

Maria A. Wimmer (Ed.)

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Knowledge Management in Electronic Government

5th IFIP International Working Conference, KMGov 2004
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Preface

“We know more than we can tell and we can know nothing without relying upon those things which we may not be able to tell”

(Michael Polanyi)

The importance of knowledge management (KM) is increasingly recognized in the public sector and in relation to e-government implementations. Because governments and public administrations deal with information and knowledge on a large scale, this domain is particularly predestined to actively practice KM: much of the work of public authorities refers to the elaboration of data, information and knowledge on citizens, businesses, society, the markets, the environment, laws, politics, etc.

Even many “products” of public administration and government are delivered in the shape of information and knowledge themselves. This aspect especially applies to the policies, management, regulation and monitoring of society, markets and the environment. With the recent evolution of e-government projects, high expectations are linked. As a consequence, efficient support from adequate KM concepts and tools to exploit the huge knowledge and information resources dealt with in e-government is expected.

Not only the trend towards a knowledge society calls for KM solutions. Current e-government developments significantly influence the public sector. These require the rethinking of knowledge distribution and management: Citizen- and business- oriented service delivery, including one-stop service provision, interorganizational co-operation between government agencies and cross-border support for complex administrative decision making call for largely opened-up access to remote information and knowledge resources. E-government – and specifically the concept of online one-stop government – integrates dislocated information and knowledge sources into a global virtual knowledge fabric.

Modernization and reorganization of government work and responsibilities imply significant redistribution of knowledge resources. Even when introducing new IT into a specific administration, project knowledge on which decisions have been made, why, and how problems have been solved is a valuable knowledge resource for future changes. Support for the collection of, elaboration of and access to such domains and project knowledge needs to be designed properly.

E-government implies a fundamental knowledge redistribution and requires a careful rethinking of the management of valuable project knowhow, domain expertise, information resources and knowledge bases. At the same time, the specific problems of public administration and governance (e.g., data protection, security, trustworthiness, etc.) need to be taken into account.

The annual international working conferences on “Knowledge Management in Electronic Government” (KMGov) bring together academics and practitio-

ners to discuss and disseminate ideas, concepts and experiences on the many perspectives and issues that deserve attention when developing e-government systems and KM solutions for the public sector. The proceedings cover contributions on theoretical, methodological and practical aspects of knowledge and KM in the public sector, such as: strategies for KM introduction in the public sector; concepts of KM and knowledge engineering; KM methodologies and tools for the public sector; analysis of knowledge in public sector environments; knowledge transfer in e-democracies; technical aspects of knowledge flow and KM in e-government; and experiences and examples of knowledge maintenance.

KM in the public sector involves various disciplines. The authors contributing to this volume come from distinct backgrounds and reflect insights from distinct fields. Also, the joint organization of the working conference by the IFIP Working Group 8.3, the IFIP Working Group 8.5, the German Society for Informatics (GI) Working Group 6.2, the University of Linz (Institute of Informatics in Business and Government), and the Danube University in Krems, together with the organizing and program committee members involved a team of people with distinct research backgrounds.

This year, KMGov celebrated its fifth anniversary as an IFIP working conference. KMGov started small with a workshop held in Schärding, Austria in 2000. Since the workshops in 2001 (Siena, Italy) and 2002 (Copenhagen, Denmark) the interest has grown tremendously and the event turned into an IFIP working conference in 2003 (held in Rhodes, Greece).

Many people worked to form the conference and to prepare the program and the proceedings. Special credit goes to the members of the Program Committee and the additional reviewers. In particular, the editor expresses thanks to Vera Himmelbauer for assisting in the review management and compilation of the proceedings.

May 2004

Maria A. Wimmer

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Knowledge Management for E-service-Delivery – A Conceptual Approach within E-government

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Abstract. The critical challenge for the success of e-government projects is the ability to create new and interesting customer bids. This requires an organization that is able to (re-)design and (re-)invent its business models and processes continuously. Knowledge Management Systems (KMS) can only accommodate such volatile readjustments if their design permits smooth adaptation and (re-)configuration of the underlying business processes. Such a KMS ensures or even improves the required business performance outcomes. We describe here a conceptual approach towards KM, which ensures a very high level of adaptability in order to incorporate dynamic changes in business models and information architecture. The GPWM Project of the public administration of Basel – Switzerland – is finally presented as a case study of the proposed approach.

1 Introduction

Information technology is not the most critical factor in the realization of strategic e-government projects. More important than IT and its implementation is knowledge of the impact on business and of the implied consequences for the associated business processes. Demands arising from the aims of e-government projects require consistent alignment of all associated resources and processes. Projects that do not take these factors into account lack integration and sustainability and are at best short-term solutions. Information technology projects tend to be of this type.

We frequently find in the public sector a fairly fragmented operational and organizational structure. The responsibilities for delivery of services to the citizen or to business are not transparent enough.

Moving towards a customer-centred administration in the context of e-government brings with it a redistribution of tasks and hence of knowledge. Such a reorganization has a tremendous impact on all the administration's current processes. Knowledge about the processes and the way they interact has to be managed in order to bring about these strategic changes in a controlled manner. In this context, knowledge man-

agement becomes a critical success factor for the implementation of e-government. Only those organizations that are able to develop a smooth interaction between the organisation's internal knowledge management and e-government, which stretches far beyond the limits of the organisation, will be able to achieve the full potential of e-government.

Against this background, the canton Basel-Stadt is aiming for a new concept of business process and knowledge management. The intention is to achieve the following mid- and long-term impacts:

- the service performance of the canton Basel-Stadt is to be significantly improved in terms of efficiency, transparency and quality as a result of the transparent and configurable flow of information well as comprehensive responsibilities
- the public reputation of the administration is to be based on well organized and technically functional internal business processes. This is the prerequisite for a more demanding stage in the development of the e-government project, as well as an answer to the concerns related to New Public Management (NPM)
- skills related to workflow and their optimisation are to be promoted in the departments.

2 Current Situation

With regard to knowledge management, the concepts and activities are focused on the IT-related use of knowledge, and on a "holistically" oriented design approach, which, for example, integrates human resource management. The first category includes ontology-based knowledge management [1,2] and organizational memory [3,4]. The second category includes for example the building block model [5] as well as model-base knowledge management [6].

As has already been seen in many different areas, it is of only limited use to transpose allegedly proven approaches to knowledge management in private business into the public sector.

One major difficulty is that there is no agreed definition of knowledge management in the private sector (see the case studies in [7]). A variety of projects are labelled as knowledge management, such as for example business process redesign, cultural change or establishment of databases. They often concentrate on instrumental aspects of managing data, information and knowledge. It has so far been impossible to establish a generally accepted strategy in relation to knowledge management. This indicates that knowledge is highly system-dependent. And this is the reason why third party solutions cannot be easily adapted [8].

Moreover, public administration is by nature a highly heterogenous system with a diversity of targets, functions and processes [9]. So far, it has not been possible to develop a knowledge management system for the activities of the public sector without taking into account the uniqueness of the different processes [10].

Different authors have argued the necessity to combine knowledge management and e-government ([11, 12, 13, 14, 15 etc.]) and thus form the foundations of this work.

3 Concept

3.1 Approach

This work focuses on an outline showing the technical and conceptual interplay of knowledge management and e-government based on concrete requirements and solutions. The targeted knowledge management of the canton Basel-Stadt is intended to be

- resource-oriented with a focus on intra-corporate knowledge to assure effective and efficient service provision processes
- market and public-oriented to enable the design of new (e-)services, for example in the context of e-government.

Knowledge management and its activities are in this context not considered as a separate task, but as an integral part of the organizational processes of (e-)service delivery and its design, and hence an integral part of business process management.

An e-service can be defined as any asset that is made available via the Internet to drive new value streams or create new efficiencies. To be used, such a service has to be open, serviceable in inter- and intra-organizational business processes and easily composable to varying business processes [16]. Different internal and external resources are needed to make such a (e-)service available and to integrate it in a set of the changing business processes (Fig. 1).

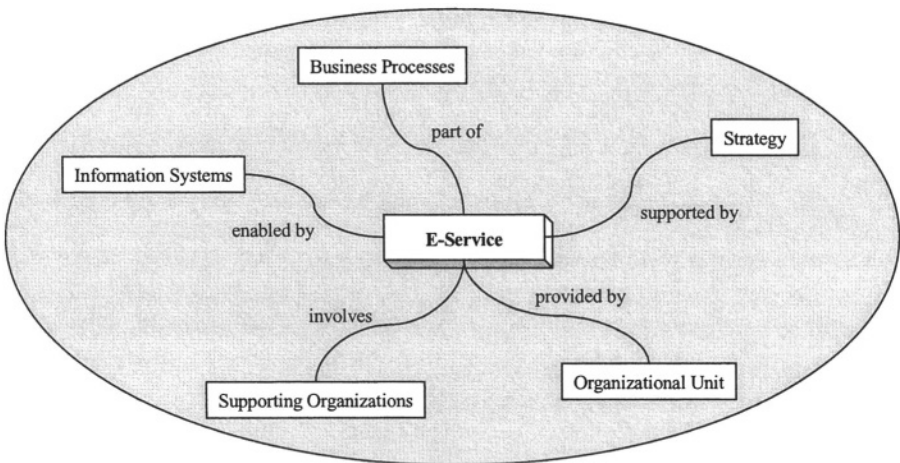


Fig. 1. E-Service resources

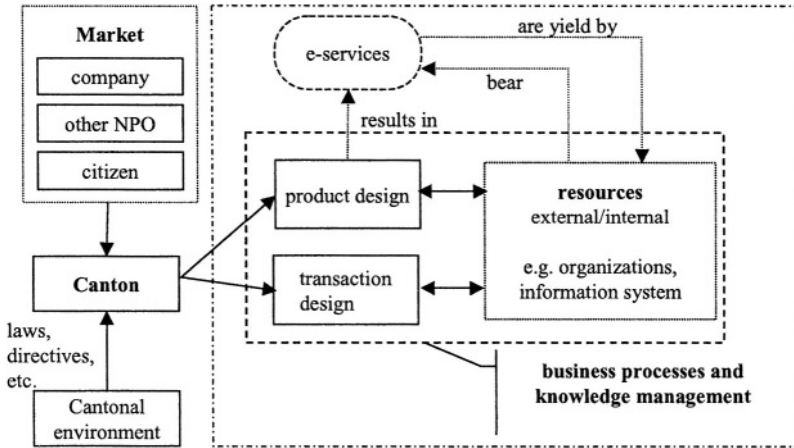


Fig. 2. Business and resource oriented business and knowledge management processes

Different business processes are executed by organizations. Particularly in the case of complex and knowledge-intensive processes and their execution, navigation through these (networked) business processes is done mentally. It is a fundamental task of knowledge management to make these processes requiring knowledge effectively transparent, along with the associated internal and external resources, in order to render them usable by the whole organization e.g. on the basis of the provision of services in the context of e-government (Fig. 2).

3.2 Steps

Based on a strategy definition for the project (phase 1: strategic definition), a thorough concept of knowledge management in e-government is worked out (phase 2: conception).

In order to guarantee the targeted implementation of a widespread organizational business process and knowledge management system in the canton Basel-Stadt, pilot schemes (phase 3) have been started. We are deliberately avoiding an integrated, organization wide introduction of business process and knowledge management involving projects of enormous dimensions.

These pilot schemes relate to knowledge-demanding processes which are interdepartmental, interdependent and involve several participants. These projects are of strategic importance for the organization to ensure acceptance and underline the corporate importance of business process and knowledge management. These are projects that have extensive implications for the execution of traditional processes. Based on the experiences of the pilots, the result of the design studies can be validated and extended, and where necessary adjusted. This procedure assures that in a later phase the organization-wide introduction of the business process and knowledge management (phase 4: distribution) is supported by all those involved and that future e-government activities are supported by these processes.

Step 1: Strategy definition / requirements and goals

(Sub-) goals / contents	Results	Key questions
<p>According to the strategic vision of the organization – in our case e-government – concrete requirements and goals for knowledge management have to be worked out and defined.</p>	<p>KM-strategy with detailed strategic project goals according to the specific organization of the canton Basel-Stadt.</p> <p>Key figure for how to deduce and supply KM-strategy design in public administrations.</p>	<p>What are the characteristics of a KM strategy?</p> <p>What sort of KM-strategy is suitable for the support of the introduction of a new business model in the context of e-government (e.g. One-Stop-Shop)?</p>

Step 2: Design of knowledge management in e-government

(Sub-) goals / contents	Results	Key questions
<p>Methodology for the analysis, design and introduction of knowledge demanding business processes.</p> <p>Roadmap of existing, customer-oriented and knowledge-demanding business processes.</p>	<p>Evaluation / definition and documentation of appropriate methods for modelling knowledge-demanding processes.</p> <p>Classification and systematic description of knowledge-demanding business processes or workflows in public administration.</p> <p>Key figure for how to deduce and supply a reference model.</p>	<p>What requirements can be deduced for the shaping of knowledge-demanding processes?</p> <p>Which modelling approaches and methods should be used in knowledge management?</p> <p>What are the knowledge-intensive processes in public administration?</p> <p>Are there generic reference models that can be deduced for certain activities of public administration?</p>
<p>Design of a knowledge basis for business process and knowledge management.</p>	<p>Metamodel of knowledge engineering.</p> <p>Model of a staged method for creating a comprehensive knowledge basis for the public domain and its integration into the proper business processes.</p>	<p>What identifies the knowledge basis in form, content and function in the context of knowledge management?</p> <p>Which techniques of knowledge recording / distribution / use can / should be applied?</p>
<p>Overview and assessment of the relevance of tools and systems of knowledge management, dependent on requirements.</p>	<p>Decision guidance when/how/which tool and system can be used dependent on requirements.</p>	<p>What sort of tools and systems of knowledge management such as yellow pages, communities, best practices and the like can/should be used?</p>

Step 3: Pilot schemes for knowledge management in e-government

The immigration office of Basel-Stadt is planning a complete reorganization of its customer services, called a “one-stop-shop”. Instead of the traditional separation between Swiss and foreign customers, a three-stage model consisting of a front office, an inquiry office and a back office is envisaged. In the medium term, other services of the cantonal administration are also to be integrated. The goal is to create a multifunctional contact point in which the “guichet basel” – a virtual access point as one of various access channels to the administration services – is to be integrated. The clerks in the front and inquiry office will have to supply knowledge-intensive services. Their “mode of operation” will change drastically in a few years. They have to rely upon an informative, effective and user-friendly knowledge base. The connections with business processes and knowledge management are obvious. Business processes and knowledge management have to assist the immigration office in setting up the “one-stop-shop” both from the methodological point of view and by making available appropriate tools.

(Sub-) goal / contents	Results	Key questions
Field validation of knowledge management for e-government.	Methodological support of the immigration office at the creation of the one-stop-shop. Field report allowing inferences to be made about the concept of knowledge management. Integration of results/experiences into the concept.	How does the Knowledge Management Concept support the chosen pilot project? How should the concept be improved with regard to the experiences?

Step 4: Distribution of the results

(Sub-) goal / contents	Results / milestones	Key questions
Specific concept of implementation for an organization-wide introduction of knowledge management in the canton Basel. General guidance for an implementation concept in the public sector.	Specific concept of implementation for the canton Basel-Start Framework for the implementation of knowledge management in the public sector.	Which are the success factors for an organization-wide implementation of knowledge management? What are the key components for a successful framework of knowledge management in the public sector?

4 Conclusion

In the present paper we pointed out that knowledge management in e-Government is a critical factor for e-Service delivery. An outline has been discussed showing the technical and conceptual interplay of knowledge management and e-government. Therefore a conceptual approach for knowledge management within e-Government has been presented. Further research work is ongoing on the basis of the presented approach. Currently we work on the design and realisation of a knowledge basis according to the proposed business process and knowledge management within e-Service Delivery.

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The Role of Knowledge Mapping in Electronic Government

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Abstract. This paper explores the role of knowledge mapping in electronic government. It begins by outlining the rationale for knowledge mapping. It then reviews different conceptualisations of knowledge maps. These include concept, competency and process based maps. Then, it illustrates the application of these maps in a series of examples from the Australian government websites. The paper concludes by identifying some major issues and challenges for the future of knowledge mapping in electronic government.

1 Introduction

According to some analysts, the capacity of digital storage in the last decade has increased worldwide at twice the rate predicted for the growth of computing power [5]. The gap between the two trends represents an interesting pattern in the state of evolution. Our ability to capture and store data has far outpaced our ability to process and utilise it. In electronic government, the proliferation of knowledge artefacts on websites creates an overload that is threatening to inhibit the efficient functioning of these institutions. As more documents are added on the web it becomes clear that there needs to be some sort of mechanism to help organise and search for useful knowledge. Otherwise it may remain *invisible* and *unused*. This poses a major challenge for knowledge management (KM).

Some authors point to “knowledge mapping” as a feasible KM method to coordinate, simplify, highlight and navigate through complex webs of knowledge possessed by institutions [20]. Knowledge maps or k-maps point to knowledge but they do not contain it. They are guides, not repositories [2]. One of the main purposes of k-maps is to locate important knowledge in an organisation and show users where to find it [12]. Effective k-maps should point not only to people but to document and databases as well. K-maps should also locate actionable information, identify domain experts, and facilitate organisation-wide learning [4]. They should also trace the acquisition and loss of knowledge, as well as map knowledge flows throughout the organisation [7].

Knowledge mapping can offer many benefits including economic, cultural, structural and knowledge returns [20]. Indeed, empirical findings indicate that knowledge mapping has been successfully used in education to facilitate students’ learning [1].

Knowledge mapping tools have also been used in medical field and aerospace industry [3],[6]. However, despite its many possible beneficial applications in industry, a recent survey shows that knowledge mapping is a relatively rarely used knowledge management method in business organisations [15].

The purpose of this paper is to explore this issue in the government sector. In particular, our objective is to examine whether and how knowledge mapping is used to facilitate the visibility of and access to government knowledge resources required by its citizens. Multiple cases from Australian Government will be analysed to illustrate the level of use and benefits achievable from different knowledge mapping applications.

2 Overview of Knowledge Maps

A review of literature reveals a variety of definitions and categories of knowledge maps proposed and used by industry and academia. Most definitions circle around the idea of tools or processes that help users navigate the silos of artefacts that reside in an organisation, while determining meaningful relationships between knowledge domains [7], [14], [20]. For the purpose of this paper, knowledge map or k-map is understood as the visual display of knowledge and relationships using text, stories, graphics, models or numbers [4], [18], [19].

K-map examples provided by Eppler [4] include knowledge application, knowledge structure, knowledge source, knowledge asset and knowledge development maps. Wexler [20] identifies concept, competency, strategy, causal and cognitive maps. Plumley [13] suggests that knowledge maps can be procedural, concept, competency and social network maps. A more abstract set of categories focusing primarily on cognitive maps is used by Huff [11]. The analysis of similarities and differences among these various types demonstrates that some classifications are simply different ways of referring to essentially the same maps.

From this analysis, a three-class categorisation of k-maps was adopted in this paper, based on their prime function. In short, concept maps answer the “what” knowledge question by structuring the phenomenon in terms of its basic elements and relationships; competency maps answer the “where/who” question by pointing to sources of expertise; while process maps answer the question of “how” by visualising the necessary steps in a business process or situation. In practice, most maps will be a combination of one or more basic types in a single image.

2.1 Concept Based K-maps

The group of concept based k-maps or taxonomies includes conceptual k-maps [14] and knowledge structure maps [4], as both these maps provide a framework for capturing and organising domain knowledge of an organisation around topical areas. They represent a method of structuring and classifying content in hierarchical manner. Concept based maps also allow for internal experts’ knowledge to be made explicit in a visual, graphical representation that can be easily understood and shared. Mind maps, as special forms of concept or cognitive maps [20], provide further ability to

express and organise a person's thoughts about a given topic, for example, the author's own understanding of the knowledge management phenomena shown in Figure 1[9].

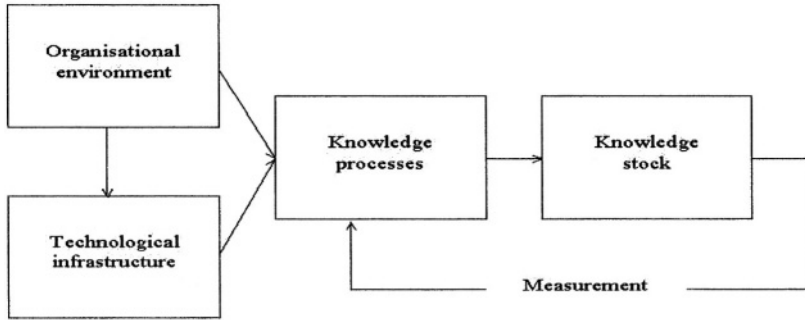


Fig. 1. Knowledge Management Ontology

Concept maps improve both the visibility and usability of organisational knowledge. The visibility is typically enhanced by the structure of the concept maps and the use of the visual symbols. The visual symbols can be quickly and easily recognised, while the minimum use of text makes it easy to scan for a particular word or phrase. In short, visual representation allows for development of a more holistic understanding of the domain, that words alone cannot convey. Concept maps also improve the usability of knowledge as they organise knowledge artefacts around topics rather than functions. Thus, they provide the ability to cross functional boundaries.

2.2 Competency Based K-maps

Competency based k-maps cover a group of similar maps including competency k-maps [13], knowledge source and knowledge assets maps [4]. They all provide an overview of expertise that resides in the organisation along with the identification of entities who possess such expertise. They act as “yellow pages” or directories which enable people to find needed expertise. They visually qualify the existing stock of knowledge of an individual, team or whole organisation. They can document the skills, positions and career paths. Essentially, they are simple graphic balance sheets of a company's intellectual capital [4].

One of the major benefits of competency based k-maps is that they make the human capital of the organisation highly visible. They can be used to profile a company's workforce across a number of criteria such as domains of expertise, proximity, seniority or regional distribution. For example, Figure 2 shows experts (ie. darker

nodes) network with nodes representing different experts and paths representing the strength of their bonds [17].

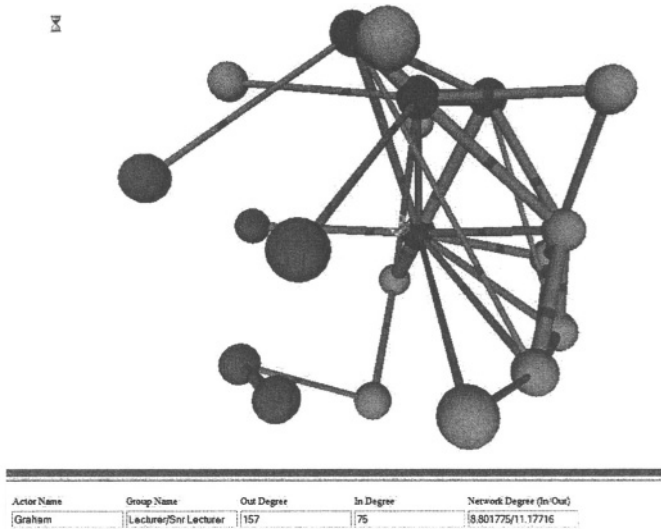


Fig. 2. Expert Network Map

Alternatively maps can be used to depict the stages to develop a certain competence. This can be used to help project managers in assessing the available knowledge for projects and jobs, as well as to make decisions about personal development and training [4]. Competency based maps can also greatly improve the usability of intellectual capital within the organisation. When converted into “yellow pages” and directories these maps can enable employees to easily find needed expertise within an organisation [13].

