natural beauty of the material without disregarding the form of the whole piece of the jewellery [4].

3 Jeweler Design

The original meaning of jewellery refers to ornament worn on heads, but now it refers to ornament worn in various parts of the human body, such as earring, pin, necklace, pendant, ring, bangle and other accessories. *The emergence of jewellery originated from the instinctive physiological demands of sense of beauty and 'making the body beautiful' is the most original as well as the most fundamental function of jewellery* [5].

Jeweler also is an art form as well as a functional object that has undergone vast changes since the primitive age. The idea of jewellery, which used to be spontaneous, started with body tattooing during the prehistoric period. The jewellers then were made from a variety of materials including berries, sea shells, bones, natural colourful beads, animal claws, feathers, hairs, nuts and seeds which reflected certain religions, rituals or cultures [6].

4 The Potential of Biomaterial in Jeweler

According to W. P. Armstrong, *who would ever believe that some of the most unusual and striking jewelry in the world come from plant?* [7].

In search for alternative materials as a substitute other than precious stones such as crystal beads, seeds are rare and inexpensive. Amongst the seeds are, for example, *Areca catechu* (betel nut), *Adenanthera pavonina* (saga) seeds and *Tamarindus indica* (tamarind) seeds. These seeds are enormous in tropical countries like Malaysia. However, these seeds are not fully utilized for commercial products. Thus, the researcher takes the opportunity to explore the seeds from natural resources to use in jewellery making.

Salkind clarifies that exploratory research allows the researcher to outline the problem and the concept that are to be studied so that an accurate hypothesis can be obtained. Exploratory research is preferred when the problem statement and research scope are not yet clear [8].

The findings gained from the exploratory research would not be accepted as a finding, but it brings out some questions in the research based on the situation for survey purposes to conclude the findings. These figures will then assist to refine a model, a series of prototypes and finally detail findings.

The exploratory and experimental methods are applied in the form of *Areca catechu* seeds in the jewellery making process. These materials are combined by using suitable techniques in jewellery making like riveting, joining, drilling, wire construction and setting to be applied in the process of fabricating. The researcher also used lathe technique to manipulate the pattern of the seeds, which is achieved by a cross-sectional cut. This particular technique shows the beauty of the surface pattern and the texture of the seeds.

BIOMIMICRY DESIGN SPIRAL

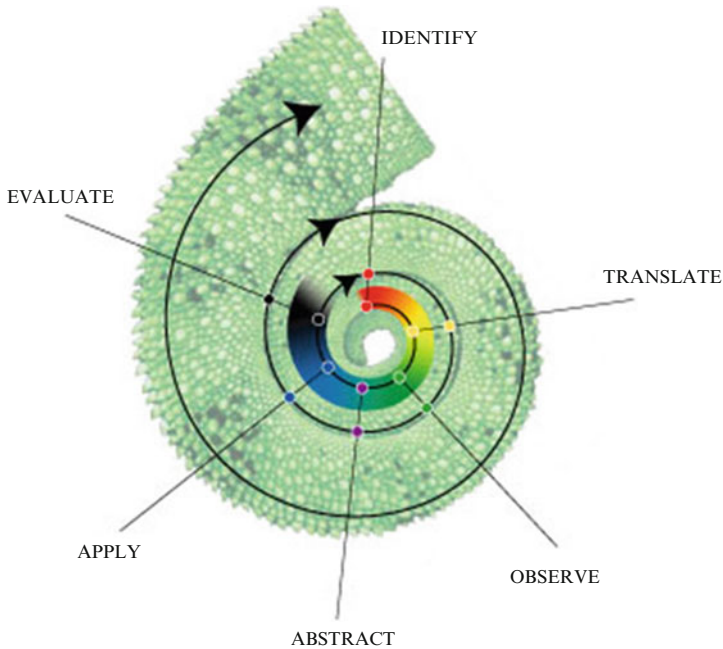


Fig. 51.1 Biomimicry design spiral: innovation of biomaterial procedure [9]

This methodology is preferred as it will give the researcher the freedom to explore the seeds and techniques to experiment on and eventually will identify their potential as alternative materials in jewellery making. Upon finishing the exploratory processes, with the results obtained, all information will be documented as the process of “seeds-based jewellery” making.

Biomimicry innovators from different backgrounds such as engineers, managers and designers may use biomimicry design process as a practical innovation process. Based on the tools, it can create more sustainable designs [9].

Figure 51.1 described the biomimicry process of consulting life’s genius, described in the design spiral, can serve as a guide to help innovators by using the process, for biologist as a test, query the natural world for inspiration, then evaluate to ensure that the final design mimics the nature at all levels like forms, process and ecosystem.

The methodology brings nature’s knowledge not just to the physical design but also to the manufacturing process, the packaging and all the way through to the delivery, sharing and take-back decisions. Use a spiral design to highlight the re-iterative nature of the process, which is after solving the test, and then evaluate how

well it meets life's principles. Other challenges often arise, and the design process will begin anew. It also can be applied to other cycles through the design method.

The process in a spiral design would be visually understandable to the designer. It can be identified and developed into a design brief of the human needs, translate, observe, abstract and find the repeating and processes within the nature to achieve, apply and develop ideas and solutions based on the models and to evaluate the ideas as compared to the successful principles of nature. The benefit from this thinking, evolving the design in repeated steps of observation and development, unearthing new lessons and applying these constantly throughout own design exploration.

Based on these methodologies, it gives the researcher a guide to perform the research onto the seeds by using several processes and techniques suitable in jewellery making. It also develops the concepts and ideas based on the natural resources through understanding the process [11]. After the explorations, the researcher chooses a suitable technique and applies the seeds through the process of jewellery making. This produces new jewellery using seeds for current trend and market.

In the data analysis, information on the usage of the seeds as an alternative material and the exploratory process of the *Areca catechu* seeds are gathered. In this research, the researcher explored the characteristic of the seeds and applied techniques in jewellery making. The entire process used by the researcher is related to the fabrication due to environmental process. This method supported by Hashim who explained about the strong significance of the complexity and fineness of the material in jewellery making and finishing qualities is always done by the designers [12].

Based on the data acquired from the feedback of the questionnaire, almost 100 % of the respondents were familiar with *Areca catechu* seeds used in the research. The respondents also supported that the seeds can be used as an alternative material in jewellery making and that they have a great potential value in the market (Figs. 51.1, 51.2 and 51.3).

By exploring this idea further, the researcher found that there is a great potential and market demand for nature-friendly jewellery. The target market for the jewellery made from seeds is the teenagers due to its inexpensive cost. The teenagers most likely accept and are ready for new, creative and innovative jewellery designs.

5 Conclusion

Through this research, it shows that seeds are an interesting medium to explore due to its unique character. The research shows the approach to "seeds-based jewellery" design allows exploration on the fabrication processes of the jewellery by adding other mediums to the seeds.

It results in a valuable project and exclusive looks from the combination of expensive metals such as gold, silver and non-precious metals such as copper

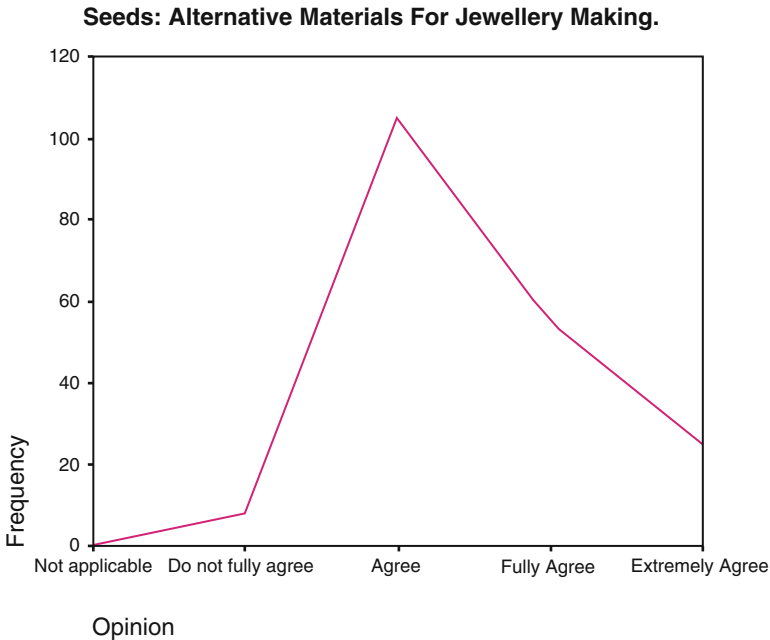


Fig. 51.2 Level of respondents' feedback

and brass with seeds. The data analysis also reveals that seeds have a very good commercial value and potential as a new material in contemporary jewellery.

The seeds succeed as an exclusive, attractive and yet simple and affordable to consumers. The character of the seeds, which vary in colour, texture and form, turns out as a remarkable combination in creating creative jewellery pieces when combined with metals. Through the exploration of the seeds, there are many possibilities in design aspects and techniques used to produce new jewellery using local natural sources.

Thus, the research on seeds as an alternative material for jewellery production in particular is a success and confirms the hypotheses of the study. Further research recommends a methodological approach to develop better and innovative jewellery through the application of design process. Laboratory tests on durability and life span of the seeds used as jewellery to maintain its character are equally important.

Product exploration may be developed by fabrication technique such as studs for menswear, prayer rosary as well as artistic embellishments and home decorations [13]. This nature-friendly jewellery is cost effective and affordable to consumers.



Fig. 51.3 Pendant made out of *Areca catechu* seeds [10]

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Chapter 52

Reformulating Local Ceramic Stoneware with Alumina as Replacement Material for the Heat Sink

Rusmadiyah Anwar, Verly Veto Vermol, Samsiah Rahman,
Oskar Hasdinor Hassan, and Teng Wan Dung

Abstract Heat sink was a device that enhances heat dissipation from a hot surface, usually the case of a heat-generating component, to a cooler ambient, usually air. Currently, heat sinks were made of aluminum alloy, brass, cooper, and steel and produced high thermal expansion inside and poor airflow access through the heat sink lamp. In this work, the investigation on typical material development based on ceramic stoneware will be conducted. The objective of this research is to fundamentally determine the applicable stoneware body composition as the most suitable for the heat sink lamp as an alternative material replacement to the existing design in the market, thus enhancing its quality production and commercial values. The stoneware body formulation is then modified into five different batches. It was investigated through a comparison study by 100 % of the stoneware with formulated stoneware versus alumina by a ratio of 90:10, 70:30, 50:50, and 30:70, respectively. By investigating the stoneware with the designed test bar mold, it shows an increasing result of body density and strength. The water absorption clearly decreased due to the increasing temperature from 1,250 to 1,300 °C. As conclusion, the acceptable stoneware body formula to replace the conventional heat sink material is a ratio of 70 % stoneware with 30 % alumina. The advantages of using proposed formula because of practicality within greenware stages until fired ware.