2.3 Process Based K-maps

Process based k-maps are one of the most commonly used types of knowledge maps in organisations. They include procedural maps [13] and knowledge application maps [4], as they are similar in that they both focus on work/business processes. Essentially, process based k-maps present business processes with related knowledge sources in auditing, consulting, research and product development. Any type of knowledge that drives these processes or results from execution of these processes can be mapped. For example, this could include tacit knowledge in people, explicit knowledge in databases, customer or process knowledge [13].

Process k-maps have several benefits. They help to improve the visibility of knowledge in organisation by showing which type of knowledge has to be applied at a certain process stage or in a specific business situation. On top of this, these maps also provide pointers to locate that specific knowledge [4].

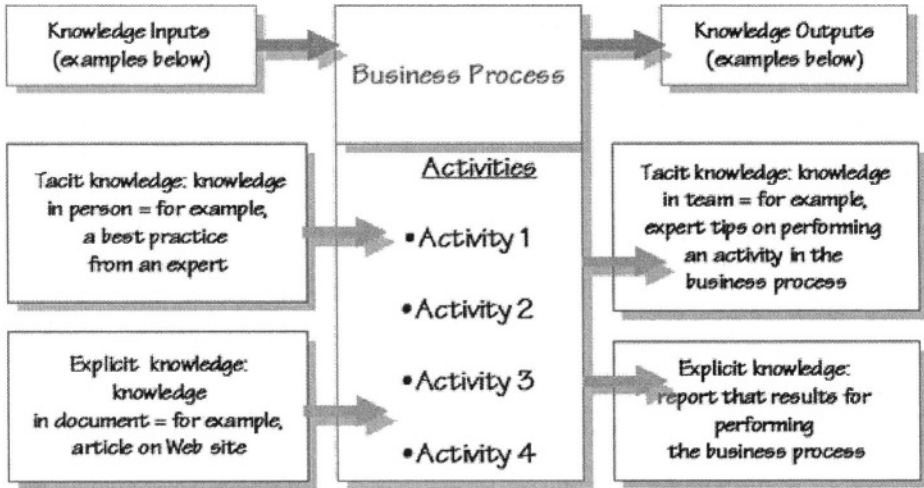


Fig. 3. Process-based Map

Process based k-maps also help to improve the usability of knowledge in an organisation by forcing participants to identify key knowledge areas that are critical to their business. The analysis of the knowledge map generates ideas for sharing and leveraging knowledge most suited to the organisation and the business context. Finally, the clear and simple visual format is easy to update and evolve over time [13].

3 K-map Application Cases

So far, Australian federal agencies have been successful in implementing an initial “Government Online” strategy which ensured that by 2001 all appropriate information and services were available via the internet for those wanting to access them [8]. According to Stephens [16], the growth of online service delivery creates new opportunities, capabilities and expectations. “Better Service, Better Government” is a strategy that maps out the next phase in the federal government’s drive to move on from placing information and services on-line. Key objectives include greater efficiency, convenient access to services, better service delivery, integration of related services, building of user trust and confidence, and enhanced citizen engagements or “e-democracy”.

Knowledge needs to be managed to serve the objective of effective online service delivery. This forces new approaches to knowledge management. However, a stock-take of most notable knowledge management activities in the Australian Public Sector (APS) reveals that very few agencies have incorporated knowledge management into their big picture [16]. The following examples show how some of these agencies applied “knowledge mapping” as a way to increase visibility and usability of their knowledge resources.

3.1 Case One: Australian Bureau of Statistics

Collections of digital content represent an exciting development full of promise for users for research, education and practice purposes. Digital collections include all kinds of electronic material including full-text documents, still and moving images, music, maps, archival manuscripts, geographic and satellite data. Issues of selection, digitisation, organisation and accessibility to these collections are all of equal importance [10]. Concept maps provide a valuable framework for organising digital content around subject areas. They also serve as subject gateways. As an example, this paper examines the website of the Australian Bureau of Statistics (ABS), Australia's official statistical organisation <http://www.abs.gov.au>.

ABS assists and encourages informed decision-making, research and discussion within governments and the community, by providing a high quality, objective and responsive national statistical service. For organising its statistical products, ABS uses a "home-grown" classification scheme. The broad themes include: economy, environment & energy, industry, people and regional statistics. Each of these is further divided into more specific categories. For example, industry theme includes agriculture and rural, building and construction, information technology, manufacturing, mining, retail, science & innovation, service industries, tourism and transport statistics. At the next level are related data and publications. In this way, the concept map outlines the global architecture of a knowledge domain of ABS. By dividing its statistical expertise into logical blocks, ABS helps the user in finding, comprehending and interpreting it.

3.2 Case Two: Australian Government Entry Point

The following example examines the application of the competency map in the context of e-government. As mentioned earlier, competency k-maps act primarily as "yellow pages" or directories, which enable people to find needed expertise. The Australian Government Entry Point <http://www.fed.gov.au> serves this purpose by currently signposting over 700 relevant Australian Government web sites and over 1 million pages of text for knowledge seekers.

It is the Australian Government's aim to provide equitable access to its expertise, and the variety of access approaches available on this site allow users to choose the method that best suits their needs. Customised links are provided for different types of users including individuals, students, businesses and non-residents. For example, the site points to relevant places where best advice on benefits and payments may be obtained for individuals, education related information for students, taxation help for businesses, and immigration tips for non-residents. The site has been developed with useability and accessibility principles as the main drivers for design. The incorporation of a common look and feel across the site with user needs and feedback providing guidance on specific features has resulted in a user-centred design. The site has been designed to keep navigation around the site as simple as possible.

The site is mainly text-based. The home page has been designed to help users find the expertise needed quickly and easily. The goal of this page is to present as much relevant information as possible without overwhelming the user. Good design practice

has been incorporated by striking a balance between keeping the site visually interesting and structuring it so that the layout of pages is logical and accessible. A number of different browsers and versions of browsers are supported to increase the useability of the site. User privacy is maintained at all times. By dividing the government competences into major areas of expertise, and linking users to places where this expertise resides, the map provides much needed assistance to specialised communities of users.

3.3 Case Three: Business Entry Point

A great deal of knowledge is required in order to set up a small business including government requirements, licences and permits, registering the business and reporting requirements, employees' rights and obligations, financial assistance, taxation matters, closing and selling a business [10]. The procedural k-map can be a valuable tool for the prospective businessman by showing the person which steps have to be executed and what knowledge is required at each step of the process. Much of this information can be found from the Australian Business Entry Point (BEP) website <http://www.business.gov.au>.

The BEP is a major online government resource for the Australian business community. It provides business with a wide range of services and information about start-up, taxation, licensing and legislation, as well as significant transactions such as taxation compliance and licence applications. For example, the "Starting a business" page provides an overview of what is needed to be done in each state when starting up a business. It describes all necessary steps to be taken and supplies connections with relevant knowledge sources. By providing this particular process based k-map, the BEP enables businesses to comply with government requirements more simply and conveniently.

4 Issues and Challenges

All maps have advantages and disadvantages. Thus, one of the major challenges facing map makers is to gather the right reference knowledge in a framework that everyone can relate to [4]. This requires continuous user involvement in a participative and interactive manner [18], [19], [20]. There is also the risk of information overload or underload if the map represents too many or too little elements [4]. Other challenges faced by map makers include the reduction of complex structures to graphic symbols, the risk that the commitment to one scheme will lead to the neglect of other perspectives, the danger of using an outdated map, the potential harmful effects if the map is seen by unauthorised users [4].

There is a widespread agreement among academics and practitioners that successful knowledge mapping requires careful planning and implementation, so that the many dangers of making and using low quality maps mentioned above can be avoided. The following guidelines outline a series of critical steps claimed to yield best results [19], [7], [4]. In the planning stage, these are: find a sponsor, determine

the rational and scope, begin awareness building process, identify stakeholders, decide upon the technical requirements, and assign a custodian of the map. In the creation stage the key activities include: collect the information about knowledge needs, hold workshops for users, keep in mind factors that contribute towards an effective k-map, and finally create the map.

Finally, in the implementation stage, a review is suggested of the completed map in terms of four quality criteria: functional, cognitive, technical and aesthetic [4]. Functional quality is evaluated in terms of how well the map serves its purpose, and whether there are an update process and feedback mechanism for improvement. Cognitive quality is evaluated in terms of adequate information load, levels of details, and comparable and discernible elements. Technical quality requires good access time, legibility on various screen resolutions and interfaces, and security from unauthorised access. Finally, aesthetic quality includes scalability and pleasing visual impression through the adequate use of colour and geometry. It is suggested that by meeting these criteria well, k-mapping could become the “killer” KM application in business (and government).

Currently, there are no empirical studies available to reliably inform about the extent to which these guidelines were followed by the government agencies in producing k-maps presented in this paper, or to show if and to what extent the expected benefits have been achieved. Future research is necessary to answer these questions. In the author’s personal opinion, the sample k-maps score fairly well on all four criteria for quality k-maps. They have been designed to serve particular purposes (functional quality) and provide feedback mechanisms for users to suggest improvements. They are also able to be grasped in one glance, while providing the ability to offer various levels of detail (cognitive quality) in a visually pleasing and scalable manner (aesthetic quality). Finally all maps are iterative and flexible so that they promote continuous change, updating and improvement [20] in consultation with map users.

5 Conclusions

The aim of this paper was to provide a better understanding of the role of knowledge mapping in electronic government. From what we have learned so far from the literature and cases reviewed, concept maps help improve the visibility of knowledge in government by allowing citizens to access the relevant domain topics and ideas more quickly. Competency maps converted into yellow pages and directories help citizens find needed expertise, while process maps provide guidance to citizens involved in task execution by showing them which type of knowledge has to be applied at a certain process stage and by pointing to its source. Clearly, the benefits of implementing knowledge maps in e-government can be far reaching. It is hoped that with an improved understanding of the concepts and clear guidelines for development of quality knowledge maps, governments will be able to fully realise these benefits.

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Reconceptualising Government in the New E-ra

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Abstract. The UK e-government initiative is strongly positivist and rationalist, built upon a competency model of efficiency which embraces only explicit knowledge and measurable outcomes. As a result e-government provision is being driven not by citizens' needs but by a techno-centric, bureaucratic culture which is at odds with successful delivery and adoption. We suggest that government must refocus from the current rationalist approach to a broader, cross-boundary, institutionalist discourse which acknowledges socio-technical, cultural complexities at the regional, national and European level. Challenging though this may be, if Web technology is to be exploited fully *and* citizens' needs fulfilled, we conclude that government must acknowledge and seek to harness both tacit and phenomenological knowledge, requiring a fundamental rethink of the form of knowledge being collected, codified, transferred and applied.

1 Introduction

According to Deloitte Research (2002:1) governments are determined to leverage all of the advantages of the new economy in anticipation that the "era of e-government - that is to say transformative government - is here to stay". However, the extent of change is open to interpretation; for some e-government may represent a fundamental transformation of governance, whilst for other it may be incremental and start simply with enhanced services and delivery. Thus, whilst e-government has been 'sold' as a tool to service and support both the citizenry and businesses, definitions and aspirations within these two realms tend to be correspondingly broad, with significant variation in both scope and operationalisation.

In the UK, the Labour Administration not only regards e-government as a new service platform targeted at the needs of the citizens, but also one that allows central government to collect, collate and mine population data economically. For the first time, communicating to and building knowledge about the populace may be done relatively easily, cheaply and quickly. Just as 'knowledge' in commerce is seen as an intangible asset with which to build competitive advantage, in politics its potential as a defence against policy opposition has also been recognised.

The white paper 'Modernising Government' describes e-government as:

"...joined up working between different parts of the government and providing new, efficient and convenient ways for citizens and business to communicate with government and receive services."

The tone and flavour of the white paper points to a strongly positivist discourse, presupposing knowledge to be explicit, rationally- based, objective, highly structured, relatively static and without prejudice or favouritism. Within such a discourse both knowledge structures and processes are clearly delineated and heavily rationalised within a technological framework. Thus, an additional presupposition is that this explicit knowledge may be harvested, fitted together, jigsaw-like, according to a predetermined design and facilitated by technology to produce a holistic 'joined up', easily accessible platform.

This institutionalist vision and the consequent policies and rules of e-government are driven from the highest levels; however the delivery is determined by public sector agencies, government departments and local government. Central government's success or failure is therefore dependent on the latter's willingness and ability to engage the public as envisioned. Although Zhou (2001) argues that conflicts between different departments and agencies can only be coordinated at the highest level of government, this ignores recent trends towards greater agent/client integration where users participate actively in a cumulative feedback loop.

In addition, the increasing assumption of the 'right to know' in modern 21st century society means further pressure on instantaneous information dissemination. The need for government to use advancing technologies for 'real time' communication to the public is aptly summarised by Benn Wegg-Prosser, a former Labour government spin doctor: "The advance in communications methods means you can't really keep such briefings private in the way you used to - mobiles, pagers and the Internet have seen to that." A report by traffic measurement company Hitwise that the official Hutton Inquiry website, which gives information on the death of UK scientist, Dr. David Kelley, was the most visited political website in the UK in July 2003 is a testimony of the public's thirst for knowledge. Yet, government department websites are generally far less sophisticated than corporate websites (BBC News, 3 Sept 2003) and are a long way from maximising the potential for two-way, interactive communications with the public.

Hence, from the citizens' perspective, it might be conceived that whilst e-government services ostensibly fulfil their needs, in fact provision may not be sufficiently timely, adequate, accessible or interactive enough to achieve this in practice. To Muid's (1992:125) far-sighted query, "Are citizens ready to have their governments led by technological innovation?" we add the caution of a lack of synchronisation between vision and delivery.

In this paper we adopt a socially-based approach to question whether assumptions underpinning current e-government communication initiatives are at odds with the historically embedded organisational knowledge and practices of public sector officials and servants, and whether the existing mechanisms for interface, coordination and control are congruent with the rules of e-governance and provision of e-services.

2 E-government for Knowledge Management: 'Spin' or 'Reality'?

Government policies have direct and indirect social as well as economic consequences. For example, Thatcherite free-market philosophy dominated the 1980s and resulted in driving a wedge through the sense of community and greater good in

preference of the so-called 'me-first' society. In the 1990s, under Major, the pendulum began to swing towards a competency-based view of health, education and training needs with increased emphasis upon public sector transparency and accountability, including the introduction of 'citizens' charters' as service quality measures. While sceptics naturally decry such efforts as superficial, the 'reality' of the success of such well-meant initiatives is difficult to construct from officially recorded outcomes, being dependent upon relative perspectives.

With the commercialisation of the Internet, Holmes (2001) saw its potential to extend the competency model of efficiency and effectiveness by enabling streamlining of processes and lowering costs (less paper, printing, mailing, personnel etc.). He also saw it as an opportunity for the UK central publicity machine to market e-government as a citizen-centric, empowering mechanism which offers enhanced choice, access, inclusion and quality of information. Each of these factors would require significant resources and effort to instigate and maintain – presumably emerging from efficiency savings overall. Another publicised reason for central government's push for e-government is the belief that it is an economic way to support and encourage business development. Through real-time provision government can help local businesses gain competitive advantage by providing data and information to aid decision-making. At the macro level other drivers of e-government include creating awareness and raising the national profile of a country (e.g. New Zealand and Australia) and for smaller countries to compete in the global economy (e.g. Singapore, Malaysia). Therefore, given the popularity of e-governments on political agendas around the globe, it might be viewed as a channel for keeping UK Plc and the Labour government on the world map. Certainly UK Prime Minister, Tony Blair, was quoted as saying "If you don't see the Internet as an opportunity, it will be a threat" (Financial Times, 1999).

Against this Utopian view are voices asserting wider social exclusion and divide between those who have access to the Internet and those who do not or cannot. One such report is that by Continental Research (2002) which identified the existence of the 'digital divide' between the 'e-literate' and those lacking access and/or confidence. Lee-Kelley and James' (2003) study confirms the earlier report and also highlights language as another barrier. With sections of society excluded from electronically-based communications, this has implications both for the effectiveness of such communications and the type, calibre and function of the intelligence collected.

Furthermore, the Society of Information Management Technology (SOCITM) (2003) has criticised the UK white paper, particularly its prescribed date of 2005, arguing that authorities which are already struggling to meet other government initiatives will fall further behind. This augments Seward's (1998) earlier report on delivery barrier issues which included short-termism, training public servants, seeking consistency across multiple jurisdictions and matching services to demand. This begs the question of whether the government's vision of efficient, convenient communications will ever be much more than 'spin'.

To make sense of this we draw upon knowledge-based organisational theory which identifies the essence of organisational capability as the integration and creation of knowledge. Following Penrose (1959, in Lam, 2000) knowledge-based theory regards the organisation itself as a body of knowledge residing in its structures of co-ordination. According to Lam (2000) from this base observed differences in organisational principles between organisations reflect their differing knowledge

bases and capabilities. Despite on-going, radical reform, the UK public sector remains functionally structured, bureaucratically uncommunicative and increasingly process driven. Thus, if organisations are to be conceptualised as bodies of knowledge residing within structures of co-ordination and if capability is to be measured in terms of knowledge integration and creation, then a generous definition would be that public sector capability is 'bounded.'

Disaggregating spin from reality also requires consideration of the taxonomic distinction of knowledge along the two dimensions of *degree of aggregation* and *degree of articulation* (Spender, 1996; Nonaka and Takeuchi, 1995; Lam, 2000). Whereas the prevailing conceptualisation, organisation and delivery of e-government presupposes knowledge to be explicit and therefore easily aggregated, structured and stored, the reality is much more complex. Following Polanyi's distinction, even if the stored knowledge is explicit, the nature of e-government delivery requires some degree of tacit knowledge, personal know-how, skills and motivations in order to manipulate the technology and access the stored knowledge. Additionally, as Nonaka (1994, in Lam, 2000) points out, the individual's involvement in the context is crucial in determining the generation and accumulation of explicit knowledge, thus supporting the broad consensus that the distinction between explicit and tacit knowledge is artificial and that in practice the two are mutually reinforcing and dependent. The challenge for government is to balance the desire to provide extensive knowledge management *capabilities* through the technological platform, which may never be exploited fully, with a recognition that the design of organisational structures, processes and procedures should consciously and deliberately *spread* tacit knowledge across departmental boundaries. This is the essence of knowledge articulation, which we argue is a pre-requisite for successful knowledge management. Lubit (2001) identifies the limited efficacy of most knowledge management efforts as being due to an overwhelming focus on creating the means to capture and store information and improve communication at the cost of persuading people to *use* systems effectively.

Hence, there appear to be inconsistencies between the prevailing highly structured, rationalist approach to e-government and the actual delivery of knowledge through e-services. Provision appears to be driven by presuppositions which accommodate the prevailing techno-centric context and bureaucratic culture rather than by a determination to respond to citizens' requirements. Evidence suggests that internal structures and processes, behavioural norms, managerial practices and outcome measures collude to reinforce historically embedded practices which do not fit comfortably with the new communications-based electronic era. A scan of 'ukonline' and most of the government local authorities, boroughs, health authorities and other agencies/departments reveals their websites at varying stages of 'e-readiness'. Few are fully integrated and interactive and many are in fact 'shells' with minimal information and navigability. Indeed, one example indicating the resistance of government departments to change (or if one were charitable, it could be the result of resource constraints), is a word-processed letter sent by post, in reply to various email chasers by a citizen's inquiry about his application for council tax exemption for an unoccupied flat: apparently, the official target for reply to any correspondence (including emails) is 10 working days!

It is hardly surprising therefore, that public cynicism prevails as to the 'true' motives of government, which they see as couched in neo-liberal managerial tones, engineered from the top with little input from the grass-roots. It may be that central

government needs to move away from regimenting assumed knowledge to permit greater local autonomy at departmental/agency level. This might facilitate the incorporation of local knowledge as well as real communication between provider and user, thus potentially neutralising the biases of those producing e-government information. Perhaps a deeper understanding of both tacit and phenomenological knowledge is required in order to optimise adoption and maximise the value of e-government services to citizens – though this in itself may be an anathema to the agents actively involved in the production and management of e-service provision. However, of note is the question: Rose tinted glasses apart, how aware *is* central government of the structural limitations of their systems and resistant behaviour of their officials to offering a truly citizen-centric public-interface? To understand the veracity of the divergence between vision and delivery, we propose that the answer might lie in the ‘biases and purposes’ of the philosophy of knowledge management within public management theory.

3 ‘Biases and Purposes’

The government’s approach draws heavily upon what Bourdieu defines as theoretical knowledge, in other words the construction of the *objective* relations that structure practice and the representations of practice. According to Acciaioli (1981) theoretical knowledge attempts to delineate structures existing prior to persons, structures that make possible the knowledge and primary experience of those persons. Conceptualising explicit knowledge in these terms fits comfortably with the dominant managerial model of governance, characterised by the economic rationalism of human capital theory in which individuals are both willing to and capable of maximising their own value. This discourse fashions the structuring and presentation of knowledge such that it facilitates economic-rational man’s decision-making.

Similarly, the dominant managerial discourse dictates organisational forms which promote efficiency and effectiveness, productivity and profitability. Thus, the government’s drive towards e-provision is essentially prescribed and imposed from the centre. According to Armistead and Meakins (2002) such an approach is usually accompanied by formal structures and bureaucratic systems to capture, store and distribute knowledge, with attempts to measure the value of knowledge through formal systems. Within such a context there is a strong emphasis upon measurable outcomes and the capability of technology within an increasingly competitive culture. According to Nielsen and Ciabuschi (2003), however, knowledge sharing decreases as the level of competition within an organisation increases. Thus, within a bureaucratic regime there is an unspoken motivation *not* to share knowledge since, as identified by Weber (1978) the power of the bureaucrat rests upon two types of knowledge; ‘technical know-how’ and ‘official information’. As the former may be shared by many, an individual’s ‘competitive advantage’ may lie in the latter, particularly if gleaned informally. Thus, organisational culture is a key determinant of knowledge-sharing and communication. Damodaran and Olphert (2000) posit that an overly techno-centric approach may fail to produce a culture and context which nurtures organisational learning. Somewhat paradoxically, they identify such an approach as the most common cause of the failure of knowledge management systems. Damodaran and Olphert (2000) espouse instead a *socio-technical system*

which has as its objective the management and *sharing* of knowledge to support the achievement of organisational goals. This supports Lam's (2000) view, drawing upon Boisot (1995) and Lam (1996; 1997), that the extent to which tacit knowledge constitutes the knowledge base of the organisation and how it is formed and used are powerfully shaped by the broader institutional context, and, further, that an interactive relationship exists between the dominant forms of knowledge and organisational form (Lam, 2000.)