Keywords Stoneware • Heat sink • Design • Firing

R. Anwar (✉) • V.V. Vermol • S. Rahman • O.H. Hassan
Formgiving Design Research Group, Faculty of Art and Design,
Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia
e-mail: rusma935@salam.uitm.edu.my

T.W. Dung
Advance Material Research Center, Sirim Berhad, 40700 Shah Alam, Malaysia

1 Introduction

All semiconductor devices have electrical resistance. It means, when any power supply is switched on, the power transistors will dissipate power and work as heat energy. The heat must be removed from the device which usually used the base junction for a bipolar transistor as fast as enough rates to prevent excessive increased temperature. Whereby, the devices will be damaged and harmed by the heat. As practice, a lot of the heat prevention commonly is solved by using heat sinks. Heat sink is a passive component to control the device heat by dissipating it into the surroundings. Heat sinks used cod electronic component such as a high-power semiconductor device. Present study shows that there are four different types of heat sinks that have been put in practice, i.e., Pentiums III and IV and AMD Athlon and Duron heat sinks, in order to analyze their performance [1]. For efficient reasons, the heat sink must be designed perfectly especially the surface area. The design should be big enough to allow the airflow from the fan to access easily through the heat sink. In the other view, provides an optimum amount of airflow cross the heat sink. The heat sink area which is in contact with the devices must be extremely good in thermal transfer. Even though the design was flat, there are still small air gaps that existed. A practical heat sink design for electronic devices must have be a high temperature item than the surroundings. The reason is to allow transfer of heat by convection, radiation, and conduction. Ceramic materials present interesting properties such hardness, high wear, and corrosion, including temperature resistance which became as optional thermomechanical applications [2]. However, these advantages were counteracted by the brittleness of the ceramics. Consequently, the presence of small weakness such as pores can lead to a dramatic decrease in strength value. Therefore, the use of ceramics as structural parts is conditioned by the development of nondestructive evaluation techniques such as ultrasonic methods which allow the porosity level [3].

2 Overview

In this work, the investigation on a typical design of current heat sink lamp and its ergonomics will be conducted. At these moments, the heat sink lamp produce quite a high thermal expansion inside and practice a poor air flow through the heat sink lamp. An observation on the heat sink lamp is to understand the situation and problem that occurred. As an option, the heat sink lamp will be reconstructed as a new design and application developed by advanced stoneware. The body composition will be an important fundamental to replace the inadequacy of the existing products. There will be some modification on the stoneware body formulation as further enhancement to its quality and commercial values [4]. The objective of this research is to fundamentally determine the application of stoneware body composition as the most suitable for the heat sink lamp compared to the conventional design thus

enhancing its quality for production and commercial values. At the end of the research, it is expected that advanced ceramic stoneware body formulation finalized as the main composition for the heat sink lamp will be produced and patented. The finding may also provide better thermal resistance and durability of any heat sink design.

3 Research Methodology

3.1 Experimental Procedures

This work presents a study on the comparison of local ceramic stoneware based on different firing profiles. Physical tests apply to determine the shrinkage, density, pores, and strength between two different firing temperatures with five different body ratio compositions [5]. This research starts with a body development using different types of advance stoneware. The choice of stoneware depends on sturdiness, chip-resistant material and are mostly used in heavy duty practices such cooking, baking, and storing liquids, including gardening. These pieces are meant to be used due to their durability. A porcelain stoneware composition was prepared by the integration of 50% kaolinitic clay, 40% feldspar, and 10% quartz [6]. Slip casting technique was used in this study, whereas new composition with different ratio of material casted in mold as per solid rectangular shape (Fig. 52.1) with 15 cm×2 cm×1 cm. All casted test bars dried in room temperature in two days time. It was transferred into the dryer in 110 °C within 12 h to make sure the test bar

Fig. 52.1 Test bar

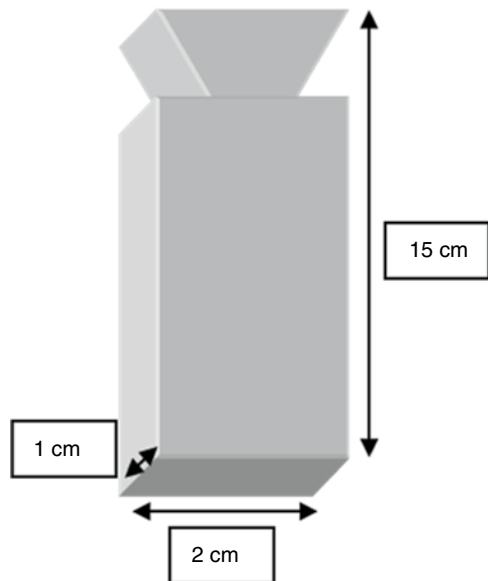


Table 52.1 Stoneware/
alumina composition

Batch	Stoneware (<i>a</i>)	Alumina (<i>b</i>)
100ST	100	0
90/10	90	10
70/30	70	30
50/50	50	50
30/70	30	70

is totally dry. Every batch of the test bar is then fired in two different temperatures as 1,250 and 1,300 °C. However, it was fired using the same firing profile. These methods have been used by Anwar in the enhancement of ceramic body developments [7] Table 52.1.

$$\begin{aligned}
 &\text{Testbar} \\
 \text{Volume} &= H \times L \times W \\
 &= 15\text{cm} \times 2\text{cm} \times 1\text{cm} \\
 &= 30\text{cm}^3 \\
 \text{density} &= \frac{\text{weight}}{\text{volume}} \tag{52.1} \\
 2.0 &= \frac{\text{weight}}{30\text{cm}^3} \\
 &= 30\text{cm}^3 (2.0)\text{g} / \text{cm}^3 \\
 &= 60\text{g}
 \end{aligned}$$

Based on the size of the test bar, 2,595.78 g stoneware is required to fulfill the prepared mold. Then, the stoneware body component is prepared based on the standard formulations [2].

$$\begin{aligned}
 \text{Ballclay} & \frac{30\%}{100} \times 2595.78\text{g} = 778.74\text{g} \\
 \text{Kaolin} & \frac{20\%}{100} \times 2595.78\text{g} = 519.16\text{g} \\
 \text{Feldspar} & \frac{40\%}{100} \times 2595.78\text{g} = 1038.31\text{g} \\
 \text{Quartz} & \frac{10\%}{100} \times 2595.78\text{g} = 259.58\text{g}
 \end{aligned}$$

$$\begin{aligned}
 \text{Alumina} &= T1 + T2 + T3 + T4 + T5 \\
 &= 0 \text{ g} + 8.07 + 25.92 + 46.8 + 71.19 \\
 &= 151.98 \text{ g} \times 9 \text{ pieces} \\
 &= 1367.82 \text{ g}
 \end{aligned}$$

3.2 Experimental Devices

All test bars fired in the temperature mentioned were then measured using the physical reflection method which is a caliper (pulse echo method) for shrinkage measure, while scale was used to weight. Mettler Toledo AG204 scales were used for the water density test which is accurately applied by four decimal results. For the water absorptions and the apparent densities required immersing procedure where test bar immersed into the water, a tank with 100 °C [7].

4 Result and Discussions

4.1 Size Shrinkage

As shown in Fig. 52.2a, complete casted test bar by slip casting process as solid rectangular succeed without any defect. The length of each test bar has been measured on the stage of greenware and dried after firing. Figure 52.2b shows the measurement demonstration by a digital caliper to get the accurate length, depth, and thickness on each test bar. Table 52.2 shows the changes of in the length of the test bar which undertook some process within two different firing temperatures, 1,250 and 1,300 °C. At this stage, it is observed that high temperature can increase the shrinkage percentage due to the material. However, it shows that the test bar

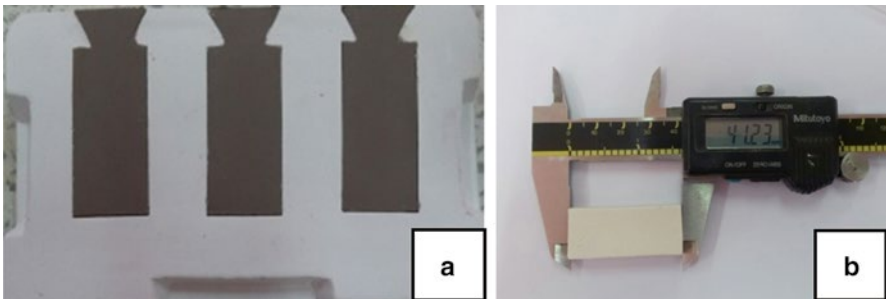


Fig. 52.2 (a) Casted test bar. (b) Measuring length

Table 52.2 Size shrinkage for five different batches

	1,250 °C				1,300 °C			
	Length (mm)				Length (mm)			
ST/Al ₂ O ₃	<i>W</i>	<i>D</i>	<i>F</i>	<i>R</i>	<i>W</i>	<i>D</i>	<i>F</i>	<i>R</i>
100/0	50.00	47.55	41.96	8.04	–	–	–	–
90/10	50.00	47.95	41.81	8.19	50.00	48.15	42.59	7.41
70/30	50.00	47.56	41.00	9.00	50.00	48.09	41.44	8.56
50/50	50.00	47.39	42.58	7.42	50.00	48.05	41.50	8.50
30/70	50.00	48.18	45.77	4.23	50.00	47.56	43.44	6.56

W wet, *D* dry, *F* fired, *R* length reduced

Table 52.3 Comparison for weight of five different batches

	1,250 °C				1,300 °C			
	Weight (g)				Weight (g)			
ST/Al ₂ O ₃	<i>W</i>	<i>D</i>	<i>F</i>	<i>R</i>	<i>W</i>	<i>D</i>	<i>F</i>	<i>R</i>
100/0	22.73	17.86	16.63	6.10	–	–	–	–
90/10	23.45	18.63	17.46	5.99	24.04	19.13	17.87	6.17
70/30	24.27	19.07	18.12	6.15	24.26	19.36	18.32	5.94
50/50	25.39	19.71	19.02	6.37	26.06	20.46	19.64	6.42
30/70	27.75	21.96	21.47	6.28	27.12	21.63	21.07	6.05

W wet, *D* dry, *F* fired, *R* weight reduced

consists with high alumina containing decreased percentage of shrinkage. For that reason, the design size needs to be controlled during the production to maintain the accurate size for the ceramic heat sink.

Table 52.2 shows a shrinkage comparison for each batch of the test bar before and after firing. Based on the results, 30% of additional alumina shows the high reduced shrinkage compared to another batch for any of the two compared firing temperatures. More additional alumina in the ceramic stoneware body will increase the shrinkage. However, the test bars show a decreased shrinkage result if the stoneware is added with more than 50% of alumina.

4.2 Weight

The test bar from the five batches was also observed by its weight from green stage until fired. Based on Table 52.3, it clearly shows the different weights between each batch if the stoneware is added with alumina. More alumina percentage than stoneware will increase the weight in green conditions. However, it still remains with the ordinary drying and firing process without dramatically showing a difference. All batches show the decreased weight after firing for only between 6 and 6.4 g.