Considering the wider institutional perspective we may draw upon Foucault's conception of institutions from a technological perspective that is as practices that put in play certain assumptions and objectives concerning the selves that inhabit them (Foucault, 1977 in Rose 1992.) This may explain why despite decades of substantive and ongoing reform, a number of civil service departments and public agencies might still be described as 'sclerotic, unresponsive and inefficient government, entrapped by iron triangles, unionism, and overbearing civil service' (Dobel, 2001:167) - though Dobel was referring to the 1970s and early 1980s. Despite government rhetoric, cross-boundary integration of departmental knowledge has fallen well short of expectations. Communication is woeful inadequate; multiple points of contact continue to exist with minimal integration or knowledge-sharing, or even information being in a sharable format. E-government services may be failing to reach their potential in terms of usefulness and usage because the citizen-centric e-government rhetoric is at odds not only with the prevailing techno-centricity, but also the established and powerful socio-cultural dynamics within and across departmental boundaries.

Additionally, within bureaucratic departments historically embedded institutional practices are likely to distort further the pursuit of e-government objectives. These may encompass individual as well as departmental objectives and priorities as well as decision-making routines, the format and style of operational processes etc. Thus, the sought knowledge synergies may remain illusory because, according to Nielsen and Ciabuschi (2003) more specialised, focused initiatives are easier to measure - and have the advantage of already being in existence. Such practices serve to reinforce existing norms and priorities and, far from being reshaped by the e-government platform, actually fashion the knowledge and technology in order to facilitate integration into the existing context. Grote and Baitsch (1991) observed similar patterns with the introduction of I.T., concluding that a knowledge sharing culture must either already exist or be developed in parallel with the introduction of technology. This is supported by Mohrman et al (2002) who identify knowledge sharing as one of four identifiable work behaviours which impact upon the effectiveness of knowledge generation, leveraging and application (the other three being: focusing on system performance rather than narrow technical outcomes; following systematic processes, and trying new approaches.)

Integration can not be achieved unless departments are willing to cooperate, yet in practice conflicts arise at both departmental and personal levels over the sharing, management and ownership of knowledge. Husted and Michailova (2002) posit that individuals are inherently hostile to knowledge sharing. This may be due to feelings of vulnerability as it might be thought that the essentially process-oriented tacit knowledge held by civil servants could more easily be replicated than other forms of expert knowledge. Nielsen and Ciabuschi (2003) identify this as 'loss of personal market value' in other words the fear of becoming superfluous if personal or tacit knowledge is shared with others. It could also be that if knowledge transfer is not an integral part of operational processes there is unlikely to be much support for

dissemination for its own sake, particularly as, as identified by Nielsen and Ciabuschi, (2003), the sharing of knowledge takes time, which people in general do not have. Effective forms of knowledge management focus need to be *action* focused – if not, they will not be considered relevant and very possibly ignored. Unfortunately, according to Lubit (2001), people are not only hesitant to share what knowledge they have, but equally hesitant to use the knowledge of others – the ‘not invented here syndrome.’ This can only be overcome by proactive *management* which, having identified the value residing in the knowledge, be it explicit or tacit, specifies the sharing and application of knowledge as an expected, rather than a desired behaviour.

Though management may be extremely influential, success remains elusive. Individual managers may be unable to switch from their established mechanisms of coordination and control to those involving a people/technology mix. This may be exacerbated by the problem identified by Armistead and Meakin (2002) of technological expertise being located with I.S. experts and users performing sub-optimally through skill deficiencies. Difficulties in judging the relative effectiveness of the employee and the technology therefore may discourage managers from playing a critical role not only in capturing appropriate and relevant knowledge but working towards the creation of a knowledge culture. Additionally, managers may simply be ill-equipped to codify knowledge, particularly if tacit in nature. Thus, in sum, uncertainty, lack of ownership and a degree of technophobia may all contribute to an overall lack of willingness and ability to integrate, impacting negatively upon e-government provision and effectiveness.

4 Conclusion

The dominant inclination in modern society is the legitimacy of rationalised and logical forms of knowledge, which totally ignores other ways of doing and thinking about truth and reality (Garvey and Williamson, 2002). In the context of our present discussion, this tendency certainly appears to be exhibited by UK central government in their approach to e-government and knowledge management. This lack of understanding of the complexities of human logic coupled by inadequate investment, and systems and infrastructure limitations serve only to create a frustrating divide between an ambitious vision and an under-developed delivery.

In this paper, we have limited our discourse to the boundaries of the United Kingdom, however the global nature of the information super-highway is such that e-government exchanges are very much part of the ‘whole’ knowledge creation phenomenon. It is crucial that future examinations of e-government vision and delivery should include accompanying cross-border issues. Instantaneous communications of world events (e.g. September 11, SARS and currently, the occupation of Iraq) and technology enabled shifts in working and leisure patterns, are important markers for changing informational relationships. There is also an increasing willingness towards greater cooperation between various law enforcement agencies. Ultimately this Europe-wide or even global policing would necessitate a revamp of localised government attitudes and competencies in favour of higher connectivity. Presumably, this logic would apply throughout the entire governmental structures. In the EU, individuals are no longer subject to all embracing, local

sovereign laws and regulations – there now exists, a higher authority and power residing in Brussels! Through the Internet and the e-government vehicle (provided they are suitably well advanced in their ‘transformation’), citizens can use the knowledge to make enlightened decisions of where to live and where to work to maximise income and quality of life. For businesses, e-government is cross-border government and there is a need to review their expectations of what these e-services and provisions can do to enhance or protect their competitiveness – indeed protecting them from whom.

In short, we conclude that the conceptualisation of knowledge, has moved from a small, regionalised ‘K’ to a larger, more complex, ‘K’, and its collection and collation, will need to be carefully understood, defined and crafted for informed government decisions and policies. Sir Isaac Newton’s explanation of his success: ‘If I have seen further, it’s because I have stood on the shoulders of giants’ is an apt reminder of the need for government to listen and learn from others.

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Business Models and Governance Strategy of Policy Knowledge Service for National Knowledge Management

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Abstract. A national knowledge management system consists of internal knowledge management systems of governmental agencies and various knowledge services playing a role of intermediary, catalyst, and network. A policy knowledge service plays the roles of abstracting, codifying, and diffusing knowledge in public sector. Through abstraction and codification, it maximizes the proprietary value of knowledge. Through the diffusion of knowledge in proprietary form into public sphere, it maximizes the shared value of knowledge. In this paper, the business model and governance strategy of policy knowledge services are discussed through theoretical understanding and practical experience of operating Korea's Knowledge Center for Public Administration and Policy. Three dimensions of policy knowledge services and two hypotheses on the governance of policy knowledge services are suggested.

1 Introduction

As the complexity of public management and policy making environment continues to increase, the importance of systematic support of decision making process is continually increasing. On the other hand, knowledge becomes one of critical components in decision making of modern society, creation of value, and institutional change. Therefore, the problem of creating and managing the knowledge systematically becomes the core issue of modern organizations.

However, knowledge environment supporting the policy making has been poor. Most of governmental organizations have not yet set up knowledge management system. Though there have been some efforts for integrating knowledge management systems, they are not successful. The knowledge and information for policymaking still depends on the limited knowledge, data, human network of individual public officers. Such problem is more severe in local governments, but central government also suffers from the same problem.

In the mean time, as digital networks are diffused, the size of digital content industry and the services supplying high-level knowledge for private and public sectors radically increase. However, their business models are not soundly established and the mechanism of cooperation and governance between the businesses and governments has not been settled.

This paper deals with the issue, that is, what are the desirable business models and governance mechanism of policy knowledge service. Building national knowledge-

management system cannot be successful only with government's efforts. For its success, the role of policy knowledge services is important because they act as catalyst and intermediary of knowledge creation and sharing. Since the policy knowledge services exist external to government organizations, the government should have a sort of governance [6, 11, 13, 14] mechanism with them. With this premise, this paper applies knowledge theory and the concept of business model to policy knowledge service for building up the basis of analyzing the role and its direction of policy knowledge services.

First, we discuss policy knowledge service based on the recent knowledge theory such as I-space [2] and the reversed hierarchy of data-information-knowledge [16].

Second, we introduce the concept of business model as the framework to define and classify policy knowledge services since a policy knowledge service is a business whether its entity is private or public.

Third, based on the theoretical understanding of policy knowledge service and the experience of operating a policy knowledge service, KP&P (Knowledge Center for Public Administration & Policy), we propose some hypotheses for building and governing policy knowledge service from national knowledge management perspective.

2 Characterizing a Policy Knowledge Service

The development of digital network is generally claimed to advance the speed of knowledge diffusion. However, this claim needs to be analyzed more precisely. Knowledge is owned by an individual and is not easy to be observed by a third entity. If knowledge is something that cannot be diffused easily, the term 'knowledge service' might not be appropriate since the knowledge cannot be easily served. As the expression 'Who knows it?' is more natural than 'Where is the knowledge', knowledge is linked tightly to its agent [3]. Therefore, it can be claimed that though digital networking has increased the speed and amount of data and information diffusion, the speed of knowledge diffusion might not be much changed since some knowledge cannot be easily separated from its agent. However, the 'death of distance' from digital networking is a reality in some domains. This implies that the speed and amount of knowledge diffusion is dependent on the characteristics of knowledge.

2.1 Policy Knowledge Service from Tuomi's Reversed Hierarchy

For deeper understanding on knowledge characteristics and characterizing a policy knowledge service from the understanding, we first introduce Tuomi [15]'s new conceptual hierarchy on data, information, and knowledge, asserting that data emerges from information and that information emerges from knowledge. This claim seems to be against the existing explanation that data is simple facts and they become information when combined into a meaningful structure and the information become knowledge when it is embedded into a context. According to the traditional perspective, data is the precondition of information and the information is the precondition of knowledge.

Tuomi's reversed hierarchy gives a new paradigm that leads us to a different approach in developing information systems for supporting knowledge management and

organizational memory. However, Tuomi's claim complements the existing explanation rather than ignoring it. It is certain that a data clearly depends on a knowledge that produces the data. A data D_A can emerge when a knowledge K_A is assumed and the sender and the receiver of D_A should share the knowledge K_A for their communication of D_A . The new claim that generating a data should be based on some knowledge cannot deny the existing claim that a new knowledge is generated from a data. For example, from a customer's purchase data we can get some knowledge on the customer's purchase behavior. In other words, if we analyze the data D_{A1} , D_{A2} , D_{A3} assuming a knowledge K_A , then we can get a new knowledge K_B .

Tuomi's claim throws and answers questions such as "How is a 'knowledge' service different from 'information' service or 'data' service?" and "What unique functions does a 'knowledge' service perform?" If we apply the Tuomi's claim rigorously, then knowledge cannot be serviced since knowledge cannot be separated from its agent. If knowledge cannot be separate from its agent, then the knowledge service should serve the agent, a human or an information system that processes data and information with the knowledge. The degree of knowledge separability determines the basic two knowledge management strategies: codification and personalization [5]. Codification strategy is used for the knowledge separable and personalization strategy is adopted to knowledge inseparable. Kankanhalli et al. [7] suggest two-by-two contingency for adopting the knowledge management strategy using two dimensions: 1) produce-based vs. service-based organization and 2) volatility of environment. The volatility means the rapidity of change in the business environment and thus the extent to which knowledge can be economically reused. According to the contingency, some domains such as product-based organizations in a high-volatility context should mix the codification and personalization strategy. On the other hand, a government agency, basically a service-based organization, can choose an extreme strategy depending on the volatility of the domain. In high-volatile policy domain such as central government policy makers, we should use personalization approach. On the other hand, for the low-volatile public domain such as local government administration officers, we can adopt codification approach.

On the other hand, we need to answer the question 'why the clients demand the knowledge service?' Clients need knowledge for solving a problem or making a decision. There is no data without assumed knowledge and there is no knowledge without presumed problem solving or decision making. Therefore, knowledge is connected to a decision making problem. A knowledge service is a service for solving a problem and a data service assumes a same level of knowledge shared between the service provider and the client. The important characteristic of knowledge service different from that of data service is the level of knowledge. A data service assumes the same level of knowledge between the provider and the recipient, but knowledge service assumes the different knowledge level between the provider and the client. The difference between knowledge service and data service is on the existence of difference in interpreting what is provided. While a data service assumes no difference of interpretation between provider and recipient, a knowledge service assumes the variety of interpretation between provider and recipient.

2.2 Policy Knowledge Service from Boisot's I-Space

For more advances in approach to characterizing a policy knowledge service, we introduce Boisot [2]'s I-space framework introducing the concepts such as abstraction, codification, and diffusion of information. According to Boisot [2], knowledge is classified into 'concrete' and 'abstract', 'uncodified' and 'codified', and 'undiffused' and 'diffused'. A piece of knowledge which is concrete, uncodified, and undiffused, is more and more abstracted, codified, and diffused. During the process 'personal knowledge' becomes 'proprietary knowledge', and through 'textbook knowledge' into 'commonsense knowledge'. Boisot, using the I-space, explains the dilemma of knowledge creators. The value of knowledge is maximized to the knowledge creators when it is abstract, codified, and undiffused. On the contrary, the most valueless knowledge is concrete, uncodified, and public knowledge.

Using the I-space concept, we can characterize a knowledge service. A knowledge service abstracts, codifies, and diffuses knowledge. Through abstraction and codification it maximizes the value of knowledge, and through the diffusion of knowledge in proprietary form into public sphere it makes high the utilization of knowledge. The roles of policy knowledge service can be classified into the two ones.

A policy knowledge service contributes to moving knowledge in 'A' location to 'B' in Figure 1. It maximizes the proprietary value of knowledge by abstracting and codifying a data and information into a generalized and documented knowledge.

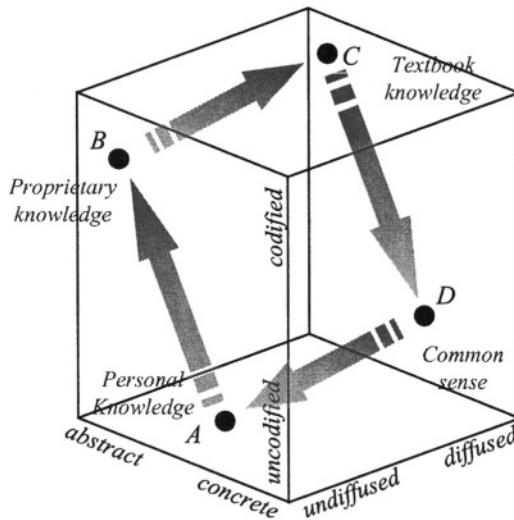


Fig. 1. Move of knowledge in I-Space [2]

The other policy knowledge service contributes to moving knowledge in 'B' location to 'C' in Figure 1. It diffuses the value-maximized propriety knowledge into society so that public can get benefits from its usefulness. The first service has the role of maximizing the proprietary value of knowledge and the second has the role of maximizing the shared value of knowledge. Both roles are important and a policy knowledge service organization can play either or both roles.

Summarizing the above discussions, we define and characterize a policy knowledge service as follows:

1. A policy knowledge service is differentiated from other policy data or information services in that it assumes the different knowledge level between the service provider and the client and the potential variety of interpretation between the two.
2. A policy knowledge service basically has two kinds of knowledge service strategies, codification and personalization, depending on the degree of separability of knowledge in a policy domain.
3. A policy knowledge service has two roles. The first role is maximizing the proprietary value of policy knowledge through abstraction and codification of knowledge in the domain. The second role is maximizing the shared value of policy knowledge through its diffusion.

3 Business Models of Policy Knowledge Service

A policy knowledge service is a business whether its entity is private or public. To successfully sustain as a business, a policy knowledge service should develop a good business model. An initiator of policy-making knowledge service should analyze its business from a business model perspective.

Business model is a description on the way of activities of a profit or nonprofit organization to develop and sustain its business. Since the year 1998, there have been many efforts to define and analyze the business model especially in e-commerce and e-business domain as well as e-government domain [8]. Timmers [14] defines a business model as: 1) an architecture for product, service and information flow, with a description of the various business actors and their roles; 2) a description of the potential benefits for the various business actors; and 3) a description of the sources of revenues. Mahadevan [9] suggests the three business model building blocks such as value streams, revenue streams and logistical streams, and claims that a business model is a unique blend of the three. Amit and Zott [1] define a business model as the design of transaction content, structure, and governance to create value through the exploitation of business opportunities.

Different from the definitions of [1], [9], and [14], those of [4] and [11] include the concepts of customer and the market. Rayport and Jaworski [11] define a business model as the four choices on (1) a value proposition or a value cluster for targeted customers, (2) a market space offering – which could be products, services, information or all three, (3) a unique, defendable resource system, and (4) a financial model. From a technology management perspective, Chesbrough and Rosenbloom [4] state that a business model is composed of 1) value proposition, 2) market segment, 3) value chain structure, 4) cost structure and profit potential, 5) value network positioning, 6) competitive strategy.

Summing up the above definitions, we give an comprehensive definition of business model. A business model is a description of following components and each of them should be determined contingently considering technological change, institutional change, competitive environment, and macro-economic environment.

1) Value Model (Value proposition and marketplace offering): The value and its realization such as product, service, and information etc. proposed to business participants including customers by the business initiator.

2) Customer Model (Target customers and market segmentation): The customer groups and their segmentation who enjoy the ultimate value.

3) Activity Model (Positioning in the industry and activity configuration): The scope of business activities of the business initiator and its activity configuration within the scope.

4) Financial Model (Cost structure and profit model): The time and monetary cost to initiate and sustain the business and the revenue and profit estimated.

Using the definition of business model, we analyze the policy knowledge service. The value proposition and marketplace offering of a policy knowledge service include a solution to a policy problem, knowledge support for a policy decision making (policy theory and practices, and legal information), policy expert network, and policy community and forum etc.

A policy knowledge service cannot serve all kinds of customers, so policy knowledge services can be classified depending on their target customers. For example, national research institutes of specific policy domains define the target customers as the public officers on the policy area and some research institutes provide knowledge service for local governments.

The third component of a policy knowledge service, activity model, includes the choice between 'demand-driven' or 'supply-driven' service. This classification is similar to the choice of manufacturing value chain between 'make-to-order' and 'make-to-stock'.

The core of financial model of a policy knowledge service is its ownership, government support, and revenue model.

4 A Case Study: Business Model Evolution of KP&P

Knowledge Center for Public Administration & Policy (www.know.or.kr) established in 2001 is a government-supported organization located at a national university of Korea. With the mission of supporting effective public decision making and promoting informatization of the public knowledge management, the center has a vision of systematically collecting, analyzing, managing, and disseminating the information and knowledge produced in the various communities of public sector. However, the business model of KP&P has been evolved through trial and errors as Figure 2.

The center started as a voluntary knowledge sharing network for public sectors. To promote the voluntary knowledge sharing between members, the center decided to first accumulate about thousands of policy knowledge items gathered from other open Web sites into its knowledge base. However, the quality of knowledge was not satisfactory because the average cost per a knowledge item was ten dollars. The steering committee of the center judged that the low quality knowledge items would not satisfy public officers and decided to defer the official service opening of the knowledge base. The voluntary knowledge sharing was also not active than expected, the center modified its business model from the knowledge sharing network to knowledge provider. Therefore, the center temporarily determined its business model as a demand-driven virtual knowledge network and had interviews with its potential customers

(public officers) for gathering opinions on its business model. The result of the interview made the center change its business model again. The demand-driven virtual knowledge network model assumed providing knowledge rapidly by itself or by cooperating with other knowledge suppliers when a public officer notifies its service request to the center. Public officers doubted the capability and the agility of the center which has a small government-supported budget. In addition, the center doubted its potential demand since such a business model has been adopted by various research institutes and consulting companies.

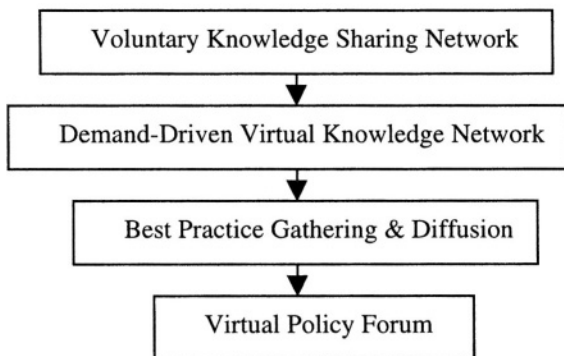


Fig. 2. Business Model Evolution of KP&P

The interview with officers guided the selection of knowledge types that the center should focus on. Initially the knowledge sharing Web site of the center has a knowledge map covering 40 knowledge types and 400 policy areas. However, among the various types of knowledge, the officers had the information needs only on a few areas such as best practices, expert information, legal information, knowledge-on-demand, and policy rationale etc. The scope of five knowledge types is still too wide for the center with a limited budget to maintain high-level quality on.

The center finally decided to focus on the best practices among the five knowledge categories. This is a decision on the value proposition and marketplace offering of the center, the first component of its business model. Now the business model of KP&P became the 'Best Practice Gathering & Diffusion'. For its activity configuration, the third component of its business model, the center decided to gather, evaluate and rework the existing best practices rather than create them. The target customers, the second component of its business model, were determined as the local government officers rather than central government officers because local government officers had suffered much more than central officers from the so called knowledge gap. Although the center has been and would be financially supported (\$400,000 per year) by government for four years since the year 2001, it should develop its own profit model to sustain itself after the year 2005.

Based on the 'Best Practice Gathering & Diffusion' business model, the center has accumulated and diffused best practices through the programs such as Local Government Best Practice Competition, Best Local Government Officer Case Studies, Public Sector Reform Cases, and Best Practices of Leading Local Governments. On the other hand, in the summer of the year 2003, KP&P launched a new service 'virtual policy

forum'. It opens eight policy forums on the central policy areas such as e-government forum, public sector reform forum, balanced regional development forum, health and medical policy forum, information and telecommunication policy forum, and human resource policy forum etc. For a half year, the center held more than fifty virtual policy forums. Each forum has one or two presenters and four to six commentators on the main presentations. The center with the new service changed its target customers from local government officers to central government officers, legislators, and policy experts. The center sends the forum information by email to their members. This new business model gives an interesting implication that the center evolved its knowledge service strategy from codification (i.e. best practice diffusion) to personalization (i.e. virtual forum).

As seen in the above, the business model of KP&P has been being evolved continuously and the evolution itself can be a right strategy rather than a trial-and-error. Since the adaptation and the evolution of business model demands flexible online information system to KP&P, the center develops and maintains knowledge management systems with an emphasis on flexible service offering and management.

5 Governance Strategy of Policy Knowledge Service

The theoretical investigation and practical experience of operating KP&P give some insights to governing policy knowledge service from national knowledge management perspective. It is an important for a nation to design and improve its national knowledge management system for supporting its policy decision making. One of core issues of national knowledge management system is governance problem such as whether to privatize a policy knowledge services or not, what to privatize, how to network policy knowledge services with internal knowledge management systems of government agencies. Summing up the above discussions, we suggest three dimensions to guide the governance strategy of policy knowledge services: 1) Proprietary Value Maximizing vs. Public Value Maximizing, 2) Supply-driven vs. Demand-driven, and 3) Private-owned vs. Government-supported.