4.3 Water Absorption

The water absorption (WA) of each specimen is determined by testing the specimens with a constant mass (D) soaked for 4 h in 110 °C boiled water and another 2 h in standard water temperature. After immersion, the mass (M) at saturation was determined. Table 52.4 shows a comparison of water absorption between two different temperatures. It clearly provided the same results with increasing alumina in stoneware followed with the increasing absorption where batch 30/70 became the highest ratio for water absorption. It also can be proved that by adding more alumina in stoneware composition, the more porous the testing specimen can gain. Compared with the 100 % of stoneware composition, it will become dense after firing in high temperature as mentioned by Melnick et al. [8].

$$WA = \frac{M - D}{D} \times 100 \% \quad (52.2)$$

4.4 Water Density

To determine water density among the fired pieces, fired specimens (W_{dry}) were examined by weighing the specimen. The fired test bar was immersed into the water, and the saturated weight is recorded (W_s) followed by the weight after immersion (W_{ss}).

$$\rho_{app} = \frac{W_{dry}}{W_{ss} - W_s} \times 1.00 \text{g / cm}^3 \quad (52.3)$$

ρ_{bulk} was measured after firing the weight (M) and was divided after the fired volume.

$$\rho_{bulk} = \frac{M}{V} \quad (52.4)$$

Table 52.4 Comparison of water absorption

	1,250 °C			1,300 °C		
	Weight (g)			Length (mm)		
ST/Al ₂ O ₃	Fired	Soak	%	Fired	Soak	%
100ST	8.17	8.2	0.003841	–	–	–
90/10	8.26	8.29	1	7.50	7.54	1
70/30	7.77	8.51	0.086522	6.60	6.615	0.002268
50/50	10.13	10.84	0.065498	7.91	8.01	0.013109
30/70	10.09	11.45	0.118777	8.40	9.09	0.076458

Table 52.5 Water density for 1,250 °C

	Dry weight	(ws)	(wss)	Density, g/cm ³	Porosity %
	(Wd)	Wf saturated	Wf immersed		
100ST	8.17	8.29	4.79	2.42	3.40
90/10	8.26	8.35	4.99	2.53	2.70
70/30	7.77	7.87	4.98	2.78	3.15
50/50	10.14	10.82	6.62	2.88	16.28
30/70	10.09	11.39	6.87	3.14	28.71

Table 52.6 Water density for 1,300 °C

	Dry weight	(ws)	(wss)	Density, g/cm ³	Porosity %
	(Wd)	(ws)	(wss)		
100ST	–	–	–	–	–
90/10	9.13	9.24	5.41	2.46	2.90
70/30	11.67	11.72	7.50	2.80	1.20
50/50	9.70	9.80	6.33	2.88	2.96
30/70	12.47	13.45	8.52	3.15	19.99

WD dry weight, WS saturated weight, WSS weight immersed

Once ρ_{app} and ρ_{bulk} are calculated, the ratio of water density can be determined by following the formula where (Tables 52.5 and 52.6)

$$\rho_{ratio} = \frac{\rho_{bulk}}{\rho_{app}} \times 100 \quad (52.5)$$

4.5 MOR (Modulus of Rupture)

Table 52.7 gives the result of data evaluation for the MOR test (see Fig. 52.4) on different ratio compositions and different types of body. Figure 52.2 proves that batch 70/30 was the strongest composition when fired in 1,300 °C as compared with others. Yet, in 1,250 °C temperature, it is still on the average results, not too strong or fragile. This study shows a good result comparison to show the significance of alumina to increase the strength for the ceramic stoneware body. The graph shown in Fig. 52.3 proves the increasing results of strength. However, even though the higher temperature achieved shows an increasing strength, the composition drastically became the strongest if the ratio of 70% stoneware and 30% alumina is fired on 1,300 °C.

Table 52.7 MOR result

ST/Al ₂ O ₃	MAX FORCE		
	Greenware	1,250 °C	1,300 °C
100ST	70.6514	2,207.26	–
90/10	72.6700	2,554.73	2,468.12
70/30	49.8732	2,624.19	4,308.49
50/50	40.7577	2,777.71	3,231.89
30/70	44.4651	2,760.83	3,580.11

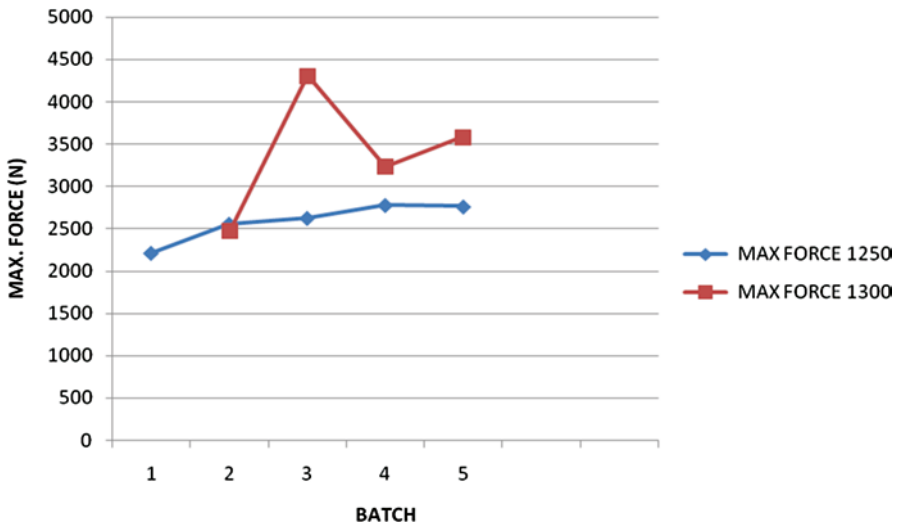


Fig. 52.3 Comparison MOR for 1,250 and 1,300 °C

5 Conclusion

Stoneware still remained as the best and easiest handling purpose while on production. Alumina contained in the composition might be useful for stages after firing due to the hardness of it physical. The right mixture with stoneware introduced a new composition that is suitable for body strength. However, more alumina content in the composition will increase stoneware porosity. The clay with increasing alumina content became fragile especially at the green condition where the handling became complicated. In average, batch 70% stoneware with 30% of alumina is the most recommended composition which is suitable for production due to its physical body reaction on greenware or fired wares. Batch 50/50 and 30/70 are good enough in terms of strength and density; nevertheless, it was very difficult while casting the process, because it needs to be stirred every time before casting. If the process is

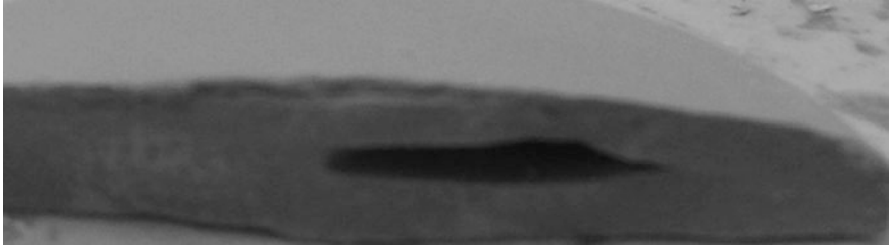


Fig. 52.4 Air trap in test bar

ignored, the test bar will have air trap as shown in Fig. 52.4. As conclusions, stoneware with the right alumina combination can purposely be used as a substitute material for the heat sink design.

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Chapter 53

Low-Temperature Transparent Glaze Study in Sustaining Luminescence Substance for Local Ceramic Craft

Siti Noor Azila Noordin, Mohamad Rizal Salleh, Rusmadiyah Anwar, and Oskar Hasdinor Hassan

Abstract Malaysia, as a country with significant heritage, always attempted to discover a novel method or investigation in order to preserve their valuable crafts. In this work, we attempted to investigate the possibility of luminescence glaze to be applied as a novel surface treatment for local ceramic craft. Literally, the application of borax acid as flux to lower the glaze melting temperature is determined to the temperature of the glaze composition itself. Borax acid reacts as a melting agent that allows low-temperature ratings to decrease further. The goal of this study is to match the glaze effect with stoneware body. Borax acid was used as composite with the characteristic of melting point of approximately 573 °C. This study was done by stoneware clay was cast using plaster mold into solid round samples with the dimension of diameter 40 mm³. Then, the samples are indicating to high bisque sintered in electrical kiln at 1,000 °C for 8 h. Common decorating method on glaze was applied on high sintered bisque samples. The composition of glaze with a high amount of borax acid as flux is applied on samples. An appropriate amount of the glaze materials was weighted, 100 g for each batch the percentage of flux content. Then, glaze sintering is consecutively at 800, 850, 900, and 950 °C for 6 h in a mild oxidation atmosphere. Noteworthy between the firing temperatures and percentage of flux in glaze composition with borax acid as flux intended for determine low-temperature glaze proved by sustaining luminescence substance. As a result, the most accurate formulation of glaze composition is with the content 80 % of borax acid to reach matured range. It sustained the glow of luminescence substance SrAl₂O₄:Eu²⁺,Dy³⁺.

Keywords Stoneware • Borax acid • Low temperature • Glaze

S.N.A. Noordin (✉) • R. Anwar • O.H. Hassan
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: noorazila9539@salam.uitm.edu.my

M.R. Salleh
Department of Industrial Ceramic, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

1 Introduction

As silica, fluxes, and alumina are combined in a eutectic mixture and fired to a high-enough temperature, a glossy transparent glaze results. In a eutectic mixture, the melting temperature is lower than that of either of the component materials (silica or alumina) alone. A combination of several different fluxes also helps to melt the glaze. In glossy glazes, the alumina to silica ratio should be around 1:9. A stiff, stable glaze with a ratio of around 1:7 is preferable for painting with oxides or under glazes. To make the glaze matt, excess alumina can be added so that the alumina to silica ratio is around 1:5. The addition of any of the alkaline earths such as magnesia can also cause the glaze to become matt. Any excess material not involved in the melt remains suspended in the glass or crystallizes out on cooling. Crystals form in fluid glazes with low alumina [1].

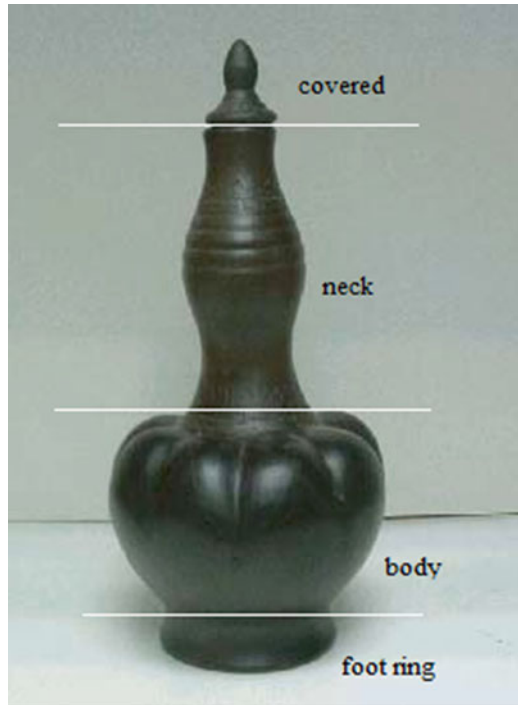
Currently, long-lasting phosphorescence has attracted much attention in an assortment of applications, such as lighting source, storage devices, medical instruments, pigments, arts, and craft. Several attempts were initially used for synthesis route, such as conventional solid-state reaction, sol-gel method, combustion, and microwave heating synthesis. Typically, the synthesis process will be more complex to obtain a good phosphor that consists of high intensity and long persistence glowing properties in an efficient, cheap, and simple way. Solid-state reaction process has been extensively used for phosphor synthesis [2]. Nevertheless, this process often results in poor homogeneity leading to high calcination temperature, irregular morphology, and long calcination period [3]. It has been reported that strontium aluminate phosphors were generally prepared at high temperatures (1,400–1,600 °C) for developing a well-crystallized structure.