The two hypotheses we propose are as follows:

1. The proprietary value maximizing function of policy knowledge service should be demand-driven and privatized
2. The shared value maximizing function of policy knowledge service should be supply-driven and fully supported by government

These principles, however, have not been well implemented in real world. Many current policy knowledge services seem to have ambiguous business models mixed with the proprietary value maximizing function and the shared value maximizing function. The main tasks of most national research institutes are providing demand-driven knowledge services requested by the upper-level ministries. Sometimes they perform the consulting work requested even by private companies. The knowledge created in such environment is shallow and short-lived knowledge. Such knowledge cannot be diffused to other domains and its public value is low. This kind of knowledge service needs not to be done by government-supported organization. The government-supported knowledge service entities should devote their efforts to make long-term nation-wide competitive knowledge and diffuse the proprietary knowledge

to public rather than to provide the short-term knowledge demanded by daily policy making.

A 'supply-driven' knowledge service should be supported by government. For example, best practice based policy knowledge service should be fully supported by government and supply-driven so that best practices could be diffused rapidly to other governments without much concern on its intellectual property. In the U.K., the domain of good practice database service was changed from ORG (Goodpractice.org.uk) to GOV (benchmarking.gov.uk).

6 Conclusions

In this paper, we propose policy knowledge service elements and their composition and governance for building a national knowledge management. Based on the theoretical understanding and practical experience, we suggest a hypothesis claiming that the proprietary value maximizing function of policy knowledge service should be demand-driven and privatized while the shared value maximizing function of policy knowledge service should be supply-driven and fully supported by government. In addition, a policy knowledge service should choose an appropriate knowledge service strategy between codification and personalization according to the characteristics of the policy domain. Applying these principles we propose following practical guidelines.

1. Best practice-based knowledge service, such as the 'best practice gathering & diffusion' business model of KP&P, based on codification strategy for local government administration should be supply-driven and supported by government
2. Virtual policy forum service, such as the 'virtual policy forum' business model of KP&P, and policy expert directory based on personalization strategy for central government policy making should be supply-driven and supported by government.
3. Demand-driven and personalization-based policy knowledge service such as special-purpose benchmarking and consulting should be privatized rather than supported by government.
4. Demand-driven and codification-based policy knowledge service, if any, should be privatized.

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Knowledge Management in Delivering Customer Oriented Services in Public Sector

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Abstract. Today in response to the changes in global economy, growing customer demands and increasing IT possibilities the public sector adapts approaches that have proven to be successful in business environment. Many private companies have successfully implemented customer relationship management strategies and are starting to use knowledge management applications to improve the quality and efficiency of customer service. The paper addresses the question whether the knowledge management approach that has proven to be successful in business environment is applicable to the provision of public sector services. The answer to the question is based on research of academic and business literature, as well as experience gained from participation in Riga¹ municipality e-city project.

1 Introduction

Knowledge management (KM) has recently attracted significant attention in business environment as a powerful tool to increase corporate competitiveness by means of more efficient governance of companies' information assets. KM has to be treated as operating philosophy rather than a specific application category, which is applicable to all business process areas of the company [2]. Customer service and support has proven to be the area where the application of knowledge management models and tools demonstrate most significant and tangible benefits for companies. Integration of knowledge management and customer relationship management (CRM) clearly shows high synergy potential and is becoming a hot issue both in business and academic circles [1].

Today the public sector faces major challenges arising from the emergence of information society. Under the logo of e-government projects governments and municipalities are implementing modernization programs to meet new requirements of society. Along with e-democracy and efficiency improvement initiatives governments and municipalities around the world are implementing CRM projects aimed at increasing the accessibility and quality of public services employing the experience of private sector in this area.

¹ Riga is the capital of Latvia, with the population of 850 000.

The paper addresses the question whether and to what extent the application of knowledge management methods in the customer service area that have proven to be successful in business environment are applicable to the public sector. The answer to the question is based on the research of available academic and business studies in this area as well as experience gained from participation in Riga municipality e-city project.

2 Knowledge Management and CRM in the Private Sector

Knowledge management is an ample concept and, unfortunately, lacks a commonly accepted definition. In this paper the authors will define KM as a process of identifying, capturing, retrieving, sharing, and evaluating intellectual and knowledge-based assets through which organizations generate business value. Most often, generating value from such assets involves contribution of employees, departments and even other companies to the common effort aimed at devising the best practices. It is important to note that while KM is often facilitated by IT, technology by itself is not KM. The examples of application categories that could imply knowledge management approaches are:

- web portals and content management tools;
- document repositories;
- search engines;
- data warehouse and business intelligence tools;
- expert systems (case-based reasoning);
- workflow systems;
- collaboration and groupware systems;
- natural language queries processing systems;
- images handling systems.

The early adopters of knowledge management initially have been global, multinational companies. Because of the market force and the need to become more competitive by bringing more value to their customers, companies had an urge to exploit more effectively one of the most valuable assets: the knowledge. Thanks to the natural driving force – competitiveness, companies had been investing and developing complicated knowledge management systems that supported their business needs. These systems supported collecting, capturing and disseminating knowledge in the most effective way.

As stated previously, KM has to be perceived as an operational philosophy that could add value to all areas of a company's operation. Meanwhile, there is a consensus among business analysts, academic researchers and business people that customer relations, service and support are the areas where the application of KM could bring most significant tangible and intangible benefits to company. Knowledge management is playing an important role in numerous aspects of comprehensive customer relationship management initiatives. Enterprises that incorporate KM processes as part of their CRM initiatives have a higher probability of success than those that do not. [3]

From a CRM perspective, many CRM processes (service, sales and marketing) clearly rely on knowledge resources. This can be illustrated by the following examples:

- knowledge about the product use or service quality;
- knowledge about customer behavior and preferences, customer relationship history;
- sales personnel knowledge, such as best sales practices and customer care details;
- market intelligence and analytics, such as market growth statistics, market structure and trends, driving forces, forecasting;
- business partner knowledge, such as the complementary services and products of interest to customers;
- knowledge of and about business processes - how and why processes are designed and interact;
- knowledge of contracts or partner agreements;
- skills and competencies of employees;
- expectations, needs and aspirations of employees.

Integration and eventual synergies of KM and CRM concepts can be analyzed using process-oriented approach [1]. According to this study knowledge flows in CRM processes can be classified into three categories:

- *Knowledge for customers* is required in CRM processes to satisfy knowledge needs of customers. Examples include knowledge about products, markets and suppliers;
- *Knowledge about customers* is accumulated to understand motivations of customers and to address them in a personalized way. This includes customer histories, connections, requirements, expectations, and purchasing activity;
- *Knowledge from customers* is knowledge of customers about products, suppliers and markets. Within interaction with customers this knowledge can be gathered to feed continuous improvement, e.g., service improvements or new product developments.

The practical experience of application of KM in CRM shows that KM brings real competitive advantage for the companies. By employing knowledge technologies, the companies that focus on quality, customer intimacy and revenue generation, reap the greatest competitive advantage. According to the AMR Research report [4] where large service and support organizations were interviewed, effective knowledge management system utilization has resulted in several benefits. Through the use of knowledge management, companies become more competitive in their service because of the increase in cost effectiveness, quality, and customer intimacy. Nearly all companies gained return on investment from implementing knowledge management systems within the first year. Companies achieved considerable cost reductions because of the increase in service quality. Mainly they have succeeded because of the self-service increase, reductions in call center activities and increase in call efficiency. Through the use of knowledge management and its underlying processes, companies are determining the internal deficiencies and learning what a customer needs to get the most. Customer segmentation allows companies to get closer to those who are more valuable for the company and gain more knowledge about their customers, which makes possible to increase customer intimacy and improve the service.

The result achieved by the companies through applying the knowledge management approach has proved that investments in KM initiative are bringing tangible benefits to companies. The question is whether the knowledge management approach can be applied in the public sector in a similar manner as applied in business environment and what are the requirements for doing that.

3 Public and Private Sector Services: Similarities and Differences

In response to the emergence of information society that is characterized by rapid development and accessibility of information, changes in global economy, as well as growing demands of society, the public sector all over the world is undergoing major changes. Public institutions, within the framework of e-government, introduce operational principles and models successfully approbated in private sector: customer centric service delivery model, multi-channel service delivery strategy, usage of remote and electronic service delivery channels, streamlining of business processes, outsourcing, output based budgeting, performance measurement etc.

Improvement of accessibility and quality of public service, as well as efficiency of public organizations is the central theme of e-government initiatives. Government and municipalities are trying to use CRM methods and tools that proved to be successful in private sector to improve public sector services, too [8].

Trying to answer the question how, and if at all, the best practices of knowledge management in CRM, are adaptable to public sector, we should understand the similarities and differences between service provision in the public and private sector.

The main differences to be pointed out include:

- The drivers of services improvement in business environment are profit and competition that pursue companies improve their performance in creative and continuous manner. In public sector the objective of the public institution is provision of the so-called public goods (wealth, which is distributed without using market mechanism as a result of democracy process) by effective use of the assigned public resources (budget);
- As opposed to the business sector, public sector services are for the main part determined by the legislative norms. “Creativity” of public sector institutions in defining the their services is very limited;
- Public sector services are often obligatory/ compulsive (e.g., tax payments, fines, etc.).

However, there are similarities, as well:

- In both cases customer-centric service delivery model (known as one-stop shop) could be applied. According to this customer service and support model, we can distinguish front-office and back-office activities;
- In general, the process of customer service in public and business sector is the same. In both cases the process starts with a customer request followed by processing, and then customer receives service.

In order to understand the similarities/differences between public and private sector customer related processes we selected the key customer service related processes

Table 1. Analysis of customer related business process

Customer related process	Application of KM (Critical, Significant, Minor, N/A)	Similarity to related public service process (Identical, Similar, N/A)
Identify customer needs and wants	Significant. KM methods (e.g. data mining) can be used to gather information from various sources, conduct advanced information analysis	Similar. Methods are same. Drivers/objectives different: in private sector – profitability, competition; in public sector – political and social factors)
Measure customer satisfaction	Significant. KM methods can be used in processing, analysis and interpretation of customer satisfaction surveys.	Identical. From customer satisfaction prospective there is no difference whether it is a private or public service
Monitor changes in market	Significant. This process is usually connected with gathering and analysis of various unstructured information, therefore the application of KM approach could be expedient (classification, storage/ finding, trends analysis etc.)	N/A. There is no competitive market (by definition) in public sector
Identify market (customer) segments	Critical. Customer segmentation usually is based on rather advanced customer data analysis (multidimensional correlation analysis, data mining)	Identical. Although drivers in public and private sector are different, customer segmentation approach used in private sector can be to a full extent applied in public sector as well
Select channels of distribution	Significant. KM tools can be applied to understand customer preferences and cost information to determine optimal channel strategy	Identical. There is no factors which could create difference in this process in public un private sector
Develop pricing strategy	Critical. Advanced data analysis methods (including data mining) could be used to get precise cost related information and set correct prices	Similar. The base cost accounting principles could be same. Application of costing information is different – in private sector to determine profit maximization price, in public sector – most effective usage of public resources as well to provide factual information for political decisions
Develop advertising and promotion strategies	Minor. Advertising and promotion depends on market segmentation and customer preferences information (indirect application of KM tools)	Similar. Advertisements and marketing campaigns are not so widely spread in public sector (although theoretically could be used)
Develop sales forecast	Significant. Usage of historical data as well as market trends information is essential to produce correct sales forecasts. Business intelligence methods could be used for this purpose	Similar. Forecasting methods could be the same. Demand drivers are different in public and private sector
Sell to customers through a field sales force	Significant. Information about services, as well as sales process and best practices knowledge is essential to streamline and ensure consistent sales quality. Knowledge base, customer information/relations data bases, business intelligence tools could be applied	Similar. Probably, sale of public service sounds unusual, but from the process perspective, activities of a customer and service provider resulting in agreement of service delivery could be treated as sale. This channel is not widely spread in public sector, but exists in some areas, (e.g. social help)
Sell to customers through retail operations	Significant. Same as above	Similar. One stop agencies (customer service centers) in public sector in some way could be treated as retail outlets
Sell to customers through the Internet	Significant. Same as above	Identical. In general, the principles of remote service delivery through internet are the same (user authentication, web forms, security etc.)

Sell to customers through direct marketing	Significant. Same as above	Similar. Although direct marketing methods are not so widely used in public sector, theoretically there is no obstacles for application of this approach also to the public sector
Manage wholesalers, retailers, and distributors	Significant. Detailed historical data are important to introduce flexible and customized terms in relations with sales partners. Multidimensional analysis, data mining methods could be used for this purpose	Similar. Public-private partnership or service delivery outsourcing agreements in some way could be treated as an intermediary in private services value chain
Manage customer orders	Minor (In general it is very transactional process. To some extent KM could be used to gather/analyze process knowledge and best practice	Similar. Orders equivalent in case of public service is public service request
Deliver service to customers	Critical. Process knowledge base, as well as information sharing and collaboration tools are crucial to this area	Identical. From the process perspective there is no difference whether it is public or private service
Ensure quality of service	Significant. Service quality information collection is important to introduce relevant process controls	Identical. Same as above
Bill customer	Minor. Process knowledge and best practice database could be used in this process	Identical. If the public service is paid, there is no difference
Provide customer post-sales service (support)	Critical. Service knowledge and support information is necessary to provide support. Knowledge bases, collaboration, customer self-service support tools can be successfully applied here	Similar. Some of public services could contain activities, which could be similar to post-sales service in private sector (e.g. construction supervision)
Respond to customer inquiries	Critical. User inquiry classification and dispatching greatly depends on systematized knowledge about customer case histories, problem solution etc. It is the area, where knowledge bases, collaboration tools, customer information/relation data bases could be successfully used	Identical. From the process perspective there is no difference whether it is public or private service

(slightly modified) from universal business process classification scheme defined in GlobalBestPractices², assessed their relevance to public sector, as well as evaluated applicability of KM:

It can be concluded from the analysis above that there are no significant differences in customer service processes in private and public sector, and, at least from theoretical aspect, KM methods used in private sector can be successfully applied in delivery of public services in government institutions and municipalities.

² Global business processes best practice and benchmarking organization is currently owned by PriceWaterhouseCoopers

4 Experience of Riga E-city Project – Reality Check

The authors of the paper had the opportunity to participate in the implementation of Riga municipality e-city project. The experience and observations we have gained therefrom are helpful in answering the question whether the knowledge management practice, used in business environment, is applicable in public services delivery, and if not, what should be done to assure successful knowledge management process in the public sector.

Responding to the challenges of emerging information society Riga City Council initiated an e-city project. According to Riga e-city project strategy [12], the project was positioned not as an IT, but as an integrated municipality modernization project by means of IT and modern organizational principles aiming at achievement of the following goals:

- Improving the quality and accessibility of services;
- Electronic service delivery;
- Increasing the level of adequacy of municipal decisions to public interests;
- Ensuring the transparency and effectiveness of the municipal spending;
- Enhancing efficiency of municipal institutions.

As follows from the e-city goals, the improvement of public services delivery is considered to be the central theme of the project. Project strategy and related project documents define a comprehensive action plan to re-engineer the municipality service delivery function and achieve the following:

- Definition of services; introduction and measurement of services quality standards;
- Implementation of service delivery improvement projects in municipality institutions;
- Establishment of a centralized front-office structure (a network of customer service centers);
- Establishment of a call center;
- Development of a municipality portal and implementation of electronic service delivery;
- Introduction of digital TV as a service delivery channel;
- Implementation of a CRM system;
- Measurement of customer satisfaction;
- Introduction of remote customer authentication methods ensuring security and privacy;
- Applying public and private partnership in service delivery.

Currently the designing of specific solutions of the new service delivery model, as well as implementation of the first pilot projects (electronic service delivery of several services, introduction of centralized CRM system, optimization of internal processes by means of workflow system, definition and standardization of services, setting quality standards etc) are in the process. As a part of specific solutions usage, various KM applications are implemented: structured municipality services information (knowledge base), on-line searchable legislative and internal document repository etc.

Introduction of extensive customer database, customer service process knowledge base, on-line customer learning system are under consideration.

Although in many of these solutions KM related methods and applications are used on the basis of our experience we can say that KM related issues are not the first priority question in Riga e-city project. In the current stage of project the key challenges are of more strategically-organizational nature:

- Municipality has a fragmented organizational structure, and often from the customers' point of view is seen as a bunch of departments rather than one institution; usually a customer acts as 'courier' among municipality departments and institutions;
- Municipality services are not properly defined and described; customers do not know what kind of services they can receive from municipality; there are no service quality standards and key performance indicators defined;
- Service delivery process, as well as the best practice is not documented; only the personnel involved is aware of the service delivery, customer support processes and the best practice; the knowledge about services for a large part is not documented;
- Despite of the recent establishment of a centralized front-office institution (centralized customer service center), due to the total lack of formalized service process, it can provide only general information about municipality services; the centralized front-office does not accept service inquiries and customers still have to visit several municipality institutions to receive the service;
- Front-office activities are not separated from back-office activities; functional departments are performing both front-office and back-office functions;
- Weak collaboration between different departments and municipal institutions; where several structural units are involved in the delivery of the service, information between the institutions is exchanged through the official paper correspondence.

Although there are many examples of successful implementation of customer centric service delivery models in municipalities (e.g., Vienna municipality), we can assume that other municipalities to some extent face similar challenges [13], namely introduction of customer-centric, multi-channel service delivery models. In reality it means a major municipality business process re-engineering and internal culture change. In this area, the public sector is considerably lagging behind the private sector.

Taking into account that application of KM in some way can be considered as a fine-tuning of customer service organization, we assume that the application of KM in public service delivery today is not reaping the expected benefits. KM definitely has a significant role in the achievement of e-government goals [9], but, in our opinion, KM initiatives will become a priority in a couple of years when the basic CRM implementation projects will be completed.

We can define the following requirements as a precondition for successful application of KM in public sector service provision yielding tangible benefits:

- Public institution is organizing its functions in the form of provision of public services;
- Customer service and support processes are defined and documented;

- Public services are defined and documented, quality standards and key performance indicators are set;
- Introduction of outcome-based, service-oriented budgeting and management;
- Services are provided by means of multiple service delivery channels; advantages of remote (e.g. telephone) and electronic (internet, digital TV) channels are utilized;
- Introduction of customer-oriented, continuous-learning internal culture.

5 Conclusions

Our analysis of academic and business reports as well as Riga e-city project experience allows us to conclude the following:

1. There are no theoretical obstacles for employment of KM in public sector CRM implementation, improving quality and efficiency of public services gaining similar benefits as in the private sector.
2. Employment of KM allows standardization and automation of customer service and support processes, as well as introduction of customer-centric universal front-office service delivery model in public sector institutions. It could bring the following benefits:
 - improved and more consistent public service quality;
 - more accessible services, aligned with customer preferences (channel selection possibility);
 - more streamlined and efficient customer service process;
 - relief of the skilled personnel from routine customer service work, thus enabling them to focus on more value-added activities;
 - possibility to outsource specific customer service functions.
3. In general, the public sector is lagging behind the private sector in applying modern customer-centric service methods and currently is focusing on the implementation of CRM initiatives providing basic CRM functionality.
4. Extensive application of KM in the provision of public services is not widespread yet; it could become a common practice as soon as CRM implementation initiatives are successfully completed.
5. Overall, KM has to be considered an important building block in the improvement of public services and successful realization of e-government initiatives in the government institutions and municipalities.

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Intercultural E-government

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1 Introduction

One of the areas in knowledge management is the representation of information, an area of particular importance in e-Government, given the State's social responsibility towards its citizens. Unlike the private industry, the State is not in a position to select its customers, and has the social responsibility to treat all citizens equally. Given this responsibility, three issues need to be addressed: the duty to provide information, the extent information is to be accessible to disabled individuals and to be provided in other languages.

These are three important issues the European Union and the individual member states need to take into consideration. In this paper, we investigate the situation in Austria, and discuss how the content of websites can be offered in more than one language.

This paper consists of two parts: The first part looks at the legal framework and compares the duty to provide information, the extent information is made accessible to the disabled and the provision of information in more than one language in the United States of America (USA), the European Union (EU), and Austria. The second part of this paper discusses three main concepts of Intercultural Communication (language, culture, and communication) and defines the requirements of professional translation management.

2 Accessibility

2.1 The Duty to Provide Information According to WAI Principles

Following the law of transparency (which itself stems from the concept of democracy), the public sector is committed to provide information. In the EU and in Austria there are no normative regulations for the duty to provide information. On the other hand, in the USA, the Clinton administration passed the Electronic Freedom of Information Act (E-FOIA), itself based on the Freedom of Information Act (FOIA) from 1966, which committed the public sector to the publication of electronic information. Furthermore, there are a number of regulations which ensure that disabled people are able to access information, for example the Americans with Disabilities Act (ADA, 1990), the Amendment to Section 508 of the ADA (1998) which could be called the civil rights bill for people with disabilities. Furthermore, the W3C guide

lines were developed, which are not mandatory. In 1999, the W3C released the Web Content Access Initiative (WCAI) guidelines. These guidelines are based on three principles specifying that pages “transform gracefully across users and technologies; complex pages should provide context and orientation; and pages should follow good design practices to promote usability”, (cf. Peek, 1999).

Many European e-Government strategies include the provision of content according to WAI principles. Austria ranks at the top in web accessibility, and aims to provide information at AA and AAA level according to the WAI principles – except for the older websites which, given the high costs, will be adapted to the WAI principles gradually. Another problem is given by the 2359 municipalities in Austria, where 68% of the municipalities have less than 10,000 inhabitants. 98% of these very small municipalities have their own local websites, but in most cases they do not meet the WAI standards. This is a problem which can only be solved through the active support by the Federal Government. At present there are still no guidelines for the public websites’ webmasters, and the W3C guidelines are too complex for those responsible in the municipalities. Help.gv.at is the central and most important web portal in Austria offering services to the citizens according to the WAI A guidelines. This portal also includes the section “for disabilities”. Clearly, there is a rising awareness for people with disabilities at a national and European level, but, in comparison to the USA, still have a way to go. Particularly in Austria a strategy for the further development of this area is necessary. Great Britain has regulations similar to the USA. In future, the EU should include the issue of accessibility for the disabled in the e-Government benchmarks, to increase the State’s responsibility for the provision of information and thus increase its transparency and public appearance.

2.2 Multilingualism

In the USA there are no legislative regulations governing the language in which the services are offered. Therefore, it is to be assumed that public websites which provide information in Spanish are done on a voluntary basis. This issue is of greater concern to Europeans, reflected in the 3 official languages and the 11 national languages in the European Union, as well as every citizen’s right to approach the European institutions using his or her national language and to receive an answer in this language. The EU faces the challenge of providing information in a number of languages to ensure transparency and legitimacy – an issue anchored in the European Parliament’s Charter of Rights. Austria faces a similar issue, though stemming from a different historical context. Since WWII, minority groups’ rights in Austria are legally protected – the article 7 of the Austrian Constitution protects the Slovenian minority in Carinthia and Styria and the Croatian minority in Burgenland, in particular their language and customs. In practice though, this protection has had to be legally claimed. A number of decrees regulate which municipalities have Slovenian, Croatian and Hungarian as the official language alongside German.

2.3 Example: Multilingualism in Carinthia

As previously discussed, the legal basis for a further official language beside German is anchored in the Austrian Constitution. In Carinthia, there are laws for these minor-

ity ethnic groups and their education, which provide the basis for a number of decrees, for example in 1977, a decree to make Slovenian an official language in Carinthia. The decree clearly specifies which public offices need to provide Slovenian alongside German, including police offices, municipal halls, military posts, post offices and railway. Furthermore, members of these ethnic groups have the right to expect their language the regional and national offices. But the municipal's public websites are provided in German only, and, given limited financial and personnel resources will probably not change in the near future. Neither the regional nor the federal government have indicated any intention to provide public information in other official languages beside German. Only the federal webportal help.gv.at offers the section "for foreign citizens" which includes procedures for foreigners living in Austria. The mandatory official languages for the ethnic minorities living in Austria are not provided at the local, the regional or the national level. At present there have been no discussions to presenting the minority groups' rights virtually.

2.4 Conclusion

In conclusion, front-end accessibility is of great importance, in public web portals more than in private web portals, as the state has a greater responsibility towards its citizens. The comparison between the USA and the EU shows how different the cultural framework concerning accessibility needs and the sensitization to this issue is. In the USA, the provision of information is bound to the law, whilst there are no similar standardised regulations in Europe. Europe has focused more on anchoring the different languages to the transnational and national legal frameworks. At the national level, virtual multilingualism has not yet been perceived as the minorities' right, and a great deal of work will be necessary to support those regions and municipalities with ethnic minorities. This paper aims to provide a guideline for the provision of information more than one language.

In the USA, disability has been a political issue for decades, and has therefore provided legal support for its disabled citizens. In the last couple of years, the topic of virtual and real accessibility has been investigated in a number of projects initiated by the EU.

3 Intercultural Communication

The provision of electronic information in different languages requires professional translation management. However, this cannot be restricted simply to the translation of the actual texts: we also have to analyze the needs and suppositions of the future readers and users and take into account their cultural background. For a better understanding of what lies behind this process, we must first define the theoretical foundations of communication across linguistic and cultural borders and then outline the project management required in translation projects.

3.1 Defining Culture and Communication

Language is not just as a set of symbols and rules that enables us to communicate. Words and sentences form only a part of the complex system involved in under-

standing and communication. The foundation of social competence is culture: culture is the source of potential coherence that enables us to communicate. Through permanent interaction and reciprocal modification of knowledge, we learn to predict other people's actions and develop social norms, expectations and roles through the repetition of goals and situations. This flexible result of modifying reciprocal knowledge and building compatible knowledge structures is what can be referred to as culture (cf. Köck, 1987; Schmidt, 1987; Maturana, 1982/1985).

In communication, we use large sets of effective cultural norms and conventions. Their repeated use form conventional symbols and symbol systems. One very special system is language, and language learning seems to have a genetic basis, developed over the course of evolution. Communication does not, however, necessarily depend on the existence of arbitrary symbol systems (like natural language) but on the possibility and ability to interpret something as a "text" – as a message intended to influence the interpreter's actions (cf. Posner, 1994). All manner of actions and objects – from coughing, clothing, movements, gestures and pictures to spoken or written language – can be used and interpreted as "texts".

The borders between different cultures are thus not set by region, nationality, language or climate, but by the ability to cooperate (using jointly established compatible actions/representations). This flexible and constructive definition of culture clearly indicates that individuals in fact belong to many cultures and subcultures, and that these cultures themselves take many different forms (e.g. the Scandinavian culture, the Anglo-American scientific culture, the Internet culture or the private family culture).

What kind of concrete phenomena are included in this broad definition of culture? We have all experienced typical "intercultural" situations – I myself faced many such situations when moving from Finland to Austria. In Finland, for example, the correct way to enroll at the University or apply for official documents such as a driving license is to fill out and submit the appropriate forms and supply copies of any relevant certificates, and I had been used to proceeding in this manner. However, in Austria, I had to learn that these things progress at a very slow pace until you actually visit the civil servants dealing with your application in person or call them a couple of times to remind them politely that you are still waiting for your documents.

The difference between specialized and popular culture is a good example of cultural differences within what is commonly referred to as a "language community". When translating internal governmental texts into a form accessible to a general audience (i.e. to popularise them), it will not be enough to simply change "difficult" words into "easy" ones.

The different meanings attached to the way we greet one another is another very good example of how different communicative actions can be in different cultures and situations: For instance, in Austria, a person would be considered impolite if they do not utter a greeting when entering an elevator, a waiting room or even a local shop. Finns, on the other hand, would be startled by a total stranger suddenly greeting them. In Finnish convention, even business letters should be left without any form of greeting, whereas in France it is customary to conclude a business letter with a complex salutation. Thus, it is not enough to concentrate on the words uttered; we should also know whether we are expected to greet at all, and if so, whether we should hug or shake hands or simply bow. Intercultural communication in this sense means looking beyond both the words used or the process of encoding/decoding linguistic units and

moving towards situations and actions. Consequently, recent developments in the field of Intercultural Communication have led to a paradigmatic shift:

The traditional

1 nation – 1 culture – 1 language or

1 group – 1 culture – 1 ‘native’ language has changed to

1 person – multiple cultures/languages

and the traditional

cultures/languages meet at political/social boundaries has changed to

cultures/languages meet in individuals (Johnstone, 1996).

Enabling intercultural communication is not about carrying a piece of information from source to destination. On the contrary, it includes making a contribution to managing the situation from the perspective of the different users, the construction of new meaning and the achievement of new goals within that situation.

3.2 Translation Management

In order to achieve intercultural communication, we need people who are capable of analyzing both the text and the situation, carrying out research on user requirements and cultural conventions, managing projects and designing reader- and user-oriented information. Thus, what is needed are professionals in the fields of Intercultural Communication, International Information Design and International Usability Testing. These experts can be found in those modern translation agencies that define and market themselves as full-service intercultural, multimedia communication consultants.

3.2.1 Globalisation, Internationalisation, Localisation, Translation (GILT)

The desire or need to offer information in different languages requires the adoption of a more global strategy in communication policies. In an ideal situation, this will include taking the subsequent translation(s) into account right from the outset, i.e. when the information is first written and designed. This is the “internationalization” process: dividing the information into the universal, non-translatable core structure and the material that will need to be translated. This ensures that it is clear which parts have cultural variations and which have not. In addition, the sizing of graphic (e.g. icons) and other elements has to be kept flexible, so that they can then be adapted to suit the lengths of words in different languages. Since the translation of multimedia information always takes into account both the visual/nonverbal and the verbal aspects of texts, it is often referred to as “localization” and not “translation”, taking into account the adaptation of the whole (software) product and not just its linguistic elements.

3.2.2 Project Plan

In order to provide a cost estimate, a translation/localization vendor must first analyze both the source material and the project objectives. The objectives, target audience, tools and deadlines are set in a kick-off-meeting between the representatives of the translation/localization vendor and the customer (e.g. a governmental office). In this phase, the governmental office (as the commissioner of the project) is responsible for

providing all the necessary source material, including a definition of any layout requirements (if available) and specific terminology (if available). They must name a competent contact person who will be able to deal with any questions that might arise later in connection with the translation. The governmental office is responsible for clearing any copyright issues and ensuring the correctness of the contents to be translated. The planning phase of the project plays a critical role in ensuring uncomplicated and productive cooperation between the partners and enabling them to reach agreement on the common objectives for the whole project.

3.2.3 Use of Translation Technology

If the volume of material to be translated is large and/or has to be updated frequently, then it makes sense to use translation management technologies to help provide cost-efficient translating and updating. A number of different technologies are available to support the translation process:

Terminology Management Systems

Terminology Management Systems ensure that uniform terminology is used throughout a translation or by a project team. They can therefore make a significant contribution to the quality of a translation by ensuring consistency.

Translation Memory Systems

Translation Memory Systems are particularly useful for handling large translation volumes, particularly when the project is coordinated from a central location and the customer places great importance on consistency. However, the risk with translation memory entries is that solutions devised for a different context may dominate the current text. Translation memories can only make a positive contribution to the quality of a translation and increase cost-effectiveness if a number of criteria and requirements are met. These include:

- Availability of specific text formats
- Adequate updates and maintenance
- Well-considered definition of program parameters
- High-quality reference material
- Link to a well-maintained terminology management system.

Localisation Software

Localisation tools, i.e. solutions for use in the translation of software applications, allow the translator to view the actual user interface during the translation process and thus take the context into consideration. Translators can adapt some items themselves, e.g. the size of a button, or delegate more extensive program changes to the software developers, e.g. if the syntax needs to be changed in a dialog box or navigation path, or the icons and images need to be swapped, removed or adapted.

Machine Translation Systems

Despite the decades of development and substantial research and development budgets that have been invested in Machine Translation Systems, fully-automated qualitative translation remains nothing but a dream. The old nightmare that kept translators awake in fear of their jobs has definitely had its day. Machine translation systems can only be used for limited purposes, e.g. to create pre-translations or to “skim over” a document.

The only translations worthy of the name remain “human translations”, i.e. translations produced by translators (with or without the use of translation technology). Today’s language technology industry now focuses on the development of tools to support translators, not to replace them.

Given the large amount of pre- and post-editing required, I would not recommend the use of fully automatic translation in this context. The translation vendor will be able to advise the customer on suitable technology on a case-to-case basis.

3.2.4 Quality Assurance

Although the quality of a translation will be checked by the translation vendor, it remains essential that the translation be validated by the governmental office, and ideally by both internal governmental experts and potential future readers from the culture in question. This form of international usability testing can be organized by the translation vendor. In the case of electronic information, it is important that these checks are not restricted to the coherence and correctness of the content, language and terminology, but also include the functionality of the layout, links, pop-ups, navigation structure and other technical and communicative details.

3.2.5 Copyright

According to the Austrian Standard for Translation Services (ÖNORM D 1201), the copyright for a translation belongs to the translator as the creator of the text. The translator therefore has the right to be named whenever the text is published. He/she is also required to accept any subsequent changes made to the translation.

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Analysis of Best Practice Policy and Benchmarking Behavior for Government Knowledge Management

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Abstract. Korean government has several best practice competition and diffusion programs for the purpose of public administration reform and the improvement of government service. From the perspective of knowledge management, this paper evaluates the best practice policy and analyzes the main factors influencing the recognition, adoption and utilization of best practices through the email-based survey and interview with local government officers. The result shows that 1) The government officers' recognition of best practice programs and the best practices themselves is not high, 2) The adoption and utilization of a best practice is affected by its value and officer's information needs, 3) Raising the recognition of Best practice policy affects the recognition and adoption of a best practice, and 4) The recognition and utilization of a best practice is affected by the work experience. The result gives important implications for designing and implementing government knowledge management systems and strategies.

1 Introduction

Korea's Ministry of Planning & Budget (MPB), Propulsive Committee of Government Innovation (PCGI), and Ministry of Government Administration & Home Affairs (MOGAHA) have held the Public Innovation Conference, the Best Practice Conference for Public Reform, and the Local Government Reform Exhibition respectively with the aim of diffusing best practices to local governments. We may call these kinds of efforts 'best practice policy', which leads local governments to benchmark best practices from central governments and each other. We view a best practice policy as a nation-wide knowledge management initiative. With the emergence and the rapid development of digital networks like Internet, now the best practice policy needs to be formulated, implemented, and evaluated based on the knowledge management and electronic government framework. Especially, a best practice policy should be supported by government knowledge management systems.

From the perspective of knowledge management, this paper evaluates the best practice policy and analyzes the main factors influencing the recognition, adoption and utilization of best practices through the email-based survey and interview with

local government officers. The result is expected to give important implications for designing and implementing government knowledge management systems and strategies.

In Section 2, we introduce best practice policies of Korean government. In Section 3, we evaluate them from program verification level and discuss the implications of the evaluation. In Section 4, we analyze the best practice benchmarking behavior of government officers and draw some implications for designing and implementing government knowledge management systems and their strategies. Section 5 concludes this paper by proposing the concept of system policy, which emphasizes the interplay between systems and policies.

2 Current Status of Best Practice Policy Programs

The instruments of best practice policy in Korea have been the conference, exhibition, paper publications, and Web pages. However, it has not been known and evaluated how much best practices have been practically diffused to and shared among local governments. We have known neither whether local civil servants have recognized best practices nor how they have adopted and utilized the best practices for their own policymaking. In order to diffuse best practices to local governments efficiently and effectively, it is necessary to evaluate the current best practice policy and investigate the problems in the policy implementation.

The Public Innovation Conference is held annually by Ministry of Planning & Budget and Ministry of Government Administration & Home Affairs to select and award prizes to public organizations, including central agencies, local agencies, and public enterprises which successfully innovated their management and services. The winning organizations chosen by review committee have benefits such as press release, invitation to the Presidential Office, and the bounty etc. The conference was introduced in 1999 to give incentives to the public innovation efforts which had not made much progress compared with those of private sectors.

The Best Practice Conferences for Public Reform were held five times at different regions in 2001, by Propulsive Committee of Government Innovation, to present and promote best reform cases that local governments can benchmark. The cases are recommended by central and local agencies. The conference was introduced for especially local governments, that is, for supporting and promoting their reforms.

The Local Government Reform Exhibition was co-held by the Ministry of Government Administration & Home Affairs (MOGAHA) and the Citizen's Coalition for Economic Justice (CCEJ), a famous NGO in Korea, in 2000 and 2002. The local government reform cases were gathered and reviewed by MOGAHA and CCEJ, and the best practices selected were announced to be used as benchmarking cases. The 2000 exhibition presented 78 best practices and the 2002 exhibition 82 ones.

We found that the best practice policy programs had not been systematically evaluated. An evaluation result [7] shows that the current evaluation of best practice policy is oriented only to PR (public relations) activities themselves rather than its effect on the adoption and utilization of best practices. Especially, the Ministry of Planning and Budget has no procedure or system for evaluating programs such as the Public Innovation Conference and the Best Practice Conference for Public Reform.

To be summarized, the current status of evaluation has problems as follows:

1. The current evaluation does not evaluate the status of best practice diffusion and reuse.
2. The current PR activity-oriented evaluation does not evaluate the effect of the programs on the diffusion and reuse of best practices in local governments.
3. The current evaluation has no systematic evaluation mechanism and cannot identify the effectiveness, efficiency, problems and difficulties of the program implementation.

To overcome the current evaluation system, in this paper, we evaluate the performance of best practice policy by investigating the recognition of the programs themselves and the diffusion and reuse of best practices.

3 Evaluation of Best Practice Policy and Its Implications

For the evaluation of best practice policy, we used e-mail-based survey and deep interview method investigating the recognition and the reuse of best practices by local government officers. The survey emails were sent to the 115 local governments including provincial governments, metropolitan city governments, local city governments and city district offices. We interviewed six local government officers among the email survey respondents for identifying the factors limiting the diffusion and reuse of best practices.

The target recipients were limited to the officers performing the role of general administration and planning or best practice related tasks. The email addresses were gathered from the homepages of the local governments and 700 survey mails were delivered. The 110 responses were gathered and the response rate was 16%. The respondents are evenly distributed in terms of the size of region, the age of respondents, and the location of the region.

We evaluate the best practice policy by the program verification level among the Fischer [3]'s four levels of policy evaluation: program verification evaluating program outcomes, situation validation evaluating program objectives, societal-level vindication evaluating policy goals, and social choice evaluating ideological commitments. The program verification tries to answer the questions such as 1) Does the program empirically fulfill its stated objectives? 2) Does the empirical analysis uncover secondary or unanticipated effects that offset program objectives? and 3) Does the program fulfill the objectives more efficiently than alternative means available? Accordingly, we review 1) whether best practices have been diffused through best practice policy programs, 2) what factors have limited the diffusion and the reuse of best practices, and 3) whether the instruments of best practice policy have been efficient.

3.1 Verification on Best Practice Diffusion

On the average, about 70% of the respondents recognized the programs. Since the respondents play a role related to the best practice, we cannot say the program recognition level is satisfactory.

To investigate the level of recognition of best practices, we chose a best practice ‘The big-deal of basic environmental facilities in Gwangmyeong City’ as a sample. The best practice is famous and has been selected by all the three best practice policy programs. This is the case where the Guro District of Seoul, a district of the Capital of Korea, and the Gwangmyeong City, a satellite city of Seoul, reached an agreement to share their environment facilities. Through the ‘big-deal’, the municipal solid wastes produced in Guro District are processed by the trash burning facility in Gwangmyeong City and the organic wastes produced in Gwangmyeong City are treated by the sewage treatment plant of Guro District. This case, the first instance of agreement on the sharing of environmental facilities between local governments, was introduced first at the 2000 Local Government Reform Exhibition, presented at the 2001 Best Practice Conference for Public Reform, and received the Minister Award at the 2001 Public Innovation Conference. Since the case was introduced at all the three best practice policy programs, it is appropriate to be used for verifying the effectiveness of best practice policy.

The survey result shows that only 40% of the respondents knew the ‘The big-deal of basic environmental facilities in Gwangmyeong City’ case. The low level of recognition of the most ‘famous’ best practice shows that the diffusion of best practices has not been effective.

3.2 Factors Limiting the Diffusion and Reuse

To identify what limited the diffusion of best practices, we interviewed six local government officers. Most of local government officers have not been interested in the best practice related conferences and have even avoided attending them. The first reason of this indifference is the lack of motivation, the one of the top four important issues in knowledge management [4]. Even though a local government participates in such a conference and gets an award from it, there is not much benefit as a special budget support. Therefore, attending the conference is just a cost or burden to government officers. The second reason is the lack of resources. Small local governments, especially if they are not financially rich, are difficult to apply for the conferences without financial support from the conference organization. The third reason is the lack of opportunity. Local government officers perceive that best practices have been selected based on the criteria affected by absolute size of the case. Since many small local governments are not easy to outperform bigger local governments or central government agencies, their officers have become indifferent to best practice policy. The interviewee agreed that the ‘Gwangmyeong City’ case is excellent and very much applicable to the practice of other local governments. However, the diffusion of best practices does not work only with providing knowledge on the case.

3.3 Efficiency of the Policy Instruments

The major instrument of MPB and MOGAHA for diffusing best practices is holding the conferences. In addition, they used official document delivery, case paper book publication, and homepage etc. However, from the public officer’s point of view, the instruments used for receiving the ‘Gwangmyeong City’ case are summarized in Table 1. Local government officers get knowledge on best practices mostly from

press, official document, and conference proceedings etc. The conferences themselves have not affected much impact on the recognition of best practices.

Table 1. Instrument Use for Best Practice Reception

Peers	Press	Conference	Paper Newsletter	Online Newsletter	Homepage
8.7 %	16.8 %	6.7 %	6.0 %	3.4 %	8.7 %
Official Document	City PR paper	Province PR Paper	Ministry PR Paper	Conference Proceedings	Miscellaneous
12.1 %	8.7 %	5.4 %	4.0 %	10.7 %	8.7 %

On the other hand, officers introduce best practices to other officers or organizations by the following ways summarized in Table 2. The most frequently used channels for recommending best practices are referring to peers (25%), referring to team leaders (12.5%), and referring to inter-department meeting (12.5%). The fact means the diffusion of best practices is carried personally and horizontally rather than organizationally or vertically.

Table 2. Instrument Use Rate for Best Practice Recommendation

To Peers	To Team Leaders	To Head of Department	To Governors	Team Meeting
25.0 %	12.5 %	5.8 %	4.8 %	9.6 %
Department Meeting	Inter-department Meeting	Governor Meeting	Inter-Governor Meeting	Miscellaneous
5.8 %	12.5 %	3.8 %	3.8 %	16.3 %

Current best practice policy adopts a top-down approach where best practices are diffused from central government agencies to local governments. In addition, the policy is implemented mostly by the events such as the Public Innovation Conference, the Best Practice Conference for Public Reform, and the Local Government Reform Exhibition etc. However, our survey result shows that the actual diffusion of best practices is done horizontally rather than vertically.

3.4 Policy Implications of Best Practice Policy Evaluation

From the results of the policy evaluation, we have inferred the following policy implications:

1. Current offline ‘event’-based best practice policy programs have not been effective even in promoting themselves and diffusing best practices to government offices. It raises the necessity of a new best practice policy based on government knowledge management system that emphasizes the continuing ‘relationship’ with government officers rather than one-time ‘event’ such as conferences. The old offline-based best practice policy should be reformed into a new best practice policy based on a sort of lessons learned systems [11] and case-based decision support system [2, 6].
2. Best practice policies should give government officers incentives and resources to apply best practices into their work. Especially in public sectors, “this is my idea”

syndrome is very common. Public officers do not have much incentive to adopt other’s practices to their own domain. Therefore the incentives and resources should be given to the adoption and reuse of best practices as well as their creation.

3. While current best practice polices have diffused best practices vertically between organizations, actually the government officers share their cases personally, i.e. horizontally. It means that best practice policy should support the personal and horizontal sharing of best practices between public officers. To perform and support the personal and horizontal sharing of best practices, a non-governmental organization might be more appropriate than official government organization. The existence of this kind of an intermediary is one of governance mechanism [8] for government knowledge management.

4 Benchmarking Behavior Analysis and Its Implications

Diffused best practices produce real values when they are benchmarked by public officers. The steps for benchmarking best practices are classified as recognition, adoption, and utilization. Recognition is to know the existence of a best practice, adoption is to have the intention to apply a best practice to a new problem, and utilization is the real action of applying a best practice to a new problem. In this section, using the survey data, we investigate the factors affecting the government officer’s benchmarking behaviors such as recognition, adoption, and utilization of best practices.

Table 3. Dependent and Independent Variables

Classifications		Benchmarking Steps		
		Recognition	Adoption	Utilization
Independent Variables	Organizational Attributes	Size of Local Governments		
		Status in Organization		
		Best Practice Related Work Experience		
	Policy Recognition	Recognition of Best Practice Policy Efforts		
		Recognition of the Best Practice Conferences		
	Case Characteristics	Perceived Value of Best Practice		
	Attitudes on Knowledge	Demand on Policy Information		
		Efforts on Policy Information Search		
Dependent Variables		Best Practice Recognition	Best Practice Adoption	Best Practice Utilization

We hypothesize that the four categories of factors affect the benchmarking behavior of public officers: public officer’s organizational attributes, public officer’s recognition on best practice policy, best practice characteristics, and public officer’s atti-

tude on knowledge. The organizational attributes include the size of the local government which a government officer works for, her or his status in the organization, and the level of experience on best practice related job. The policy recognition variables include the level of recognition of the central government’s best practice policy efforts and the recognition of the three best practice conferences. The best practice characteristic variable is measured as the perceived value of best practice. The attitude variables include the level of demand on policy information and the level of efforts of the government officers on information search. The dependent variables are the level of government officers’ recognition, adoption, and utilization of best practices. The independent and dependent variables are summarized in Table 3.