Labu Sayong is one of a local craft which originated along district of *Kuala Kangsar, Perak* [4]. The soil used for *Labu Sayong* making is white, black, buff, and yellow in color [5]. The soil can be categorized as earthenware or low-temperature body which has a sintering temperature of 1,000–1,180 °C [6]. Since the prehistoric period, *Labu Sayong* was applied with a conventional decoration [7]. The current situation of local craft in Malaysia is that the products are sold as souvenirs rather than as kitchen equipment. The most popular local craft that symbolizes Malay culture is *Labu Sayong*. Currently, *Labu Sayong* is used as souvenir for weddings and produced in miniature size. Therefore, the enhancement of decoration method for *Labu Sayong* must be done. As discussed by Noordin [8], another interesting approach for *Labu Sayong* decoration effect is the use of luminous glaze. Figure 53.1 shows *Labu Sayong* which is *gelugor* type and functions as a water vessel until now.

Therefore, the development of decoration technique toward ceramic artwork focusing on glaze was proposed as reported by Noordin [9].

The main goal of this work is to determine the low-temperature transparent glaze and study the range of temperatures. This paper reports low-temperature transparent glaze splitting studies. Moreover, it also discusses the sustained use of luminescence substance glow as decoration method for low-temperature ceramic body.

Fig. 53.1 Labu Sayong, gelugor type [10]



1.1 Flux

In ceramics, in support of glaze-forming process, the addition of a flux lowers the melting point of the body or glaze. In particular, it affects the melting point of silica (SiO_2), which melts to form a glassy phase during sintering process, which bonds the ceramic body or forms the basis of a glaze.

The addition of a flux also promotes fusion or vitrification (development of a glassy phase) at lower temperatures than would otherwise be possible without the use of a flux. Some common fluxes are nepheline syenite (Na_2O) and barium carbonate (BaCO_3). Other groups of flux are alkali metal oxides and alkali metal containing feldspars such as potash feldspar ($\text{K}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$), soda feldspar ($\text{Na}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$), and lithium feldspar ($\text{Li}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 8\text{SiO}_2$). Lead compounds are also in the flux category [11].

1.2 Luminescence ($\text{SrAl}_2\text{O}_4 \cdot \text{Eu}^{2+} \cdot \text{Dy}^{3+}$)

Luminescence is the emission of light by a substance not resulting from heat; it is thus a form of cold body radiation. It can be caused by chemical reactions, electrical energy, subatomic motions, or stress on a crystal [12]. Photoluminescence is the type which occurred by ceramic chemical reaction. As revealed by A. Nor Nazida

et al. [2], green phosphor $\text{SrAl}_2\text{O}_4:\text{Eu}^{2+},\text{Dy}^{3+}$ with improved properties was successfully synthesized by solid-state reaction, and the optimum sintering temperature was greatly reduced to 1,250 °C. In this work, the low-temperature body of ceramic was used. Therefore, the luminescence substances require being banded in low-temperature glaze.

2 Experimental

2.1 Material

The standard conventional method is mostly used for the preparation of low-temperature glaze. Low-temperature glaze was prepared by standard glaze mixing approach using borax acid (H_3BO_3), potash feldspar ($\text{Al}_2\text{O}_3 \cdot 2 \text{SiO}_2 \cdot 2\text{H}_2\text{O}$), and kaolin ($\text{K}_2\text{O} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$) as materials. The raw powders were mixed. An appropriate amount of the starting materials was weighted and mixed. The weight is 100 g for each batch.

2.2 Method

First, the dry milling was used for 20 min, and then an amount of water was added according to the fluidity. After fully mixed, the mixing was not fully dissolved because of the borax acid. As the concentration of mixing is high, used plastic spatula to applied on stoneware sample which has indicate by bisque sintering at 1,000 °C and then sintered consecutively at 800, 850, 900, and 950 °C for 6 h in a mild oxidation atmosphere. The physical parameters, such as heating rates of 7 °C per minute, routine cooling furnace, and a heating time of 6 h, were the same for all samples. Subsequently, during sintering stage, the soaking stage at 573 °C for 30 min and soaking at 800, 850, 900, and 950 °C were also the same for all firing process.

In order to compare the performance of low-temperature glaze, the tests are carried out by dividing the base into four batches, which is consisting the same material with different percentage.

3 Result and Discussion

3.1 Percentage of Material

The glaze composition discussed in this paper is based on materials weighting 100 g. The objective of this research is to study the temperature and percentage of material to fabricate a low-temperature glaze composition. Therefore, the material for all batch is the same yet different in percentage [13]. Based on common glaze

Table 53.1 Glaze composition

Batch	Composition (wt %)		
	Borax acid	Potash feldspar	Kaolin
1	80	10	10
2	90	5	5
3	95	2.5	2.5
4	96	2	2

composition as stated in Table 53.1 previously, slight percentage adjustments were made to the formulation in the material content. This is due to the low temperature of the glaze during the firing process.

3.2 Heat Circulation

Heat circulation is different depending on the dimension of furnace. In heat circulation, significant effect of air bubblers on glass circulation patterns and the enhancement of heat transfer are from the combustion space [14].

3.3 Experimental

Experiments have been performed in order to analyze which composition of glaze is proficient to achieve low sintering temperature. Once the sintering completed at a temperature of 800, 850, 900, and 950 °C, physically the samples of each batch appear with approximately of all the samples achieve the mature range. The samples of batch 1 are shown in Table 53.2. The glaze layer of samples with ID; 1, 5, 9, and 13 shown the glossy and shine layer of transparent glaze. The shrinking and cracking occurred on the glaze layer; however, it is controlled. Subsequently, Table 53.2 was also explained on batch 2 which is also shown the layer of glaze composed by 90 % borax acid, 5 % potash feldspar, and 5 % kaolin were attained the mature range. The sample IDs for batch 2 are 2, 6, 10, and 14 defected by glaze failure; cracking was the effect on the surface of the samples, yet it is controlled.

Follow by batch 3 as also shows in Table 53.2 were sintered at temperatures 800, 850, 900, and 950 °C. The samples achieve the melting point; however, it shows the melting of the glaze layer. Yet, it is still glossy and shiny. Next is batch 4 which is also described in Table 53.2. The samples were subjected to the sintering process at 800, 850, 900, and 950 °C. The layers of glaze reach the mature range, yet the glaze failed; cracking occurred on the samples. The result of low-temperature glaze shown in batch 1 is the most mature at a low temperature. The mixture composed of 80 % borax acid, 10 % potash feldspar, and 10 % kaolin shows the layer of glaze less glaze failure; cracking, glossy and shines without cloudy effect.

Table 53.2 Sintering experiment

Temperature (°C)	Sample ID 1	Sample ID 2	Sample ID 3	Sample ID 4
800	1	2	3	4
850	5	6	7	8
900	9	10	11	12
950	13	14	15	16

After all the sintering experiment was done, batch 1 with temperature 800 °C has been decide on sintering with luminescence substance $\text{SrAl}_2\text{O}_4:\text{Eu}^{2+},\text{Dy}^{3+}$. The result shows that batch 1 was successful in sustaining the luminescence substance of $\text{SrAl}_2\text{O}_4:\text{Eu}^{2+},\text{Dy}^{3+}$ in typical stoneware samples. Figure 53.2 revealed the result of sintering process.

3.4 Sintering Graph

The firing graph is significant to ensure the result of glaze maturity. The core motivation is to determine the optimum sintering temperature which will be used for further low-temperature glaze characterization. The composition of glaze which is divided in four batches annealed at different firing temperatures of 800, 850, 900, and 950 °C for 6 h in oxidation atmosphere. The firing profile started with 43 °C and increased to 573 °C in 2 h. Subsequently, the temperature was maintained at 573 °C in soaking stage for 30 min. The significance of maintaining the temperature at 573 °C in the soaking stage is that inversion of quart occurs at this temperature. The quartz crystals change from an alpha (α) crystal structure to a beta (β) crystal structure [1]. After 30 min, the temperatures again increase from 573 to 800, 850, 900, and 950 °C in 3 h. Yet, again the temperatures of 800, 850, 900, and 950 °C have to be maintained for 30 min in soaking stage. The purpose of soaking stage at this temperature is to equalize the heat to the whole furnace.

4 Conclusion

In conclusion, after all the experiment has been completed, the result and discussion revealed that the experiment has obtained the successful outcomes. The experimental on temperature and glaze composition capable to fabricated low-temperature glaze with mature range as early as 800 °C. Batch 1, sintered at 800 °C, is the best result of glaze composition for low-temperature transparent glaze. The layer of glaze was glossy and shiny. The equal heat circulation during firing stage gave an influent to the mature range of the glaze. Furthermore, the positions of sample during firing stage are also contributed into the successful outcomes and significant to ensure the validity of the outcomes. The goal to achieve low-temperature glaze in

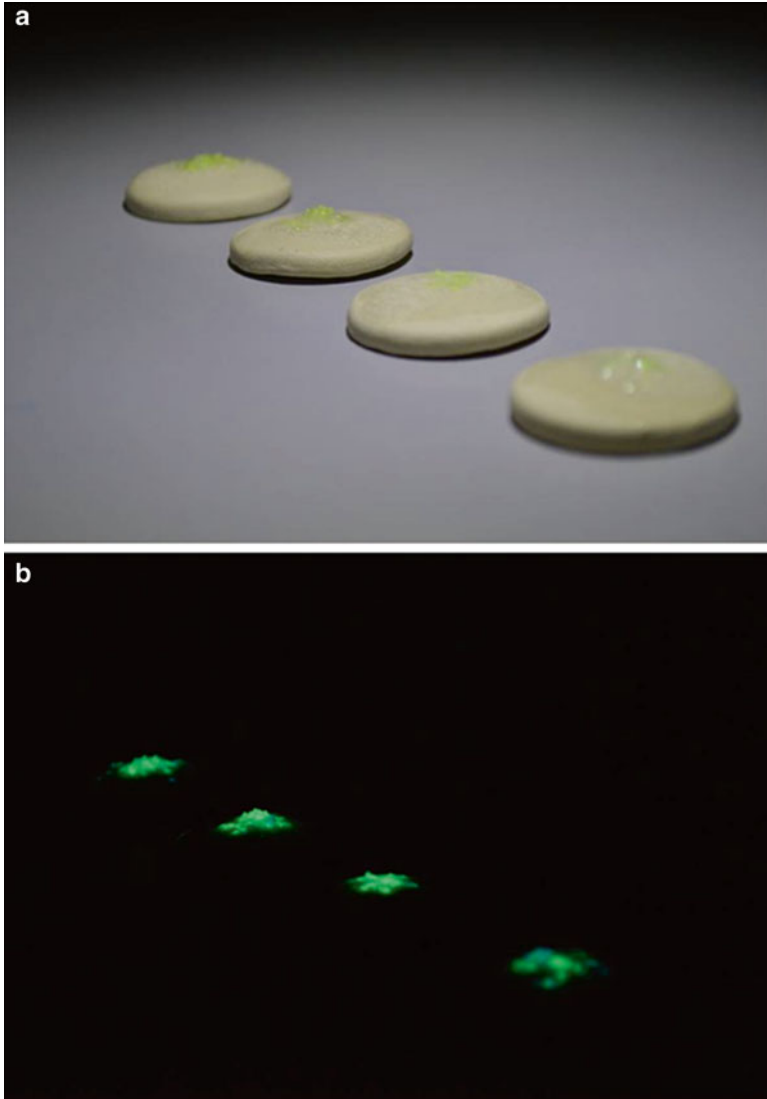


Fig. 53.2 Samples of $\text{SrAl}_2\text{O}_4:\text{Eu}^{2+},\text{Dy}^{3+}$ with batch 1; temperature $800\text{ }^\circ\text{C}$, samples ID 1, (a) under light emission and (b) without light emission

order to sustained luminescence substance $\text{SrAl}_2\text{O}_4:\text{Eu}^{2+}, \text{Dy}^{3+}$ with batch 1 at $800\text{ }^\circ\text{C}$ in purpose of decoration for low-temperature ceramic body which is local craft *Labu Sayong* was successful achieved.