We employ the logistic linear regression for the analysis and the result is summarized as follows:

1. The recognition of best practice is influenced by the best practice related work experience (p-value=0.005) and the recognition of best practice conference (p-value=0.018).
2. The adoption of best practice is influenced by the perceived value of best practice (p-value=0.012), the demand on policy information (p-value=0.019), and the recognition on best practice policy efforts (p-value=0.036).
3. The utilization of best practice is influenced by the best practice related work experience (p-value=0.015), the perceived value of best practice (p-value=0.026), and the demand on policy information (p-value=0.031).
4. The variables such as the size of organization, the status of government officers, the efforts on the policy information search are not significant in our analysis.

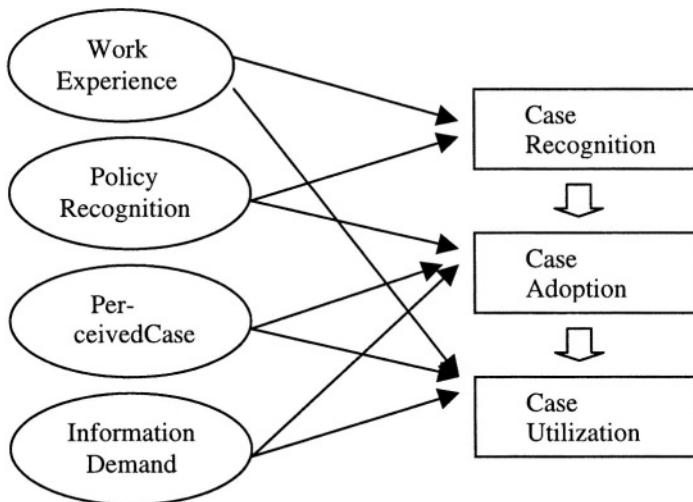


Fig. 1. Influence Relationship in Benchmarking Behavior

The above results are integrated and reinterpreted as follows and described as Figure 1.

1. Though the recognition of best practice is not affected by its perceived value, but its adoption and utilization is affected by its value.

2. Though raising the recognition of best practice policy affects the recognition and adoption of a best practice, but does not affect its reuse to a new domain.
3. Though the adoption of best practice is not affected by the work experience of officers, but its utilization is affected by the work experience.

The officers, whose demand on policy information is high, are eager to adopt and reuse best practices.

4.1 Implications of Benchmarking Behavior Analysis

The processes of Case-Based Reasoning (CBR), which gives more emphasis on the computer-based automatic case adaptation [5] than human direct use (i.e. benchmarking) of cases, consist of case retrieval, case reuse, case revision, and case retain [1]. The case retrieval of CBR corresponds to the recognition step of benchmarking, the case reuse to the adoption step, and the case revision to the utilization step. The similarity between the KM processes and CBR steps has been already discussed in [9, 10]. The similarity between the processes implies that the result of analyzing the best practice benchmarking behavior can be applied to the design of knowledge management system. The interpretation on benchmarking behavior analysis gives interesting implications to the government knowledge management systems as follows:

1. For the wide adoption and reuse of best practices, we should raise their potential value perceived to government officers. It means that the government knowledge management systems should accept only high-quality best practices and diffuse them to the target customers who will value them high.
2. The efforts for raising the recognition of best practice policy will raise the recognition and adoption of best practice rather than its reuse. It means that the efforts for the reuse and those for the other processes should be separate and evaluated respectively. It does not mean to devalue the efforts for raising the recognition of best practice policy. Since the utilization cannot be done without adoption and recognition, the PR (Public Relations) efforts are still important.
3. Best practices should be delivered to officers whose information demand is high for their wide adoption and reuse. The knowledge management systems should have some measurement mechanism to identify the public officers with high information needs.
4. To raise the utilization of best practices, we need to deliver them to the workers experienced on best practice related task. It means that the knowledge management systems should have personalized case distribution systems to recognize the officers who have experience related to the delivered best practice.

5 Discussions and Conclusions

KP&P (Knowledge Center for Public Administration & Policy, <http://www.know.or.kr/>) is a government-supported organization located at a national university of Korea. With the aim to support effective public decision making and promote informatization of the public sector, the center has tried to systematically collect, analyze, manage, and disseminate the information and knowledge produced in the various communities

of public sector. The center has emphasized its role as the internet library that contains public administration and policy database and tries to provide tailored knowledge when in demand.

The authors of this paper have worked for this center and the analysis introduced in this paper has been carried out for extracting strategic implications for the design and operation of the government knowledge management system. As we saw in previous sections, current offline-based best practice policy in Korea has been ineffective. The current best practice policies have been limited to 'events' rather than having consistent relationship with public officers. There has been no central intermediary organization or systems for accumulating, evaluating, and diffusing best practices. The lack of an official intermediary results in the problems of lack of responsibility and integration. The center, KP&P, has aimed to play a role of an intermediary or a catalyst for best practice sharing though it is not official and just a university-based organization.

At first, the center used a 'pull' strategy rather than 'push' strategy. It gathered best practices and therefore accumulated about five hundred cases on its Web sites. Government officers could freely visit the site and download the cases. However, the usage rate was not high. The center determined its strategy from 'pull' strategy to 'push' strategy. The background of the strategy change is closely related to the characteristics of best practices. Best practices are a sort of perishable goods whose value deteriorates drastically as time goes. The center determined to diffuse best practices to government officers through email. Before designing and implementing the best practice diffusion system, we needed to evaluate current best practice policies and analyze benchmarking behavior of government officers. From the result, we could extract valuable implications for the new government knowledge management system such as those described in this paper.

Modern policy cannot succeed without a proper information system support and a public information system cannot succeed without a discreet policy consideration. Designing a knowledge management system for public sectors should also start with a systematic evaluation of existing knowledge management policy, for example, best practice policy. E-government is the typical and representative area where systems and policy consideration should be integrated. We may call these efforts 'system policy'. In this paper, we showed an example of system policy research. Based on the system policy perspective, in this paper, we illustrated that the evaluation result of existing best practice policy can be utilized for the design of a new knowledge management system for public sectors and the new best practice policy can be formulated and implemented considering the effective use of government knowledge management systems.

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Rewarding Quality and Innovation: Awards, Charters, and International Standards as Catalysts for Change

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Abstract. In the competitive, downsized, and mission-driven global service economy of the early 21st century, all organizations search for models to encourage innovation, measure performance, and raise customer service quality standards. Competition for an award can be a cost effective strategy to identify processes needing improvement, conduct self-assessments, receive objective feedback, and motivate employees to meet higher performance goals. Numerous international, federal, state, local, regional, and private award programs now use similar criteria and methodology to recognize and transfer information about the most effective processes, methods, systems, and results. Awards can advance knowledge about management and organizational learning theory, standardize processes, and assist public, private, and non-profit sector managers in determining which strategies are best suited for their organizations. This paper describes various quality award programs worldwide and reports the preliminary results of an empirical study analyzing the impact of awards on improving service quality in the United States (Survey, 2002).

1 Introduction and Methodology

All types of organizations are integrating advanced training, new information technologies, and better equipment to meet extraordinary administrative, institutional, and organizational challenges. Reforms are accelerating in many private firms and public agencies, at all levels of government, including the armed services, intelligence and security agencies, departments of health and human services, and several state military reserve units. Public and private service organizations are expanding their missions with limited resources. Similarly, private firms must devote increasingly resources to maintain and improve customer service and security systems.

It is especially difficult for economically hard-pressed firms to integrate human, material, and technical resources necessary to improve relationships and cross-functional (departmental) communication across jurisdictional (geographic) boundaries. To achieve integrated, horizontally-linked, and networked management system reforms, service organizations must demonstrate enhanced capacities for inter and intra-organizational coordination, knowledge management and learning, and performance management. More importantly, they must understand and apply these practices to compare results, exchange information about best practices, improve service delivery,

integrate human assets with technologies, and standardize performance measures. Organizations seek a common framework to determine if goals are being achieved within the revenue parameters set by private markets or public budgets.

Regardless of the type of reform, employees need motivation and recognition to encourage innovation, improve performance, and sustain management changes. The central research questions raised in this preliminary study are: 1) what choices are available to managers in selecting the most appropriate recognition program? 2) What organizational values do quality awards reward and recognize? 3) How is success measured and what lessons can be publicized and transferred? 4) Are other organizations learning from these innovative benchmark models? 5) Does applying for an award provide the comparative standards, objective assessment, and outside perspective needed to evaluate the performance of internal systems and results? If so, do other organizations regard winners as models for improved performance? 6) Are private or state-sponsored awards being used to recognize, reward and disseminate successful organizational changes? These long-term empirical questions can only be answered with integrated knowledge management systems linking diverse databases across many micro-organizational functions (Agor, 1997; Senge, 1994,1996; Wimmer, 2002).

This paper presents the conceptual design, preliminary empirical results, and a theoretical basis for an integrated study of how quality awards contribute to overall improvement of productivity. The results are based on a survey of U.S. state quality award offices, conducted in the spring of 2002, which examined the importance of standardizing processes for all organizations. In addition to demographic data, respondents were asked to describe application procedures; the number and types of applications received; the criteria for judging applicants; indicate whether the number of applications was increasing or decreasing; list award criteria and give examples of successful state or local programs; and detail how program successes are publicized and transferred to other companies.

2 Improving Organizational Performance and Customer Service

Failure to continuously improve internal processes, human resources, and management systems is a pervasive problem for many service organizations. Many find it difficult, even under the most favorable circumstances, to improve performance with limited resources. Computers, software, and new technologies change so rapidly that equipment, systems, and training protocols become obsolete after just a few months of use. The public service sector is even more vulnerable. In addition to state and local electoral systems, other vital and necessary public sector infrastructure potentially vulnerable to human and material obsolescence include airports, schools, roads, security systems, and public utilities.¹ As public service or-

¹ Until recently, the phrase “public sector innovation” was regarded by many as little more than a bad joke or an oxymoron. The chaos following the 2000 U.S. presidential elections and 2002 primary elections in Florida resulted in part from continued use of obsolete (40-year old) technology and failure to invest in new equipment, training, and technologies. Congress has passed legislation and authorized billions of dollars to update equipment, standardized procedures, and improve training to prevent such events from happening again.

ganizations, governments face unique challenges that may inhibit the adoption of new equipment, systems, training, and technologies. Improving performance is more challenging because: 1) governments experience uneven capacity (and willingness) to measure performance; 2) political interests conflict with multiply pre-existing problems of defining citizen and customer needs; 3) private interest groups compete with each other and with government agencies for limited resources; 4) public agencies often find service standards difficult to set and enforce; and 5) outcomes, performance, and results are less tangible and more difficult to measure (deLancer Julnes and Holzer, 2001; Donaldson, 1999; Milakovich, 1998, 2003; Sanderson, 2001). In addition to these factors, a dearth of relevant examples of successful models in *specific* functions contributes to a pervasive need for “hands-on”, operational, and practical models to guide organizational changes in many service organizations.

During the past decade, numerous service organizations adopted new performance management systems designed to decentralize decision-making authority, empower employees, improve internal management processes, and measure results. Various management styles and techniques encourage higher levels of performance, internal organizational changes, and responsiveness to customers. Many past organizational change efforts also suffered from inconsistent applications and uneven results.

One of the most widely applied approaches, total quality management (TQM), a generic method, focuses on customer (user) satisfaction, participatory management, and a results-orientation. TQM methods and theories often associated with better financial performance and “breakthroughs” in attitudes and motivation among federal government executives, achieve reinvention and results-oriented goals (Hendricks and Singhal, 2001; Milakovich, 1995). Although TQM theories formed the basis for government reinvention in the 1990s, past reforms often spur memories of poor implementation or the resultant downsizing and budget reductions that followed (Douglas and Judge, 2001; Hackman and Wegman, 1995; Milakovich, 1990; Zbaracki, 1998). When appropriately researched, documented, and summarized, comparative methodologies offer administrators detailed “benchmarks” for understanding customers’ needs and training employees to meet them. Customers and managers benefit from empirically-based knowledge and theory gained from customer surveys that evaluate the level of service expected and delivered, especially by intelligence, law enforcement and regulatory compliance agencies (Milakovich, 2003).

Applying for an award or an audit certificate provides incentives for employees to improve their processes and services and recognition by outside examiners offers objective evidence of performance gaps. Awards can also serve as a cost effective way to disseminate knowledge about best practices for managing personnel and technology. This eliminates much of the risk from a “trial and error” approach to different improvement strategies and allows less experienced organizations to participate. Organizations that already received awards can use benchmarking for self-promotion and to implement newer more innovative ideas. If effectively implemented, these changes are likely to result in better performance. Most impor-

tantly, providing incentives, such as awards, charter marks, and audit standards to achieve organizational goals encourages companies to overcome barriers to innovation.²

3 International Quality Awards, Charters, and Standards

The trend toward decentralized, flexible and results-driven management is accelerating worldwide as more attention is being paid to successful models for managing change. Many companies worldwide have taken actions to implement customer-oriented and performance-based changes (Sanderson, 2001; Kettl, 2002). Widely used in Asia, Australia, Canada and Europe, various methodologies such as awards, citizen's charters, charter marks, and audit standards help to spread success stories from an expanding number of private companies and governments (Chuan and Soon, 2000; Debia, 2001; Hui and Chaun, 2002; Puay, *et.al*, 1998; Tummala and Tang, 1996). Globalization of the reinvention effort, with heavy emphasis on electronic government (e-gov) technology, encourages citizen access to information, knowledge management processes, and participation in public decision-making (Fountain, 2001; West, 2001; Wimmer, 2002).

The leading international awards and standards for quality include: the *Deming Prize* in Japan, the *ISO 9000-14000* series, *European Quality Awards*, and the *Malcolm Baldrige National Quality Award* (BNQA) in the United States.³ These prizes, awards, and audit accreditation programs influenced the creation of numerous state-sponsored U.S. "mini-Baldrige" programs that recognize success at the state and local level as well. Forty-five of the 50 U.S. states, and many local communities, now share similar missions using the BNQA criteria to advance service quality initiatives. In the United States alone, over 1700 private, non-profit, manufacturing and service organizations have received recognition by states and locals awards for service quality and productivity improvements in the past decade (Survey, 2002). In addition, over 50 countries, including Canada, Ireland, Mauritius, Israel, New Zealand, South Africa, Slovenia, Singapore, Sweden, and Taiwan have established national quality awards.

In addition to awards, benchmarking, and e-gov initiatives, *citizen charters* guarantee specific levels of service and *charter marks* to recognize agencies for exemplary service (Davison and Grieves, 1996; Van Thiel and Leeuw, 2002). Citizen charters, similar to a "bills of rights" (for airline passengers, consumers, healthcare

² This creates a "demonstration effect" where "champions" are identified as leaders of specific processes in particular agencies, within various regions. The Director of the California Quality Awards program, for example, identified specific individuals within the state who were known as leaders of the service sector quality movement (Survey, 2002).

³ For details and list of Deming Prize winners, see: <www.deming.org/demingprize/>. <www.snqc.org/INFORMATION/QAw.htm>. For European Quality Awards, see: <www.efqm.org/model_awards/eqa/intro.htm> and <www.nqi.ca/english/awards.htm>; and the Baldrige website <www.nist.gov>.

patients, taxpayers, travelers, etc.) have been enacted during the past two decades in nearly 20 countries, including Australia, Belgium, Canada, Denmark, Finland, France, India, Ireland, Italy, Norway, Portugal, Spain, Singapore, Sweden, as well as governments in the United Kingdom.⁴ At the organizational (micro) level, several steps are being taken to maximize a charter's effectiveness. Charters are bolstered by well-developed systems and procedures and providers must make sure that all employees understand the terms and standards stated in a charter. Charter marks reward excellence, reinforce standards, and raise the level of public service provided. They also improve public service via feedback to applicants.

The *Deming Prize* is the oldest of the major awards (established in 1950) and many Japanese consider it to be as prestigious as the Academy Awards or the Nobel Prize for quality recognition.⁵ Although less well known in Europe or North America, the Deming Prize influenced the development of quality control and management practices in Asia. The prize recognizes individuals and applicant companies and divisions of companies, including a few non-Japanese companies and service organizations, for their new approaches to total quality control. The *ISO 9000-14000 Series*, the fastest growing quality assurance system in the world, applies to most types of organizations. Although neither a quality award nor a charter *per se*, the International Organization for Standards (IOS) audit certification – commonly known as the ISO 9000 through 14000 (for environmental standards) – series requires the application of many of the same objective criteria and review by outside examiners. (*ISO* is not an acronym, but the shortened Greek word for equal.) To date, only a few governments are ISO certified and there is a need for more research on its effectiveness in improving the management capacity of service organizations (Chu and Wang, 2001; Lowery, 1998). Nonetheless, the ISO series maintains a commitment to customer service quality improvement and shares many of the same criteria as the Baldrige, Deming, and European quality awards (Puay, *et al.*, 1998; Tummala and Tang, 1996). Together, the criteria used in these methodologies form a standard multi-national definition of quality processes in most types of organizations (See Table 1). The *European Quality Awards*, created in 1990 by the European Foundation for Quality Management (EFQM), and in effect since October 1991, spawned many national and regional quality awards throughout Europe and influenced development of ISO 9000 standards. The newest categories for the award were added in 1994: the Public Sector

⁴ In the United Kingdom, there are over 200 national charters and an estimated 10,000 local charters, all designed to provide better services for citizens. For a detailed and indexed guide to the use of charters, citizen participation, performance standards, charter mark awards, networks, best practices, and how to complain in the U.K., see the excellent Modernizing Public Services Group website at: <www.servicefirst.gov.uk/>.

⁵ The Union of Japanese Scientists and Engineers (JUSE) evaluates applications and makes the awards to companies and individuals that have achieved high levels of statistical quality control. Japan's leading manufacturers such as Bridgestone, Hitachi, Fuji Photo, Komatsu, Mitsubishi Electric, Nissan, Ricoh, and Toyota among many others have received Deming Prizes. The number of winners each year is unlimited. Any company or individual that achieves a high level of quality and is certified by examiners as meeting rigorous performance standards can be eligible to receive the award.

Award and the Small and Medium size Enterprises Award. Each applicant is reviewed by a team of Award Assessors, which determines a total score for the application. Based on the final report of the team of assessors, the jury selects the most outstanding organizations for the award.

Table 1. Global Criteria for European and American Quality Awards

Adopted from: Criteria for European Quality Awards and Malcolm Baldrige National Quality Program <<http://www.quality.nist.gov/BusinessCriteria.htm>>

- (1) **Leadership:** how senior executives guide the organization and how the organization addresses its responsibilities to the public and practices good citizenship;
- (2) **Strategic Planning:** how the organization sets strategic directions and how it determines key action plans;
- (3) **Human Resource Management:** how the organization enables its workforce to develop its full potential and how the workforce is aligned with the organization's objectives;
- (4) **Information Analysis and Technology:** the management, effective use, and analysis of data and information to support key organization processes and the organization's performance management system;
- (5) **Quality Systems and Processes:** how key production/delivery and support processes are designed, managed, and improved;
- (6) **Customer/Market Focus:** how the organization determines requirements and expectations of customers and markets;
- (7) **Customer/User Satisfaction:** documents how the organization meets customers' requirements;
- (8) **Corporate Governance and Social Responsibility:** responds to post-Enron concerns about corporate corruption and social responsibility;
- (9) **Supplier/Partner Relationships:** just-in-time delivery and supply chain management;
- (10) **Results:** the organization's performance and improvement in its key business areas: customer satisfaction, financial and marketplace performance, human resources, supplier and partner performance, and operational performance. For private businesses, this category also examines how the organization performs relative to competition.

Organizations/ companies that demonstrate productivity, results, and the highest levels of customer service are eligible to apply for the **Malcolm Baldrige National Quality Award (BNQA)**, but the number of awards is strictly limited. Although federal agencies are ineligible and there is no specific category for government agencies, the BNQA accepts applications (since 1995) from educational and health care organizations. Every year, the BNQA gives a *maximum* of two awards in each of five categories (manufacturing, healthcare, education, service, and small business), in contrast to other awards with an unlimited number of winners. Many state and local organizations also encourage recipients to share their success formulas. Seventy-five percent (75%) of the states also require winners to showcase their procedures with

potential applicants (Survey, 2002). The BNQA originally aimed at improving manufacturing quality and productivity by stimulating greater competition (and profits) through the use of quality initiatives. Public recognition of improvements and achievements provide examples for others to benchmark. Winners must publicly share information about quality strategies at a national conference, to guide other organizations and to encourage them to become part of the quality improvement effort.⁶ This requirement is important because learning from the experience of other agencies can stimulate government organizations to become part of the quality process and find effective ways to improve their performance.

As a public-private partnership to reward exemplary and innovative management processes, the BNQA recognizes successful innovation strategies. BNQA criteria acknowledge the importance of results and require winning organizations to prove that their processes have positively affected the quality of outputs.⁷ Although the awards still reinforce the need for private sector international competitiveness in manufacturing, they now emphasize the equally important need to raise the quality of domestic services, especially in education, government, and healthcare.

3.1 Do Awards Encourage Innovation and Reward Performance?

Operational design, planning, and policy decisions are based on collection, analysis, and interpretation of objective information. Gathering data is a challenge for most organizations. Achieving goals in high-performance, results-driven, organizations further requires annual strategic planning and performance reviews (Milakovich, 1995; Thompson and Strickland, 2002). Performance management strategies reinforce core values (i.e. collaboration, cost reduction, participation, results-measurement, satisfying external customers, teamwork, etc.) and are used to measure results.

Since the early 1990s, hundreds of quality award programs, created worldwide in the past two decades, now exist. Their recipients, a largely untapped, but increasingly rich, reservoir of detailed information, demonstrate how various organizations successfully change internal processes to measure and meet performance goals. The full global impact of these many awards is too extensive to describe in a single article, but the evolution of several national quality awards has been described elsewhere (Chuan

⁶ Interview with Myron Tribus, Former Assistant Secretary of Commerce, October 18, 1990. For a complete list of Malcolm Baldrige National Quality Program award recipients, contacts, and profiles see World Wide Web at: www.quality.nist.gov/Contacts_Profiles.htm

⁷ Since its inception, 58 organizations (37 large and small private manufacturing firms and 21 service organizations) received Baldrige Awards. In 2001, for the first time in the history of the awards, three of the five award winners came from the education category.⁷ In 2002, SSM Health Care of St. Louis, Missouri became the first such organization to be recognized with a Baldrige Award. In 2003, two other hospitals, Baptist Hospital of Pensacola, Florida, and St. Luke's in Kansas City, Missouri, were recognized. The 2001-2003 awards represent a major change in the mission of the BNQA.

and Soon, 2000; Dedhia, 2001; Flynn and Saladin, 2001; Hui and Chaun, 2002; Nak-hai and Neves, 1994).