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lished by Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to Malaysia Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 54

Integrated Design Development Incorporate with Interactive Public Sculpture

Md Faizul Khalid Abd Malek, Rusmadiyah Anwar, Adibah Ali, Oskar Hasdinor Hassan, and Ham Rabeah Kamarun

Abstract Public sculpture is a different facet of art whereby it is constructed at open spaces and displayed. It is an approach taken to display the artist's artwork as a decoration where they provide connection and exposure to the public. The objective is to recognize the reaction of the public through interactive art and to study the potential of interaction that makes people participate through public art. Consequently is identifying the form and design that is appropriate for interactive artwork in public spaces. This research will open up a new development of design on interactive public art which can communicate and relate more with the public.

Keywords Art • Form • Interactive • Public • Style • Sculpture

1 Introduction

The park is a free recreation location for the public to enjoy for leisure activities as well as interact with the artwork displayed at the area. Public art is about inclusion of culture, environment, and community [1]. The issue of public art is often discussed in context of meaning, usefulness, and aesthetic values. However, this issue may not be profitable for someone who has no understanding about art. Because of that, the issue of public art should get the attention of all related parties such as the public, tourists, and artists. In Malaysia, most public art serves as appreciation and symbolism to educate viewers and for decoration purposes for public space. As mentioned by painter-educator Jolly Koh, 65, "The problem with public art here is one of quality versus kitsch. I suspect these roundabout works were selected by bureaucrats who know nothing about art."

Md.F.K.A. Malek (✉) • R. Anwar • A. Ali • O.H. Hassan • H.R. Kamarun
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: mdfaizul@salam.uitm.edu.my

There are the “Millennium Park” located in Chicago and “Moerenuma Park” created by Japanese artist Isamu Noguchi located at Sapporo Hokkaido and the “Olympic Sculpture Park” located on the grounds of the Seattle Art Museum. As we can see, these three parks are considered as public art, and there are very beautiful outdoor artworks and fantastic sculptures created by famous artists like Anish Kapoor, Frank Gehry, and others. This can be considered a meaningful impact and attraction of public art, where they provide connection with the public; hence, the philosophical meaning and story behind the artwork can be delivered.

For this study, the objective is to recognize the reaction of the public through interactive art and to study the potential of interaction that makes people participate through public art. Consequent is the identification of the form and design that is appropriate for interactive artwork in public spaces.

In this work, a new way of creating public art or sculpture through inclusion of design development is introduced, whereby artists focus on the aspect of public interaction, hence increasing interaction between public art and the public.

2 Public Art in Malaysia

In producing a great artwork, an artist or designer should acquire knowledge in art and design genuinely. A work of art has great value and capable of attracting the attention of many parties. If we were to study the potential public art in Malaysia, it is likely that there should be an improvement in terms of quality, material, and design of the work. A very good example of our local artist who is frequently involved in public art commission in Malaysia is Ramlan Abdullah. In his point of view, he believes that public art is one of the most effective mechanisms to bring out the feeling of patriotism among the population or community of a nation.

If we compare the public art from other countries such as Japan, we could learn that they have done a more excellent job in creating public art. For instance, the great artist such as Isamu Noguchi has done lots of public arts and sculptures, and most of his sculptures were created for public participation and appreciation. He is a prolific sculptor and designer of spaces, including interiors gardens, public plazas, outdoor monuments, playgrounds, and fountains. What I want to highlight here is that Noguchi is not just creating artworks as expression of some issues or a representation, but he designs and delivers his piece for public usage and participation. Figure 54.1 shows some of Noguchi’s public sculpture cum playground.

3 Interactive Public Sculpture

The playground sculpture in the Park La Brea, Los Angeles, is also considered as a landscape architecture, created by Oleg Lobykin, a professional sculptor from Russia. The title of the art piece shown in Fig. 54.2 is “Dem Bones” and was



Fig. 54.1 Playground called forest of cherry blossoms at Moerenuma Park



Fig. 54.2 Sculpture by Oleg Lobykin called Dem Bones (Custom Building and Restoration Trades Directory 2013)

designed based on the idea from a dinosaur fossil, and it has an “interactive” concept, where children could play and participate within. In his statement, “As an artist my priorities were to stimulate the imagination, ensure that the sculpture was interactive and that it looks beautiful.”

3.1 Public Art

Public art is any work of art or design that is created by an artist specifically located in a public space. It can tower several stories high, or it can call attention to the pavement beneath your feet. It can be in any kind of form which can be casted, carved, built, assembled, or painted. By its presence alone, public art can heighten our awareness, question our assumptions, transform a landscape, and express community values. Art managers have focused their interest on an understanding of their participants in order to design and implement effective programming and marketing strategies for different artistic goods [2].

3.2 Interactive

The definition of interactive is acting or capable of acting on each other [3]. Application of interactive in this research was focused on the physical factors of human interaction such as seating, laying, and playing. Video approach had gained and enhanced the level of student’s understanding. Hence, there is a need for such application that enables students to a lifelong learning [4].

3.3 Sculpture

Sculpture is an art of making figures, objects, and shaping clay. It is also known as the art or practice of shaping figures or designs in the round or in relief, as by chiseling marble, modeling clay, or casting in metal [5]. The present archaeometric study, conducted with a 3D roughness meter, showed that the marks on several sculptures analyzed were made with the same type of tool and the same engraving technique [6]. However, recent artists like to create an artwork that differs with the conventional method as suggested by Salehi [7] which is developing artwork through exploring waste material. It easily can be applied onto ceramic material applications, but might not be suitable for large-scale pieces and should be applied for small pieces of products and joinless [8].

Table 54.1 The weight age of design criteria by percentage

Aesthetic	Usability	Technical
40 %	20 %	40 %
Inspired by nature (dragonfly wings)	Interactive (encourage public participation as a hands-on way)	Materials (clay, fiberglass, composite materials)
Organic form/shape (elegance)	Public space (playground, garden and park)	Size (large scale)
Concept (playground sculpture)	Public seating (fun, relaxing, safety)	Process fabrication (to produce mold for mass production)
	Human factors (new way of seating (form follow function))	Testing (public, outdoor, or indoor)

3.4 Form

Form is known as making or producing something in a particular shape or form. Study on geometric and organic form will be clearly defined to achieve the aim and objective of this research. The researcher will explore the form in terms of experiments and design development process with the consideration of “good design.” “Good designs” are full of living nature. For designers, it is an inexhaustible “design database” [9].

3.5 Form Follows Functions

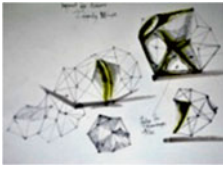
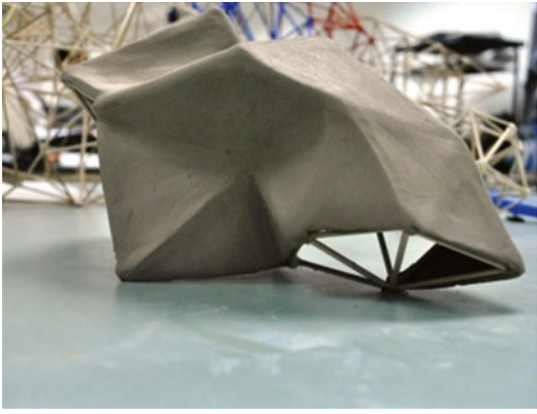
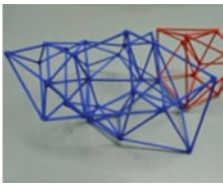
Form follows functions is a principle associated with [modern architecture](#) and [industrial design](#) in the twentieth century. The principle is that the shape of a building or object should be primarily based upon its intended function or purpose. Linking the relationship between the [form](#) of an object and its intended purpose is not always by itself a complete design solution. From the perspective of consumers, designers may identify a particular design concept in terms of product form image for fitting consumer’s needs in addition to achieve a high EPV value product [10] (Table 54.1).

4 Case Study

4.1 Working Drawing Toward Ideation

In idea development process, the purpose of 2D sketches was to gain the idea concept and detailing based on topic of studies. A part from that, in idea development process, the design criteria have guided the researcher to make an appropriate

Table 54.2 The procedure of design process

Ideation process flow	
	
(A) Sketch	
	
(B) Structuring	
(C) Forming	

design and 3D structuring which then helped refine the design's perfect form in 360° view that 2D sketches was unable to do. Art seeks visual solution in what is often called design process [11]. Table 54.2 shows the design process procedure.

4.2 Design Development

Continuation process from the second stage will be further detailed in design development process (third stage), which the researcher justified the idea for appropriate design selection. In this process, application toward material has been explored to produce prototype based on the design criteria's. From 2D sketches and 3D sketches, the selection of design for making prototype is through discussion with a supervisor who has been selected to develop more details in contacts of form, proportion, scale, and materials for mock-up making. Table 54.3 shows the procedure of prototyping after the final design has been chosen (Table 54.4).

4.3 Ergonomic Design Studies

Constructive method in these studies applied from the direction of study on the locking system where the artist constructing the part of the backbone by focusing on determining the locking system for the artwork [12]. In this work, form is created by determining the human sitting posture in order to get the idea of ergonomic purpose. Based on the prototyping processes (see Table 54.3), suggested from was

Table 54.3 The procedure of prototyping process



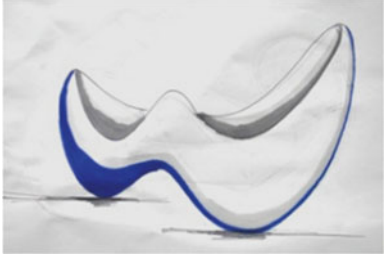

Design process flow	
	
(A) Final idea	(B) Detailing design
	
(C) Technical drawing	(D) Scale prototyping

Table 54.4 The procedure of ergonomic design study

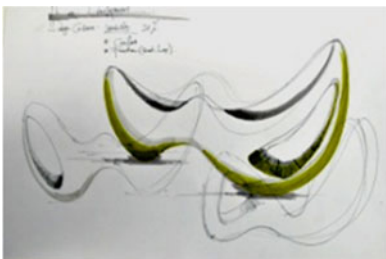



Design process flow	
	
(A) Final design	(B) Scale prototype
	
(C) Proportion	(D) Ergonomic study – sit

Table 54.4 (continued)

Design process flow



(E) Ergonomic study – lay



(F) Ergonomic study – situate

tested to get the most possible position to display. In accordance, the most possibility sitting part on the design will determine as a final design for the interactive public sculpture.

5 Results and Discussion

Figure 54.3 shows a life-size prototype that was used to interact with humans. The evaluation toward the sculpture's prototype was based on testing that has been done among the students. Response, comments, and feedbacks from them reflect the research in real situation. In this case, the evaluation process will help the researcher to improve and overcome design issues for future designs.

Furthermore, the respondents have their own justifications when they are testing the prototypes. Some of them said that the sculpture is interesting and is able to be utilized in public spaces. For some, the concept of playground sculpture will be successful due to the potential of the form to attract the public to come closer and interact with it. They also said that the organic form will attract the public especially children in terms of safety and concept that they can play, seat, and lay around the form.

The physical aspect has also been discovered when the researcher observed in the testing process and that the respondents will utilize the sculpture in their own ways. From that, the researcher concludes that the sculptures have great potential as a new form of seats in public spaces and it can benefit the children too.

6 Conclusion

This research is one of the new researches which can be further developed in the future for new findings to be discovered. Based on the new findings, which is the application of ceramic material in public sculpture, forms can be developed further



Fig. 54.3 Testing on the human physical factors in public space

in terms of reproduction process, technique, and types of material that have been used. Because of the durability of the ceramic material, they can stand long outdoor exposure. Based on the researcher's experiences in ceramic in the last 7 years, the researcher believes that this research has never been done by anyone and strongly suggests this research to be implemented. For ceramic application, it's easy to apply with some material parameter development which has been reported by Anwar [13–15].

As a new research, the potential to enhance and improve the research should be continued to discover new findings. As long as this research has the potential with new findings, it can be explored further in the context of industrialize, technology, and sustainable design to reflect the modern and contemporary world.

Furthermore, this research can benefit those who are studying in the related topic. They can use this research as reference for getting information for their research. Subsequently, from this research, new findings and knowledge can be shared among academics for future researcher.

Summarily, this research has discovered lots of new things as academic findings and can be improved and explored further. It is hoped that these studies will be useable for everyone in the future.

Acknowledgment We would like to acknowledge the generous participation of the interaction designers in the research. This study was conducted in Formgiving Design Research Lab established by Research Management Institute, Universiti Teknologi MARA (UiTM). Full appreciation is given to Malaysia Ministry of Higher Education for the financial support under RAGS grant and Research Excellent Fund Scheme (RIF) provided by UiTM.

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Chapter 55

A Construction Procedure for Interactive Artwork via Waste Material

Md Faizul Khalid Abd Malek, Samsiah Rahman, Rusmadiyah Anwar, and Ham Rabeah Kamarun

Abstract This paper evaluates the possibility of waste material to become a mixture model or prototype for public sculpture. The procedure of design development participates with waste to wealth concept. A case study on the existing material embarks with a replacement of alternative materials. The objective is to study the form and design that are appropriate for the interactive artwork in public spaces. The organic material and composite material are tested to identify its strength for construction. With the right technique applied, it shows that time constraints and technical limitation make the public art prototyping suitable with the composite materials. It can automatically transform the idea and design to the final artwork. Finally, we have drawn certain implications from the model or prototype; thereby, the public art will not only interact with the public as an artwork but will allow the waste material to be utilized by the public.

Keywords Public art • Waste to wealth • Sculpture

1 Introduction

The issue of public art has often been discussed in the context of meaning, usefulness and aesthetic values [1, 2]. However, this issue may not be profitable for someone who has no understanding about art. Because of that, the issue of public art should get the attention of all parties, the public, tourists, artists and relevant authorities [3]. As we can see, in Malaysia most of the public art mainly serves as appreciation, symbolism, to educate people and to decorate a public space only. Jolly Koh, 65, the painter-educator, says ‘The problem with public art here is one of quality versus kitsch. I think these roundabout works were selected by bureaucrats who know

Md.F.K.A. Malek (✉) • S. Rahman • R. Anwar • H.R. Kamarun
Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: mdfaizul@salam.uitm.edu.my

nothing about art'. There are 'Millennium Park' located at Chicago, 'Moerenuma Park' created by Japanese artist Isamu Noguchi located at Sapporo, Hokkaido, and 'Olympic Sculpture Park' located on the grounds of the Seattle Art Museum. As we can see, these three parks are considered as public art, and these are very beautiful outdoor artworks and fantastic sculptures created by famous artists like Anish Kapoor, Frank Ghery and others. The park is free for the public to enjoy and interact with people through the artwork or sculpture, and it is not only a spectacular artwork, but people could also use it as recreation locations and for leisure activities. This can have a meaningful impact and be an attraction of public art, where it provides connection with the public and everyone can enjoy it besides the philosophical meaning of the artwork and story behind the artwork that delivers message to the public and society [4].

2 Interactive Public Sculpture

Sculpture is a three-dimensional object created by artists, designers or architects with certain meaningful and metaphorical context [2]. The function and purpose of sculptures have always been discussed to reflect the world of modernism. Therefore, the function of public sculpture should be clearly understood by the government especially the experts to these issues. Malaysia should move a step further in creating public sculpture that involves public participation through artworks such as incorporating the elements of interaction as part of the artwork. In order to develop the interactive public sculpture, the research framework was developed based on CSWD methodology introduced by Anwar. He mentioned about the important of empirical study in order to get a balance of development between idea and production [2].

The playground sculpture in Park La Brea, Los Angeles, is also considered as a landscape architecture, created by Oleg Lobykin from Russia. He is a professional sculptor. The title of the art piece is 'Dem Bones' (Fig. 55.1), and it was designed based on the idea from dinosaur fossil and it also has an 'interactive' concept, where children could play and participate within. In his statement, 'As an artist my priorities were to stimulate the imagination [5], ensure that the sculpture was interactive and that it looks beautiful'.

3 Appropriate Strength Materials for Public Sculpture

In creating a sculpture, materials is one of the most important aspects that should be well thought of. In most cases, the materials reflect the function and the space. Large-scale sculptures will often welcome the inquiries on the kind of material used by the artist or designer [6]. Stone, cement, stainless steel, concrete, bronze, metal,



Fig. 55.1 Dem Bones

clay and fibreglass are some of the materials that are always used in making a large sculpture.

Nowadays, a lot of exploration on materials has been done by numerous artists, designers and scientists especially on the strength of the materials in large-scale sculptures. Certain kinds of materials have certain advantages and limitations in terms of their application.

A composite material is a potential material currently used in public sculpture production as a sustainable material [7]. For instance, ‘The Green Pavilion Sculpture’ (Fig. 55.2) is made from a specially developed biocomposite consisting of cork-board, flax fibres, soya beans and maize starch. A composite material consists of two components, which when put together have stronger properties than each of the components on their own [8].

Ceramic materials have been used in this study for the purpose of showing the potential of these materials in large-scale outdoor sculpture. In ceramics, there are several types of materials that can be classified as stoneware, earthenware porcelain and terracotta [9]. It can be available in two different characteristics which are in liquid or solid forms. The consideration of the safety, climate changes and endurance based on the material is part of the research of this study (Fig. 55.3).



Fig. 55.2 The Green Pavilion Sculpture

4 Construction Experimentation

4.1 Experiment 1: Stoneware Clay

The result of experiment 1 was unsuccessful. Any possibilities can happen when handling the clay. Basically, the process of ceramic making takes a long time, so the clay collapsed because the quality of the clay is poor and the clay is low in plasticity [10]. Plus, the process of building the form is too fast; as a result, the clay cannot stand the impact. Besides, the techniques used were wrong and need special tools. In order to overcome this problem, a material was developed which has been reported by Anwar [8]. The clay was added with grog but applied with hand building technique (Fig. 55.4).

4.2 Experiment 2: Styrofoam

The result of this experiment was successful because it is easy to form, cheaper and easy to handle. By using styrofoam, it is easy to get the result. Were, process of making are appropriate if compare with clay. Furthermore, only basic tools are needed when producing the design using this material. In sum, the researcher decided to use the styrofoam to produce the final prototype in this research (Fig. 55.5).

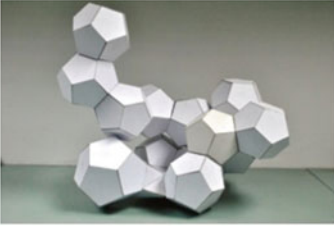



IDEATION	DESCRIPTION
	<p>IDEA 1</p> <ul style="list-style-type: none"> • This idea was inspired by nature. (dragonfly wing) • The geometry pattern in the dragonfly wing was developed into a structure form. • Based on the concept of a modular design.
	<p>IDEA 2</p> <ul style="list-style-type: none"> • The idea was inspired by origami. • Studies of potential forms and technique that can be applied in a sculpture form. • This concept also is based on the modular idea that can be repeated.
	<p>IDEA 3</p> <ul style="list-style-type: none"> • The idea was inspired by dragonfly wing. • Study on geometric and organic form the dragonfly wing to develop into a sculpture form. • Clay as the main material to produce this form
	<p>IDEA 4</p> <ul style="list-style-type: none"> • The idea was derived from organic form and the modular concept. • To study simple forms. • The concept of idea is creating functional sculpture form. • Function as seats.

Fig. 55.3 Ideation of design

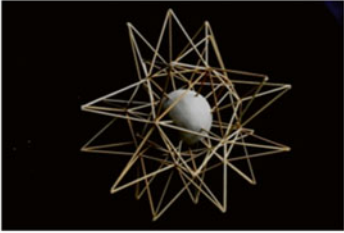


	<p>IDEA 5</p> <ul style="list-style-type: none"> • This idea was derived from dragonfly wing • The concept of idea is a combination of two different materials (clay and stainless steel) • Function of this sculpture is to provoke people's mind in materials expect.
	<p>IDEA 6</p> <ul style="list-style-type: none"> • The idea was inspired from a modular design concept. • Studies on basic forms (sphere) and the ability in assemble and jointing. • The function of this concept is playground sculpture.
	<p>IDEA 7</p> <ul style="list-style-type: none"> • The idea was inspired by nature (dragonfly wing). • Study on geometric into organic form. • The potential of structure form developing into functional

Fig. 55.3 (continued)

5 Result and Discussion

In this stage, the studies were continued to the next process, which is to produce the final prototype. At this level, there are some challenges that were faced by the researchers. Here, the process of making the final prototype will be explained in detail in this section. The process will be shown step by step starting with carving and finishing the styrofoam, then applying the paper mache on the styrofoam

Waste Materials : 5% grog, news paper, wood and plastic
 Technique : Pinch and coiling



The process started with coiling technique



Coiled clay will be arranged step by step while forming.



process of drying the artwork



The clay collapsed while drying.

Fig. 55.4 Experimentation of clay bodies

surface as cover, next applying the fibreglass as final finishing and last making the mould. There are four final prototypes that have been produced in this study, where each final prototype were made through the same process.

From the mock-up, the researcher has done the technical drawing to get the actual size of the final artwork based on the scale model 1:10 (Fig. 55.6a). The technical drawing will be applied on the styrofoam in six views, top, bottom, front, back, left and right side (Fig. 55.6b). Appropriate tools will be used such as a cutter and metal brush to carve and cut the styrofoam based on the specific design (Fig. 55.6c). The final prototype form is ready for finishing using the sand paper (Fig. 55.6d). The next step is to apply the paper mache using newspapers on the styrofoam surface. The paper will be pasted with glue done layer by layer making sure that there are no air bubbles on the surface. Air bubbles will affect the surface for the next step (Fig. 55.6e).