4 Conclusion: A 21st Century Trend or Passing Fad?

This preliminary study of multi-national recognition programs builds on past research and confirms that most award programs successfully accomplish a majority of what they intend to achieve. All reward organizations for innovation and assist applicants in improving their previous performance levels; some expect this level to be maintained. The future success of quality awards depends on several related factors, including:

- Continued evidence of a positive economic benefit from award winners;
- Commitment from winners to exchange knowledge, share information, and transfer results;
- Shared opportunities for applying knowledge in other types of organizations; and
- Expanded participation by all types of organizations.

The more proof potential applicants have that quality awards can improve the internal efficiency of their organizations, increase profits, and reduce costs, the greater the number of applications. To what extent have awards encouraged other agencies to implement changes? The empirical evidence here is somewhat mixed: two-thirds of the state respondents reported that as of early 2002, applications either increased or remained the same. In states where applications decreased, directors suggested that complexity of award criteria, lack of marketing, and weak regional economic conditions explained most of the decline. These negative factors were overcome in the majority of states by affiliations with corporate sponsors, partnerships with non-profit and private organizations, strong leadership, and volunteer service (Survey, 2002). Encouragingly, despite a sluggish national economy, applications for the Baldrige Awards increased in 2002.

State and local award programs reflect our federalist structure of pluralist decentralized government and are different in many ways: some require payment of examiners fees, others offer cash prizes; some are closely affiliated with the governor's office or corporate sponsors; many are organized as non-profits, and others have multi-tiered awards. However, this preliminary study reveals several common features:

- Most state award programs depend on volunteer support and receive only limited state funding;
- All state awards, and several private and international awards, rely on the Malcolm Baldrige National Quality Award criteria, rules, and application requirements;
- Nearly one-half of the quality award organizations are independently chartered as 501(c)3 non-profit corporations and operate without extensive state budgetary support;

- Three-quarters (75%) of the states require recipients to disseminate results to other organizations;
- In several state, responsible officials, such as directors of quality awards, could identify public officials (champions) who demonstrated success within certain state or local governments and are recognized statewide as quality leaders; and

The common criteria used by all states provide a standardized methodology for comparing one service function to another in diverse regions (Survey, 2002).

As quality recognition becomes *the* main factor in judging an organization's performance, those that fail to accept the new demands of an increasingly competitive global economy will be less likely to survive. Customer satisfaction is already an obsession for many global service organizations, and most companies already go beyond merely "satisfying" customers to *exceeding* their expectations. Consequently, awards, benchmarks, charter marks, and international audit standards will most likely play a more significant role by offering credibility in the eyes of citizens, customers, and employees alike. This will be especially important for corporations seeking to regain public confidence and trust. The critical question for future micro-organizational research is: have quality awards changed internal organizational processes and systems to provide incentives for individual employees to become more responsive to citizens and supervisors?

Rewarding customer service and performance management, part of this complex process, proves to be a useful way to share best practices, measure results, add value, and achieve quality and productivity goals. Quality awards are an under-utilized resource for organizations committed to improving service quality and performance. They can serve as catalysts for change, identify areas needing improvement, support internal collaboration, motivate everyone to achieve specific goals, and provide learning tools to retain expertise. The competitive challenge and distinction that accompany pursuit of an award, charter mark, or ISO certification can be a significant source of employee motivation and pride. Perhaps most importantly, the data generated by various performance recognition techniques can help to develop theories to assist managers in determining which practices are best suited for their organizations. Awards, benchmarks, citizen charters, and audit standards will never entirely eliminate the differences between the missions of nonprofit, public, or private organizations. They can, however, provide a rich database for assisting businesses and governments in implementing change strategies, developing successful performance measures, and reaching out to all customers being served.

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Model of Experience for Public Organisations with Staff Mobility

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Abstract. Public organisations with a high rate of staff rotation lose their valuable asset – experience of employees. Mobile employees, who have to face duties at new positions, would find computer assistance helpful in efficient inception. The idea to support current work of employees on the basis of gathered experience in past activities is driving the Pellucid project (IST-2001-34519). To serve experience-base assistance to the employees it is necessary to have experience modelled first. The comprehensive model containing user profiles, which defines experience in the scope of organisation, is described in the paper. The representation of the business process items and employees expertise level in the domain of organisation's activity is created on the basis of the organisation model. To represent experience an active hint approach is provided. Active hints are presented to employees spontaneously and on demand according to their level of competence. Furthermore, the methods of experience gathering are discussed in detail on the basis of the platform development in the Pellucid project pilot sites.

1 Introduction

Nowadays, one of the most valuable assets of organisations is experience of their employees. Organisations with high level of staff mobility suffer significant loss if experience is regarded only as an ability, which belongs to the employees. If the experience was accumulated by the organisation, e.g. in the computer system, it could be many times reused.

The Pellucid project [1] is deriving from the idea of capturing and reusing of experience. Assistance to the novice employees at the initial stage of their work based on past gathered experience may be done by a dedicated software platform [2,3,4]. The Pellucid functionality is not limited to the accumulation of experience only. A desired situation for the employees is to get an adequate

and accurate piece of experience just in time. Such an adaptation of experience to the individual needs is especially important in the case of mobile employees. Novices find helpful a selection of experience items that allow them simply progressing. The Pellucid platform is designed to serve employee assistance in form of experience items spontaneously or on demand.

In the paper a model of the uniform experience management for public organisation is described. The model is general in its assumptions. All, medium and large-size, organisations with semi-structured business administration process, and with knowledge-intensive activities performed by the employees, are addressed. At the initial stage three installations will be provided for project pilot sites.

In Sect. 2 the state of the art is described. Models created in the stage of system analysis and design are presented in Sects. 3-5, together with brief presentation of the methodology. A description of the domain modeling for the pilot organisations is given in Sect. 6. The models are used for organisation ontology specification, which is discussed in Sect. 7. Finally, the proposed approach to the experience acquisition is introduced in Sect. 8. Conclusions in Sect. 9 are finishing the paper.

2 State of the Art

Knowledge management for public sector organisations has become very important issue during the last decade. Several projects supporting public sector have been developed so far or are still in development. Scientific community tries to support employees by providing a service called an Organisational Memory [5,6]. Such a memory is treated as a collector of all kinds of organisational knowledge and is specially designed for the reuse in the future. DECOR [7], FRODO[8], KnowMore[9] projects deal with such a knowledge repository.

Information and knowledge stored within an organisational memory is often described with the help of the ontology [5,10]. The ontological approach has been found especially useful in the knowledge management systems [2,7,8,9,11].

Problems rising within the public sector organisations, deriving from the nature of their business process. They can be characterized and described, but cannot be formalized fully. These types of processes are often called semi-structured [12]. Extensions to the traditional business process are necessary. Some approaches integrate the workflow management system with delivering of knowledge [2,13,14]. In such a solution the workflow management system gives the description of the context. On the basis of that context knowledge and/or information is delivered to the user. The collaborative nature of knowledge intensive tasks [15] and the distribution of several knowledge sources entails the use the intelligent software agents in this area [8,16,17,18]. Modern agent based systems are realized implementing object oriented programming languages, like Java, C++ or Smalltalk and use distributed objects environments, e.g., CORBA [19], DCOM [20], Voyager [21].

3 Organisation Model

The Pellucid system modelling has been highly influenced by the CommonKADS methodology for developing knowledge-based systems [22]. In CommonKADS, a development of a system entails constructing a set of engineering models of problem solving behaviour in its concrete organisation and application contexts. This modelling concerns not only expert knowledge, but also various characteristics of how that knowledge is embedded and used in the organisational environment. We have followed a similar approach in the Pellucid project, borrowing some components from the CommonKADS methodology.

The CommonKADS organisation model describes the organisation in a structured, systems-like way, by representing aspects such as an organisation structure, processes, staff, and resources. All these aspects were taken into account in our organisation model. The main CommonKADS model specifies knowledge and reasoning requirements of the prospective system. It deals with the domain-specific knowledge and information used within the application, and the task/inference knowledge, which express application's goals and its realisation through a decomposition into subtasks and ultimately inferences. We have followed a similar approach in the Pellucid experience model. The working context deals with domain-specific characteristics of an organisation and active hints formalize the inferences needed in helping employees.

The ORGANISATION is defined by a structure, employees and goals oriented toward serving citizens. The public sector organisation achieves its goals by settling a set of AFFAIRS (see Fig. 1). Each affair engages EMPLOYEES. The employees work to accomplish ACTIVITIES, which are necessary to settle the whole affair. Each activity requires employee's SKILLS to be performed efficiently. A set of skills that the employee possesses does not necessarily contain all skills needed to perform the specific activity. An employee is chosen to work with affair on the basis of a ROLE played in the organisation. However, the role of employee may change dynamically according to current needs. The employee experiencing frequent changes of his/her role in the organisation is called a mobile employee.

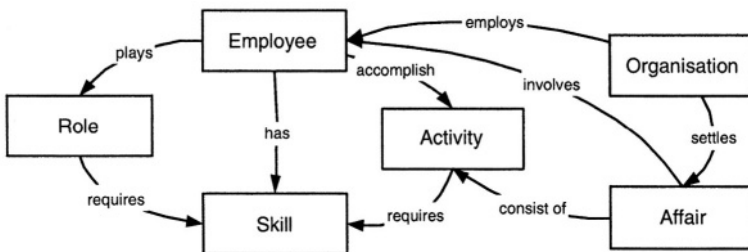


Fig. 1. Fragment of the organisation model

4 Experience Model

In the Pellucid system, EXPERIENCE is defined as an ability to perform an ACTION according to the given CONTEXT (see Fig. 2). The context is composed of tasks to be performed, actors to cooperate and resources to be exploited. It should describe all circumstances in which a particular activity is taken. The accomplishment of activity requires a PROBLEM to be solved. The problem is described in terms of the domain specific ontology. Moreover, some external factors may influence the way of activity accomplishment such as RESOURCES that are involved in the problem solution, both the HUMAN beings and elements of an INFRASTRUCTURE, e.g., Workflow Management System or Workflow Tracking System.

The idea of an active user support by knowledge delivery, triggered according to the context in a workflow, was developed by the DECOR project [7]. The Pellucid project has borrowed the idea of an “active hints” as conveyors of experience, and is working it out in a somewhat different direction. Active hints are regarded as suggestions to the user to perform some actions that will assist his/her current activity in the process instance. An active hint is a special element of knowledge which consists of an action, a resource and a justification (cf. Fig. 2), together with a context against which the current working context is matched and which will trigger a presentation of the hint. This context covers both the context in the work process (starting or completing a task, opening a document) as well as a domain-specific representation (relevant similarity of the current case to prior cases). An additional context is the characteristics of the employee (whether experienced or novice) at the most basic level.

The part of the hint called action is what the employee is suggested to do, e.g., to examine some documents, contact a person or use a template. The resource is the “subject” variable of the action. The justification presents a reason why the hint is being suggested. This model of active hints is very general, since

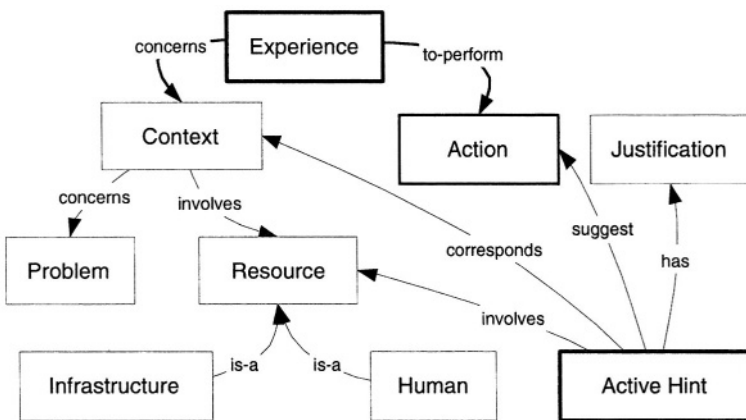


Fig. 2. Model of Experience

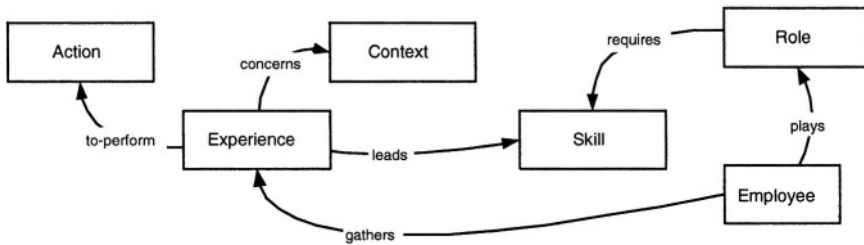


Fig. 3. Mobile employee gains required skills by gathering experience

it can encompass hint types built up from templates (similarly to the generic query templates in DECOR) as well as a retrieval of free-text notes entered by expert users and of documents accessible in organisational repositories. One of the central threads of work within the Pellucid project is the development of an ontology of the hints themselves, which is a basis for linking them with a representation of the work process.

The active hint is a formal representation of organisational experience (see Fig. 2). The example active hint is presented below:

Context: Creating a quarterly report

Action: Use

Resource: QuarterlyReportTempl.doc

Justification: It is a template

5 Mobility Model

A mobile employee changes his/her position within the organisation as a normal progress of his career. Each position requires some skills. Accomplishment of tasks at the particular position or in the scope of the particular role leads to a new experience accumulation and consequently to the skills (cf. Fig. 3).

It is important to note that most of skills are common for all roles within the organisation. They could correspond to the nomenclature, documenting techniques, procedures, etc. For this reason an employee who is changing position cannot be treated as a novice. A mobile employee should not be bothered with hints concerning the skills already possessed. The system should recognise current needs of the employee and provide only suggestions relevant to the employee's experience and skills [23].

6 Domain and Context Modelling

Trying to define the domain for each of Pellucid pilot applications it is necessary to find a general and simple criterion that could be used to model other applica-

tions which follow a defined workflow. In this section we explain our approach to describe the domain according to two aspects: the procedure and the dossiers.

Indeed, at the first level of approximation we can see the domain as a space (the dossier space) where dossiers are distributed along two axes:

1. the technical data description,
2. the procedure description.

Each dossier is represented by a point on the axis 1, its life is represented by a line parallel to axis 2. However, each value on the two axes is represented by a multidimensional vector in the two spaces of a dossier description and a procedure description. This could be a general approach. From this point we started to model the two spaces. For each application, we identified some parameters that, in a univocal manner, characterize the procedure and the dossier. A point in this bi-dimensional space can therefore represent the characteristic part of a case, in case-based reasoning. The action, that leads to the subsequent point (the dossier fixed), is the lesson part. The context (cf. Fig. 2) is therefore described both by the procedure and the particular problem to face (the dossier), which, in turn, are described by a set of parameters that are dependent on the application. Therefore, we have a procedural part, that can inherit some general concepts about workflow and activities, and a more specific part which is described by very technical concepts. Thus, we simplified the problem of context modelling, by dividing it into a domain specific component and a generic one.

One of Pellucid pilot application is provided for the design and installation of traffic lights by the mobility and transport department of one municipality in Italy. In this pilot site procedural data consists of general information (e.g. activity status, notes written within an activity, documents attached to the activity, e-mails sent during each activity) and information related to each activity

<pre> <owl:Class rdf:ID="ActiveHint"/> <owl:DatatypeProperty rdf:ID="explanation"> <rdfs:domain rdf:resource="#ActiveHint"/> <rdfs:range rdf:resource="XMLSchema:string"/> </owl:DatatypeProperty > <owl:ObjectProperty rdf:ID="action"> <rdfs:range rdf:resource="#Action"/> <rdfs:domain>owl:Class> <owl:unionOf rdf:parseType="Collection"> <owl:Class rdf:about="#Event"/> <owl:Class rdf:about="#ActiveHint"/> </owl:unionOf > </owl:Class></rdfs:domain> </owl:ObjectProperty> <owl:ObjectProperty rdf:ID="resource"> <rdfs:range rdf:resource="#Resource"/> <rdfs:domain>owl:Class> <owl:unionOf rdf:parseType="Collection"> <owl:Class rdf:about="#Event"/> <owl:Class rdf:about="#ActiveHint"/> </owl:unionOf > </owl:Class></rdfs:domain> </owl:ObjectProperty> <owl:ObjectProperty rdf:ID="context"> </pre>	<pre> <rdfs:range rdf:resource="#Context"/> <rdfs:domain>owl:Class> <owl:unionOf rdf:parseType="Collection"> <owl:Class rdf:about="#Event"/> <owl:Class rdf:about="#Employee"/> <owl:Class rdf:about="#ActiveHint"/> </owl:unionOf > </owl:Class ></rdfs:domain> </owl:ObjectProperty> <ActiveHint rdf:ID="ahl"> <resource><Employee rdf:ID="emp15"> <title>Technical Staff </title> <email>Gguiducci@comune.genova.it</email> </Employee></resource> <context> <District rdf:ID="dist6"> <title>VI.Medio ponente</title> </District> </context> <context> <WfActivity rdf:ID="wfa4"> <title>Design</title> </WfActivity></context> <explanation> He will help You understand the mechanism </explanation> <action><Action rdf:ID="aCommunicate"/> </action> </ActiveHint> </pre>
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Fig. 4. Example ontology implementation.

(e.g. input, preliminary analysis, data collection, design, installation, economical evaluation, external evaluation). Technical data describes the attributes of dossiers (e.g. type of request, applicant, dates, location, crossing shape).

7 Model Formalisation – Ontology

Ontologies can be represented using UML standard, in any object oriented language (OOL) or in special ontology languages such as DAML+OIL[24] or OWL[25]. DAML, DARPA Agent Markup Language is developed by DARPA organization. One of the W3C activities is to create a standard for ontology description - just OWL has been created, which started out from DAML+OIL. DAML+OIL and OWL are based on XML and RDF, thus ontology represented by DAML+OIL or OWL is easier to integrate with existing commercial technologies. The ontology represents structure of knowledge. The knowledge itself is mainly a set of instances of ontology elements, which need to be stored and manipulated. When representing ontology by OOL we need to store knowledge into object oriented database. Ontology represented by OWL can be stored in XML-based databases. OWL is quite easily readable by humans and computer system. XML parsers are available in any development environment. XML interfacing with other systems can be done easily based on XML-RPC or SOAP technology. Presentation of knowledge to the user can be done by using XSLT which transform OWL/XML data to HTML. OWL ontology can be manipulated by Java based Jena library[26] which provides several storage models, methods for ontology manipulation, RDF manipulation and query engine for RDF query language (RDQL).

When developing an ontology we can have two types of relation between entities: inheritance (“is a”) and properties (“has”), thus we need to simplify the real relation from CommonKADS model to inheritance, properties and instances. In Fig. 4 a fragment of ontology implemented in OWL is presented.

Implementation. The prototype of the Pellucid system was pre-evaluated and found very promising for the future users. We have got a lot of feedback, which is used for the refinement of some techniques and solution applied.

8 Experience Gathering

In the Pellucid framework, experience management is organised around three phases: capture, capitalisation and return phases. The capture phase is essential for the experience management because it enables gathering of experience and ensures the growth of the memory. Moreover, an enrichment of the Organisational Memory (OM) is a fundamental aspect when Experience Management aims to knowledge learning/maintenance. Thus, the objectives, the channels and the involved actors of the capture phase are outlined below.

Objectives. Employees' experience captured in the Pellucid system (cf. Fig. 3) is twofold: explicit and tacit. Explicit experience is formal knowledge found in manuals, documentation, etc. Tacit or implicit experience is personal context-specific knowledge, which results from human intelligence and consists of the mental representations or models (cognitive dimension) and skills and expertise of employees (technical dimension). As shown in [27], four conversions have been defined to describe the interactions between tacit and explicit knowledge. The capture phase was focused mainly on two of them: the externalisation, i.e. the "tacit-explicit" conversion and the combination, i.e. the "explicit-explicit" conversion. In our approach, the experience gathering stage will allow:

- to transform tacit into explicit experience by means of a human process. The externalisation will provide active hints (cf. Figs. 2).
- to capture explicit experience (such as a document or a potential contact) by means of an automatic process,
- to capture explicit knowledge (such as a contact) by means of a human process and more precisely by combination,

Experience Gathering Channels. The capture phase deals with experience collected during different activities of the employees. In Pellucid, only the individual experience is considered. Hence, the approach focuses on those gathering channels that are designed for individual use as opposed to those designed for group use. Two types of process will support these different channels: automatic and human processes.

In the case of the automatic process, i.e. through the workflow tracking system, two channels are identified: the channel enabling the capture of the documents and the channel enabling the capture of the potential contacts. The potential contact is a description of an actor, which is currently working on the workflow. In the case of the human process, three channels can be identified: the channel enabling the capture of contacts, the channel enabling the capture of active hints and the channel enabling the capture of indexing elements. The last one is key channel for the OM enrichment. The channel allows the user to define and underline some aspects of experience by using pre-defined elements of description such as keyword, tags, or sentences.

Actors. The concept of an actor refers to the principal types of users. Two types of actors are taken into account in the capture phase: the experienced employee regarded mainly as an actor enriching the organisational memory and the new employee. Some sub-types of new employees can be distinguished:

1. The novice: a new employee who has just graduated and is starting his career.
2. The skilled new-hire: a new employee who already has some experience on the same tasks, because had come from another company.
3. The relocated employee: a new employee who comes from the same company and therefore knows the internal procedures but has been previously involved in others tasks.

Identification of employees' types at the experience gathering phase is important to promote the evaluation feedback among the employees at the experience reuse phase (e.g. when a novice has evaluated a document as very good for his/her purposes, it is probable that this document is interesting for another novice).

9 Conclusions

In the paper, some results of development of experience management system for solving problems arising from high level of employees' mobility within organisations were presented. The concept of experience was modelled for the purposes of organisation. There was specified experience representation and some domain-specific applications. The approach to the experience gathering within organisation was introduced. Finally, implementation in form of ontologies was presented.

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The Governance Enterprise Architecture (GEA) High-Level Object Model

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Abstract. In this paper, we continue our work on building the Governance Enterprise Architecture (GEA) by proposing the GEA high-level object model for the overall governance system. The core concepts of the model emerged by utilizing a metaphor: administration and society interacting in a linguistic way. The model elaborates on this isomorphism (common structural artifacts) between the two systems: language and public administration. Based on this metaphor, the object model is built both with regard to its structure (object classes, relationships, inheritance) and its contents.

1 Introduction – Motivation

During the last decade, there have been several attempts, in various industries, proposing high-level domain specific models [1-6], which aim at describing the overall domain under study. The derived models could be used as blueprints for analysis, system design and implementation. Moreover, they could constitute a common language thus providing a means of communication amongst units or even a means of representing knowledge for use in the industry as a whole. The same need has led IT vendors such as SAP [7] and IDS Scheer [8] to formulate ready-to-configure solutions covering specific industries and creating generic industry process and data models.

In public administration relevant initiatives are rather rare. A brief description of the more important follows:

The U.S. Vice President's office of the National Performance Review together with the Inter-Agency Benchmarking & Best Practices Council supported the development of a government process classification framework. This framework proposes four major processes for all public administration agencies: "Establish Direction", "Acquire Resources", "Provide Capabilities" and "Execute the (Agency's) Mission". These are further analysed providing over 150 lower level processes [9].