Waste material : Styrofoam, news paper
 Technique : Cut and carving



The process of cutting the styrofoam using a saw.



The process of carving the Styrofoam by using a wire brush



Process of carving the curve part



Finishing the product

Fig. 55.5 Experimentation of clay bodies

All the surfaces are covered with newspaper in eight layers. The reason for this is to make sure that the resins do not absorb to the styrofoam surface to prevent it from spoiling. Afterwards, the tools, fibreglass, resin and hardener need to be prepared for the next process (Fig. 55.6g). The next step is to apply fibreglass to the final prototype; this step is the most important part where safety is concerned. All the safety equipment must be prepared before starting the process (Fig. 55.6h). The fibreglass will be applied in at least four layers to ensure the final prototype is strong enough. The pieces will be dried under the sun for the whole day (Fig. 55.6i).

The technique and the process for the other prototypes are similar. We suggested four (4) final prototypes in this study (see Fig. 55.7).



Fig. 55.6 Process of making the final prototype



Fig. 55.7 Final prototype design



Fig. 55.8 Testing the final prototype at the ‘garden area’

6 Conclusion

To achieve the aim and objective of this research, the researcher has displayed the final prototype in few public spaces. This test aims to ensure whether the researcher has achieved the design criteria. Here, the researcher has selected a public space in the UiTM Jalan Othman Campus as a target location for the testing (Fig. 55.8).

To the degree that the testing is concerned, the entire final prototypes were placed at the target location to get the impression of view. The impression of the environment is very important to blend with the space [11, 12]. It is to help the researcher to study further on how to place the sculpture within the real situation. Moreover, the arrangement of the sculpture’s placement must also be considered so as to get the public’s attention [12–14] (Fig. 55.9).

The test has been done in two different spaces: in the ‘Palm Square area’ and in the ‘garden area’, and photographs were taken as documents for the evaluation process.

7 Recommendation

The evaluation towards the prototype (sculpture) is based on the test that has been done amongst the students. Response, comments and feedbacks from them reflect the research in real situation. In this case, the evaluation process will help the researcher improve and overcome any problems in future designs.

Furthermore, the respondents have their own justifications when they are testing the prototypes. Some of them said that the sculpture (prototype) is interesting and is able to be utilized in public spaces. For some, the concept of playground sculpture will be successful due to the potential attraction of the form for the public to come



Fig. 55.9 Display for the final prototype

closer and interact with. They also said that the organic form will attract the public especially children in terms of safety and concept and they can play, seat and lay around the form.

The physical expect has also been discovered when the researcher observed in the testing process and that the respondents will utilize the sculpture in their own ways. From that, the researcher concludes that the sculptures have great potential as a new form of seats in public spaces and it can benefit the children too.

As a suggestion, this research can be done and developed further in future proper way and production. Collaboration with the professionals such as sculptors, designers, architects, engineers and experts is needed to ensure success.

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Chapter 56

Enhancing the Appearance of Printed Products Using Special Effects

Muhammad Yusuf Masod, Mahadzir Mohamad,
Muhamad Fairus Kamaruzaman, and Rusmadiyah Anwar

Abstract There are many applications of special effects on a printed sample. Special effects not only help projects stand out, but also enable printers to effectively separate themselves from their rivals. The methodology of this study will employ a set of eight print samples which contain different types of printed special effects. They were subjectively assessed by selected observers who utilized psychometric scaling procedures. All samples are standard CMYK print samples with the following special effects which are gloss and matte laminating, fragrant and textured specialized paper, lenticular 3D, foil stamping, and spot and textured varnishing. The objective of this research is to identify the application of the special effect and its influence to the observer. The research revealed that the factors which influenced user perceptions of the printed product are the content of the printed product, color variation, color reproduction, visual design, and technical implementation.

Keywords Component • Special effects • Psychometric • Printed products

M.Y. Masod (✉)

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia
e-mail: yusuf595@salam.uitm.edu.my

M. Mohamad

Department of Printing Technology, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

M.F. Kamaruzaman • R. Anwar

Formgiving Design Research Group, Faculty of Art and Design, Universiti Teknologi MARA,
40450 Shah Alam, Selangor, Malaysia

1 Introduction

Printed products are extremely complicated: they convey messages through colors, text, illustration, and substrate [1]. Their main functions are to give information or to give protection. Hence, consumers often purchase printed products for rational needs. Even though people at this day and age preferred to use electronic media, printed products still have their own demand. Many people think that printing will be replaced by electronic media in the future. But who knows what will happen in the future? Maybe in the next 30 years, we still have our reading materials in printed sheets. Moreover, printing technology has lived up due to its own demand and also the challenge by electronic media [2]. The utilization of print finishing in printed products is influenced by the additional effects on the product making them more attractive as compared to plain printed products. Other than types of papers, there are numerous types of print; there are numerous types of print finishing that give special effects to the printed product such as laminating, varnishing, embossing, perforating, foil stamping, and so on. There are many applications of these special effects on printed products. They not only assist particular printed products by making them more noticeable, but also make the product effectively distinct from other opponent [3]. The objective of this research is to identify the application of special effects that can be applied to the printed products and to examine the influence of special effects on the perception of printed products. The aims of this research are to study and identify the application of special effects that can be applied on a printed product in order to improve the visual attractiveness of its appearances. The use of different types of special effects and the usage of the printed product itself can give different outcomes to the data, and this can create difficulty to identify and describe the observer's perception [4]. The scope of this research is the application of special effects on printed product in order to improve visual attractiveness. It is imperative to possess the ability to know which special effects give more influence on the consumer's perception and improve product's visual attractiveness. Currently, special effects are applied on the most printed product in this industry [5]. The survey focuses on only eight print samples containing different types of printed special effects which were subjectively assessed by non-probability sampling observers who utilized psychometric scaling procedures. The survey instrument is distributed among the students of local universities in Shah Alam, Selangor Malaysia.

2 Special Effects on Printed Products

2.1 *Laminating*

There are two types of lamination which are gloss and matt lamination. In lamination, a thin plastic film is placed on one side of the sheet. After one-sided lamination, it is possible for the reverse un laminated side of the sheet to either take up or lose moisture, resulting in curling of the substrate, particularly with paper and lighter

weight boards. To help reduce this, it is advisable to moisture-proof the material while in storage and to try and prevent exposure to extreme condition before, during, or after processing.

2.2 Specialized Paper

Specialized paper is used in printing industries based on the product that needs to be produced. Specialized papers that are regularly used are fragrant and textured paper. Fragrant and textured paper are usually used for products such as wedding cards. This is because fragrant paper can evoke passion and tenderness to those who read the wedding cards, while textured paper can make the card appear more attractive and valuable.

2.3 Lenticular 3D

Lenticular 3D printing is a new technology in which lenticular lenses are an array of magnifying lenses designed so that when viewed from slightly different angles, different images are magnified. This lens is also used for 3D displays. In lenticular 3D printing, lenticular lenses are used to produce printed images with an illusion of depth or the ability to change or move as the image is viewed from different angles.

2.4 Varnishing

Varnish is a liquid coating applied to a printed product after the product has been printed to add a clear glossy or matte finish to the product. There are major types of varnish available such as spot UV varnish and textured spot UV varnish. Spot varnish is applied to chosen spot areas of a printed product. This not only produces the effects of highlighting and drawing attention to that part of the design, but it also provides the additional visual stimulus of having varied textures on a single printed surface. A textured spot UV varnish allows the creative designer not only to surprise the recipient of the printing with a mix of textures on the same printed surface, but also to reinforce the tactile properties of the product he or she is depicting.

2.5 Metallic Foils

Metallic foil stamping uses heat and metallic film in a specialty printing process that produces a shiny design on paper. Metallic foil stamping can be combined with dimensional embossing to make letters and images on business cards, book covers, gift cards, office folders, and a whole host of professional or personal items [6]. Foil stamping also comes in a variety of colors and finishes.

3 Research Methodology

The questionnaire consists of section A and section B. The aim of section A was to gather demographic profile of the observer. The demographic data includes gender, age, and educational background [7, 8]. The procedure in section B was adapted from Laine et al. [9] psychometric scale which consist of eight statements designed to identify the views of the observer toward the applications of special effects on a printed product. There are five-point ranking scale; a lower number means that the observer strongly disagrees with the statement, while a higher number means the observer strongly agrees with the statements. There are seven statements which are: statement 1 (This sample is interesting), 2 (This sample catches one's attention), 3 (This sample is memorable), 4 (This sample is stylish) 5 (This sample is beautiful) 6 (This sample is pleasant to look at), and 7 (The visual appearance of this sample support content).

4 Data Analysis and Findings

The data from the questionnaire are gathered and analyzed. All the data are tabulated using Microsoft Excel software.

4.1 Section A: Demographic Distribution of the Observer

1. Gender

The chart below shows that most females, or 60 % of the respondents, answer the questionnaire than males which were represented by 40 % of the respondents (Fig. 56.1).

2. Age

The chart below shows respondents by age groups. Most of those who aged below 25 answer the questionnaire, which is 98 % of the respondents, while only 2 % of the respondent belongs to 25–40 years old age group (Fig. 56.2).

3. Educational Background

The chart below shows respondents by educational groups. Based on the graph, the highest percentage is from bachelor's degree group, 76 %, while 18 % of the respondents are from the diploma group and another 6 % are from the master's degree group (Fig. 56.3).

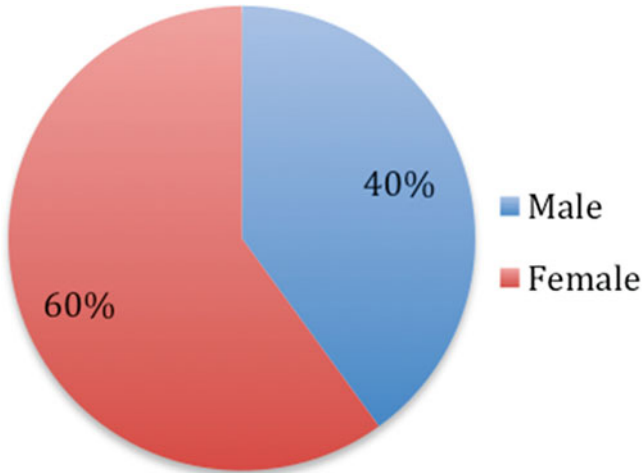


Fig. 56.1 Respondents by gender

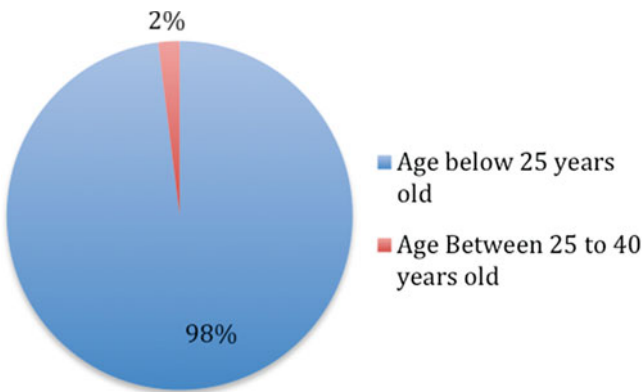


Fig. 56.2 Respondents by age group

4.2 Section B: Psychometric Distribution of the Observer

1. *This sample is interesting.*

Based on the chart, most of the respondents, or 56 %, slightly agree that the sample is interesting. Yet, 36 % of the respondents completely disagree (Fig. 56.4).

2. *This sample is on the one that “catches one attention.”*

The chart below shows that more than half of the respondents, or 56 %, slightly agree that the sample catches one attention. Twenty-two percent of the respondents are undecided whether the sample catches one attention or not, whereas, 2 % of the respondents slightly disagree (Fig. 56.5).

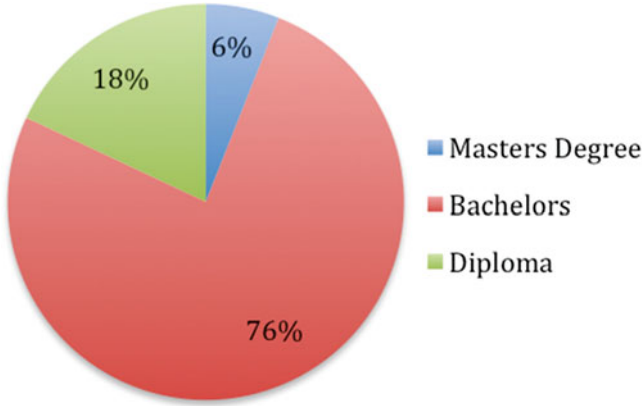


Fig. 56.3 Respondents by educational background group

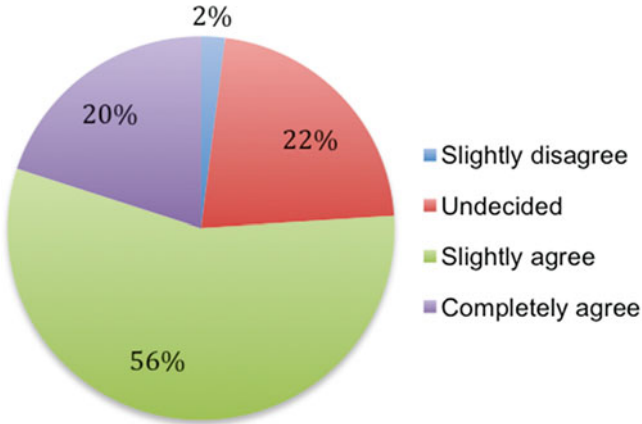


Fig. 56.4 Respondents by question "This sample is interesting"

3. *This sample is memorable.*

The chart below shows that the highest number of respondents (52 %) who agree that the sample shown to them is "memorable" number of the respondents which is 52 % slightly agree that the sample is memorable. Another 26 % of the respondents are undecided, and 18 % of the respondents completely agree. However, only 4 % of the respondents slightly disagree that the sample is memorable (Fig. 56.6).

4. *This sample is stylish.*

The chart below shows that the bulk of the respondents which is 46 % slightly agree that the sample is stylish, while 34 % of the respondents completely agree, but 20 % of the respondents are undecided that the sample is stylish (Fig. 56.7).

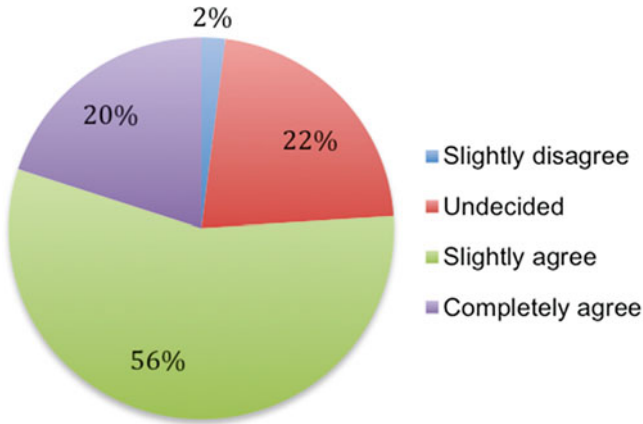


Fig. 56.5 Respondents' responses to the question "This sample catches one attention"

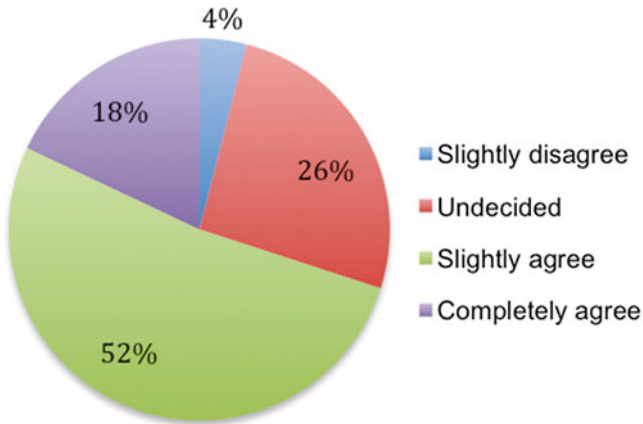


Fig. 56.6 Respondents' responses by question "This sample is memorable"

5. *This sample is beautiful.*

The chart below shows that the greatest number of the respondents, which is 60 %, slightly agree that the sample is beautiful. Thirty-two percent of the respondents completely agree that the sample is beautiful. Only 8 % of the respondents are undecided that the sample is beautiful (Fig. 56.8).

6. *This sample is pleasant to look at.*

The chart below shows that the majority of the respondents, which is 54 %, slightly agree that the sample is pleasant to look at, and the respondents that completely agree that the sample is pleasant to look at stands at 26 %. Yet, 18 % of the respondents are undecided, and another 2 % slightly disagree that the sample is pleasant to look at (Fig. 56.9).

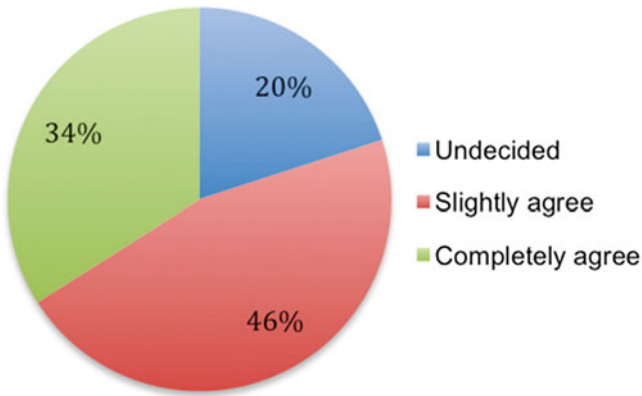


Fig. 56.7 Respondents’ responses to the question “This sample is stylish”

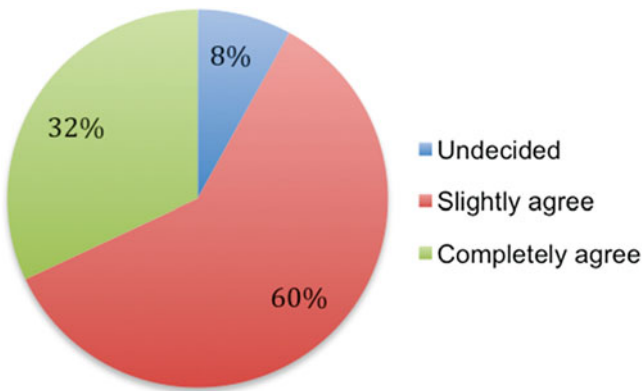


Fig. 56.8 Respondents responses to the question “This sample is beautiful”

7. *This visual appearance of this sample supports the content.*

The chart below shows that a high number of responses from the respondents which is 63 % slightly agree that visual appearance of the sample support content and only 19 % of the respondents completely agree. Yet, 16 % of the respondents are undecided that visual appearance of the sample is able to support content, while 2 % of the respondents completely disagree (Fig. 56.10).

5 Conclusion

The result suggested that the influence of special effects on the perception of the printed products was mainly reflected on two perceptual dimensions. These dimensions were termed “noteworthiness” and “aesthetic value.” Statements 2 (this

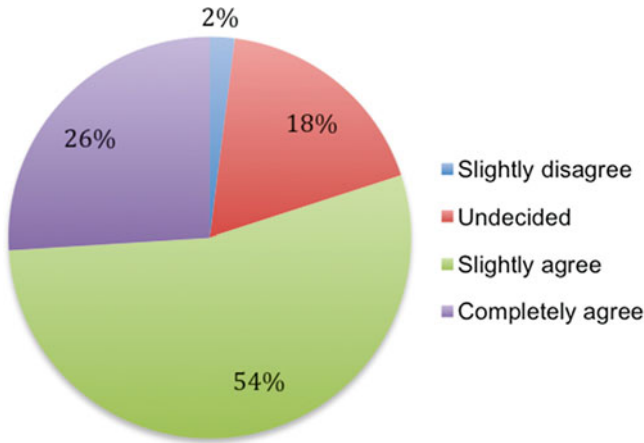


Fig. 56.9 Respondents' responses to the question "This sample is pleasant to look at"

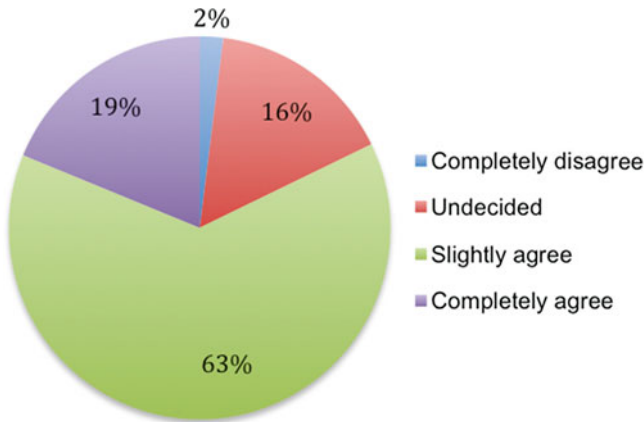


Fig. 56.10 Respondents' responses to the question "This visual appearance of this sample support content"

sample is interesting), 4 (This sample catches one's attention), and 6 (This sample is memorable) in the previous chapter were intended to measure the noteworthiness of the print samples. Likewise, statements 1 (This sample is stylish), 3 (this sample is beautiful), and 5 (this sample is pleasant to look at) were intended to measure the aesthetic value of the print sample. It should be stressed that due to the complexity of perceptual interactions which involve factors such as the content of the printed product, color reproduction, the visual design, and technical implementation of the special effects and the varying preferences and expectation among the users of printed products, the results cannot be taken as a categorical indication of how the use of a given type of special effects will influence the user perception of the printed product in a specific case. However, the findings reported in this study did indicate

significant positive overall trends in the examined perceptual dimensions resulting from the use of printed special effects. From the research outcomes, in order to enhance the appearance of printed product, the designers are recommended to increase their understanding and expertise in the application of special effect among designers. This is especially important when all the special effects have been identified and analyzed based on their influences on the printed product. The designers should know about the special effects and improve their creativity as well as attract customer to select and purchase the product. Next, the content of a particular product has to be enhanced to strengthen the quality of a product. Extensive use of special effects does not guarantee high-quality product. The appropriate use of special effects should be combined with the strong use of color combination with the high technology visual to further enhance the printed product production.

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