Following a similar approach, the recent Business Reference Model, as introduced by the Federal Enterprise Architecture Program Management Office in the USA, has defined four different core business areas. These areas separate government operations into high-level categories relating to the purpose of government (Services for Citizens), the mechanisms the government uses to achieve its purpose (Mode of Delivery), the support functions necessary to conduct government operations (Support Delivery of Services), and the resource management functions that support all areas of

the government's business (Management of Government Resources). These high-level areas are further analysed in 39 "Lines of Business" and 153 "Sub-Functions" covering the overall federal enterprise [10].

In the UK, the e-Envoy Office proposed as part of the e-Services Development Framework [11], the Government Common Information Model (GCIM) which is a generic data model representing the basic entities and relationships during the Service Interaction phase. These entities identified to be: "Rule", "Service", "Location", "Evidence", "Outcome" and "Subject"[12].

These national initiatives have developed descriptions and models based on and addressing specific needs of the broader projects they were part of. As a result, they were focused on providing solutions to local problems and not to develop models to be accepted on a wider basis. For this reason, they were not adopted or exploited by a wider community outside the country they were proposed. An additional limitation of these approaches has been that they were focused only on the part of the overall administrative domain that is related to "service provision". Identifying the overall governance domain with service provision excludes important aspects and parts of the overall governance system such as the society-to-political system interaction.

Attempting to address the problem regarding the lack of *holistic* domain models for the overall governance system, during the last years we have created the Governance Enterprise Architecture (GEA). At the current stage of development, GEA consists of four high-level models:

- The GEA mega-process model of the overall governance system [13].
- The GEA interaction model of the overall governance system [14].
- The GEA public policy formulation object model (strategic planning) [15].
- The GEA service provision object model [12].

Advancing our domain analysis, we present here the latest development of our work: the GEA high-level object model for the overall governance domain.

2 Overall Presentation of the GEA Object Model

The GEA object model has been derived in a top-down fashion. The basic model's entities, instances, and relationships emerged by employing a metaphor in describing the governance system: we used the metaphor of language, and we consider the relationship between administration and society in a linguistic context [16].

The model (Fig.1) depicts the main objects and relationships that constitute the overall governance system. That is, it covers the path that leads from the conceptualisation of administrative action to the realization and process execution in the real world, in correspondence with the "Formulate Public Policy" and the "Provide Service" mega-processes of our GEA mega-process model [13].

As can be seen in Fig.1, we have included instances in some of the model's objects. In some cases, these instances serve simply as examples (e.g. at the Public Service object). Though, in the case of the "Administrative Function" and "Type of Public Service", we propose important, exhaustive populations of the entities. As these are of particular interest for our domain analysis, we present them separately in Sections 3.2 and 3.3, respectively. The primary entities and the underling relation-

ships of the model are depicted in Fig. 1. A description follows, starting from the right side of the model.

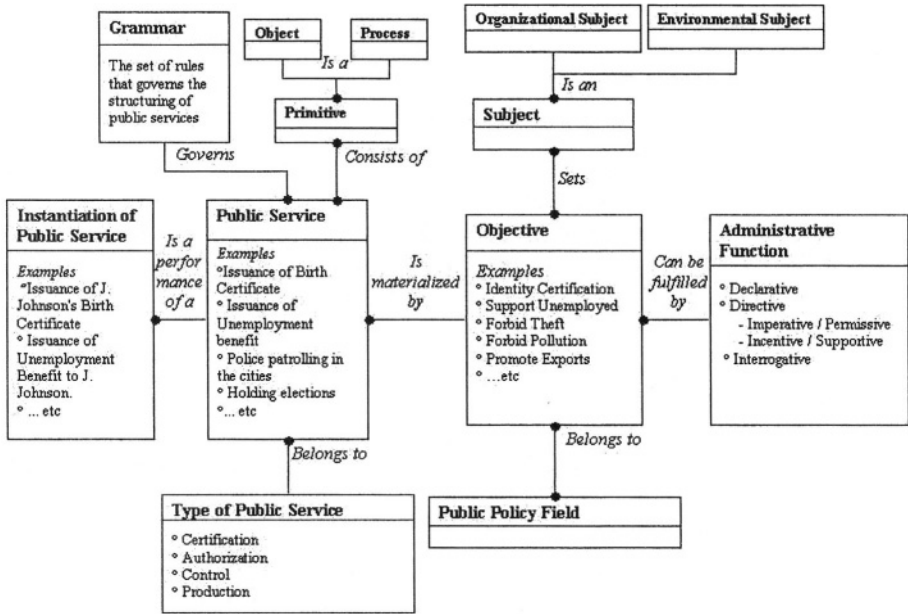


Fig. 1. The GEA object model for the overall governance system

Administration performs a set of primary Functions. At a high level there are three types, as derived by the linguistic metaphor we employed. In the society – administration “conversation”, there are three types of interaction: Declarative, Directive and Interrogative. The directive administrative function is further broken down into two categories: Imperative/Permissive and Incentive/Supportive.

Administration sets Objectives to be reached. By doing so, administration chooses from a superset of potential objectives, the subset to be realized. Objectives are related to the abovementioned three primary Functions. They are politically defined, and administration sets them as targets to meet.

Objectives are linked to several Public Policy Fields. The latter are defined as functional areas of Public Policy interest. These Public Policy Fields are more or less close to the departmentization introduced to administrative space by ministries.

In order to materialize the Objectives, administration has to organize and to provide Public Services. We identify four primary types of Public Services: certification, authorization, control and production.

It is very important for the comprehension of the model to distinguish between “Types of Public Services” and “Types of Administrative Functions”. Although a strong link exists between the two, each Administrative Function is realized alternatively by all Types of Public Services. So a single Objective can be attained through a number of different Public Services. The choice each time of the specific Public Service, through which Administration will reach the satisfaction of an Objective, de-

depends on various factors, such as the administrative capacity, the information technology available, the existing organizational and institutional infrastructure, etc.

Public Services are considered to consist of Objects and Processes (here called Primitives). Their appropriate organization is governed by a set of structural rules, which could be called (administrative) Grammar.

Public Services are described here as abstract entities. They are units of the administrative system they belong to. What is finally performed in the real world is just the Instantiations of these Public Services. Both the Service and its Instantiation can be perceived either as a process or as a product. The meaning of each Instantiation is richer than the meaning of the Public Service from which it derives. Instantiations consist of the abstract models (Public Service) together with all the intonations of the real world (space, time, real people, behaviour, culture, etc). What finally reaches the citizen is the Instantiation and not the Public Service. For each Public Service, we have numerous real world instantiations.

3 Administrative Function

All systems perform a set of primary functions. In the case of the governance system an interesting question can be posed: What are the categories of administrative action that the governance system performs?

Researchers of administration usually address this question proposing classifications along various lines [17-19]. One of the more common is based on the functional notion of the public policy field. In this line, administrative function is classified in categories such as securing the existence of the state and internal order, promoting economic growth and welfare of the society, etc.

Although useful for practical purposes, this classification of administration action is not sufficient, as it demonstrates more the variety of the fields in which administrative action can be applied and not the different nature of this action per se. Thus, this taxonomy lies at the surface and cannot appropriately address the posed question.

Getting insights from linguistics [16], we tried to identify primary functions performed by administration during its communication with society. We propose three primary administrative functions, in line with the three basic communication functions of the language:

- Declaration
- Direction
- Interrogation

The Interrogative function corresponds to the upward movement of information from society to decision-makers, while the Declarative and Directive functions correspond to the downward movement of the political decision to the administrative system, and society. The latter functions lie at the top of our domain analysis, thus clarifying their characteristics is critical. A description of these two functions follows in the next sub-sections. We will not elaborate further on the Interrogative function here.

3.1 Declarative Function

Through the Declarative function, administration declares and certifies the existence and the truth of certain world states. Thus, this function is referential and descriptive. It is uttered by administration in declarative mood. The logical pattern describing the declarative function is “Certifying X for Entity Y” (e.g. certifying J. Johnson’s family status or place of birth).

Why does society need the administration to certify states of the world? Social entities need to interchange certified information. There are several possible ways to certify a piece of information. Depending on the importance of each particular case, these may include a declaration of the individual (e.g. official income declaration for tax authorities), a third party certification (notary, lawyer) and for more critical information an official certification from a public agency. Administration is considered to be the most reliable certification actor in society: a kind of “honest broker” arbitrating private transactions in a neutral manner. Nowadays, administration certifies an extended set of information related to citizens or enterprises.

3.2 Directive Function

Through the Directive function, administration directs society to certain states. Thus, this function is constructive and deontological.

The Directive function can be further decomposed into two types, describing the two paths administration uses to direct society:

- Imperative – Permissive
- Supportive

The first refers to administrative action that gives direction to the society by command. The second gives direction through incentives and support.

3.2.1 Imperative – Permissive

As Imperative, we define the set of functions through which the administration forces or forbids societal behaviours. These functions are uttered by administration in an imperative mood and society owes mandatory compliance and obedience.

In administration the prevailing position of the Imperative function is justified on historical, significance and frequency grounds.

The Imperative function can be further decomposed into two types, depending on whether the administration forbids or forces the subject to have specific behaviour. We call the first kind of functions “prohibitions” and the latter “obligations”.

- *Prohibition.* The state prohibits behaviors for many different reasons. What is prohibited each time in society depends on various socio-political factors that change in time. The prohibition has a clear negative connotation: the subject should avoid specific behaviors.
- *Obligation.* On the other hand, the state sometimes demands specific behaviors and forces the society to obey certain patterns (e.g. mandatory education up to an age). Although an obligation can derive as the alternative, opposite view of a prohibi-

tion, the first in contrary with the latter has generally a positive connotation: the subject should follow specific behaviors.

In another dimension, two categories of the Imperative function result as follows:

- *Absolute command*, when the prohibition (or obligation) is general and without exceptions (e.g. theft, kidnap, rape)
- *Conditional command*, when the prohibition (or obligation) can be lifted under specific circumstances (e.g. not to drive without a driver's license, not to build without a building license).

The latter category of Imperative functions acquires special interest for the administration, as it is the basis for the Permissive administrative function.

We define as Permissive the set of functions through which the administration recognizes special rights and allows behaviours otherwise prohibited. Through the Permissive function, exceptions are activated in situations where a universal prohibition has been enforced. These functions are also uttered by administration in an imperative mood, as administration sets a mandatory process that has to be followed if the subject wants to exercise this kind of behaviours. The Permissive function can be perceived as a special case of the Imperative one, as it directly relates to command under conditions [16]. The logical pattern describing the permissive function is "X is prohibited, unless Y occurs" (e.g. building a house is prohibited, unless you have a building license).

Why does society need the administration to assign special rights and decide exceptions to universal prohibitions? From the first time administration posed certain prohibitions to society through its imperative function, we can assume that the need for exceptions emerged. Even if these exceptions could be assigned ad-hoc, administration sooner or later faced the problem of better organizing the process of "exceptions". The generalized use of this practice resulted in the appearance of the Permissive function.

3.2.2 Supportive

In this broader category, we group functions through which the administration offers guidance and support to society. These functions are uttered by administration in an incentive mood, as compliance is not mandatory (optional).

Through the supportive function, administration either promotes specific behaviours or assists the society, providing basic infrastructures, goods and services.

Why does society need these supportive functions to be provided by the administration? As described in contemporary macro-economic theory, there are several types of inconsistencies that the market mechanism cannot resolve automatically, to the contrary of what was initially declared by the classical liberal approach. These inconsistencies are related to social and macro-economic issues (e.g. income distribution, production of public goods and infrastructure).

Administration takes action in these cases in order to support the (macro) economic development of the society and the citizens with low income. Historically, administration developed these functions with the emergence of the Welfare State.

In the Figure that follows, we present the different types of the Support function.

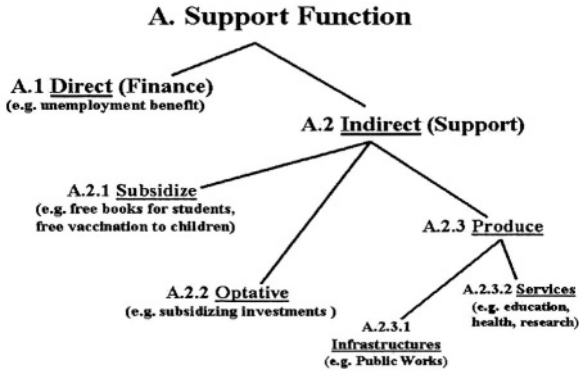


Fig. 2. The types of Support Functions

The Support function can be either Direct (A.1) through financing actors with few financial means (giving money, which means financing consumption) or Indirect (A.2). There are three types of Indirect support:

- **Subsidize (A.2.1):** Subsidizing access to goods and services that are considered as vital and for which exclusion is considered unacceptable (e.g. subsidization to keep low fares for urban public transportation, for museum entrance, for covering a percentage of operational costs of kindergartens). The production of these goods and services remain with the private sector.
- **Optative (or Incentive) (A.2.2):** Through the Optative Function, administration promotes specific behaviors. To persuade and urge society towards these behaviors, administration offers support as an impetus (e.g. subsidizing investments, providing bonus for having a third child or for employing unemployed persons).
- **Produce (A.2.3):** There is an important type of indirect support, due to its size in modern states, when administration offers for free (or below the production cost) infrastructures, products and/or services that have been *produced internally* (e.g. public hospitals, public schools). The infrastructures and services selected for production are usually those considered as “public goods”. The inner motivation for this production is the same as with “Subsidize”. For effectiveness and efficiency reasons administration decides not simply to subsidize the access to these services, but to undertake the overall control and produce them using internal resources.

4 Objective

In language, speakers want to communicate messages to other entities. The speaker usually utters sentences to communicate these messages. In an analogous sense, administrations want to fulfil certain objectives. Administrations perform public services to fulfil these objectives.

Communicating effectively the message is a target for the speaker. Several different sentences of different types can be used alternatively and even the very same sentence can be uttered in very different styles and moods. Similarly, fulfilling certain

objectives is a target for administrations. Several different public services can be performed in the quest to meet a specific target.

The process of defining objectives (issue filtration and agenda setting [20]) is quite complicated in public policy since drafting objectives is directly linked to the process of realizing them [21]. Nevertheless, administration comes up with a concrete list of objectives to pursue, regardless of the difficulties encountered to draft this list. The administrative objectives are defined both on an historical and a geographical basis.

Objectives are ideas, which administration sets as policy targets. In order to meet these targets, administration must organize an implementation mechanism. This mechanism has to transform vision into action and practically results in an extended set of public services.

As shown in the model, each objective is related to one and only one administrative function, while each administrative function is associated with a number of objectives (one-to-many relationship). Additionally, administration can alternatively deploy a variety of public services, in order to fulfil an objective. Different objectives may not be achieved through the same public service (one-to-many relationship).

Objective is the connecting entity between administrative function and public service, as can be seen in Fig.1. It serves as an intermediate entity between the abstract administrative function and the “down-to-earth” public service.

5 Public Service

Modern administrations, in the quest to address the ever-evolving social needs, produce a wide spectrum of services that currently covers almost every aspect of the citizen’s life. Each different public administration chooses and orchestrates a different set of public services in order to fulfil the selected objectives.

Can we classify the hundreds of public services provided by administrations into general types with common characteristics? By addressing this question, we then can identify generic types of public services with similar characteristics. These generic types could be described once and these descriptions could then be used either to analyze existing or to create new instances of services by just reconfiguring the generic types appropriately. A generic process model could also be proposed for each type of public service.

In our work, we have identified four generic types of public services:

- **Certification:** There is a prevailing (characteristic) type of public service for fulfilling the Declarative function and this is “Certification”. Through certifications administration declares and certifies different states of the world.
- **Control:** How do administrations realize the Imperative function, through which it either prohibits or forces specific behaviors upon society? Administration has to secure that society adheres to prohibitions and obligations. The main role of public administration in this case is to “Control”. As the offender tends to hide his behavior from the administration, the most ordinary type of this administrative action is inspections on a periodic or on an impromptu basis.
- **Authorization:** There is a prevailing type of public service through which administration realizes both the Permissive and the Support function, and this is “Authorization”. Administration sets up an entire mechanism, to exercise this type of serv-

ices. In case special conditions are met, either the universal prohibitions should be withdrawn (permissive) or a support should be awarded (supportive).

- **Production:** In Section 3, Production has been identified as a sub-type of Supportive administrative function. Public administration must organize a “Production” mechanism internally.

In Table 1, we present the correspondence between administrative functions and the type of public services, which are typically (or characteristically) employed.

Table 1. Characteristic types of Public Service for Administrative Functions

Administrative Function	Characteristic Type of Public Service
Declarative	Certification
Imperative	Control
Permissive	Authorization
Supportive	Authorization
Production	Production

Although a strong (characteristic) link exists between administrative functions and types of public services, each function can be realized by many types of public services. This statement has many consequences in our overall domain model.

We demonstrate this “multiplicity” feature between functions and public services using an example (Table 2).

Table 2. Multiplicity in “Administrative Functions – Public Services” relationship

Objective: Prohibition of polluting the atmosphere
Administrative Function: Directive, Imperative
a. Instance of Public Service = Periodic control of pollutant emission from factory flues Type of Public Service = Control
b. Instance of Public Service = Issuance of operating licenses for factories Type of Public Service = Authorization
c. Instance of Public Service = Issuance of a certificate asserting that no pollution is caused Type of Public Service = Certification

6 Conclusion – Future Work

In this paper, we overview the GEA high-level object model for the overall governance system. There are still parts and aspects of the models, which need further analysis. The difference between “public service” and “instantiation” and the notion of the “administrative grammar” are indicative examples.

Furthermore, we plan to analyse the four generic types of public services, with the intention to identify and reduce them into “primitive components” (or building blocks). Through this path of work, we intend to come up with more detailed descriptions for the processes executed in the “Provide Service” mega-process.

Last, we intend to better “tune” all the GEA models in order to better align all the concepts presented in them, enforce the existing interrelations and strengthen the overall GEA consistency.

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Retrieving Knowledge in E-government: The Prospects of Ontology for Regulatory Domain Record Keeping Systems

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Abstract. If e-Government systems are to achieve the anticipated goals of storing, manipulating, diffusing, and preserving knowledge, then these systems must incorporate mechanisms for domain-specific information. One often overlooked asset for this activity is the knowledge embedded within and between records and legacy record keeping systems; however, lacking government-wide documentation management systems and subject specific resource description, timely retrieval of relevant records is impossible. This paper explores the benefit of ontologies for improved retrieval of subject domain knowledge. Historical records and recording keeping systems were reviewed for this purpose. Structural and semantic information was derived, from which requirements for an ontology in the subject domain of export control regulation were identified. Class, subclass, instance, and relationships were identified and modelled via an Entity Relationship Diagram. Through this exercise, it is clear that e-Government systems hold great potential for circumventing past information management deficiencies, and ontologies may have a role in the transition from information systems to knowledge systems.

1 Introduction

Just as developers are rapidly developing and deploying e-Government systems, so too is considerable attention centering on precisely how effectively these systems store, manipulate, diffuse, and preserve knowledge. The failure of countless technology ventures over the last decade clearly demonstrated that blind application of technology constitutes neither a necessary nor sufficient condition for effective knowledge management. Systems developers must do their best to incorporate as many existing knowledge artifacts from the policy community they seek to connect. This explicit goal must precede the application of technology, and in no place is this fact more germane than in the systems development process of e-Government.

It is as yet unclear how successfully e-government systems are being developed. This is not to suggest that the prospects for e-Government are gloomy; in fact the possibilities are limitless. However, numerous examples of information failure within government foreshadow the prospects of e-Government. The

concern is whether e-Government systems can overcome the systemic, organizational, and bureaucratic barriers to effective knowledge management or instead simply replicate the latent deficiencies so long present in analog systems. Information failures are costly; however, in instances of government decision-making these costs can prove incalculable.

One area that has long suffered from knowledge mishandling is the administrative process of regulating militarily sensitive exports or the area of export controls. Instances of information failure in this area are frequent, and they characterize the problem plaguing knowledge management in governance more broadly, that of knowledge retrieval and sharing. The case of the *U.S. vs. Fiber Materials, Inc.* is a prime example. [1]

In 1995, two businessmen were found guilty of violating U.S. export control laws based on the memory of two government officials as to the meaning of two words in a specific export regulation: “specially designed.” The two licensing officers testified at the trial that the meaning of the terms had never been written down. It was “in their heads.” Researchers for the Defendants in the case, however, successfully unearthed the explicit, written definition of the terms as it was intended to be used in the regulatory language. The very government agency responsible for issuing and enforcing the regulations, the same that had that brought the charges, had defined “specially designed” some forty years prior to the trial. The definition had simply been lost, encapsulated within an obscure government document.

Because the written definition contradicted government testimony, in August 2003, the original verdict was overturned. This knowledge failure calls into question the validity of every export license decision and compliance with regulations which included the terms “specially designed” prior to the discovery of the documentary evidence. The terms appear in over two-hundred export control regulations. Did government officials deny licenses for benign, profit generating exports? Did they accidentally permit the release of strategic items, proliferating weapons technology. Lastly, why was this crucial knowledge, so important for export license decisions, seemingly lost for over forty years?

e-Government systems must push information into knowledge. Systems must operate within well-defined and informed parameters of specific subject areas. This knowledge must be bound. It must include the language and process derived from accumulated, relevant evidence recording administrative history, such as documents. Ontologies may prove a useful tool for facilitating there retrieval.

2 The Study

This paper endeavors to build an ontology for the subject domain of export controls. Development of such an ontology may prove critical for effective knowledge retrieval and knowledge sharing in this area. Via detailed analysis of public records associated with export controls, this paper constitutes a first iteration in this endeavor. It is in no way to be viewed as complete. Ontology building is an iterative process. The intent of this first iteration is to examine the many lay-

ers of relationships between information objects, and, in so doing, inform future development through a document-centered approach. First level taxonomies can guide ontologies. This analysis revealed a central taxonomy common to multiple objects around which an ontology could be built.

This document analysis relies on international and U.S. Executive branch records obtained from the U.S. National Archives, U.S. government agency libraries, three U.S. Presidential Libraries, multiple depository, public, and academic libraries. A representative sample of the documents reviewed include:

- Declassified documents of NATO’s Coordinating Committee on Multilateral Export Controls;
- Declassified Executive branch documents obtained from Presidential Libraries;
- Title 15, Part 799 U.S. Code of Federal Regulations: Commodity Control List, copies of which were reviewed between the periods of 1950 and 2002;
- Schedule B: Statistical Classification of Domestic and Foreign Commodities Exported from the United States;
- U.S. Department of Commerce Annual Reports;
- Department of Defense “Militarily Critical Technology List;”

In total, over twenty libraries, records, and information centers were scoured for information relevant to the domain of export controls.

2.1 Domain, Memory, and Decision

The movement of information within the bureaucracy of arms control and non-proliferation policy is extremely complex. It is a policy area that involves dozens of countries all of which are members of several international organizations and regimes. Representatives from member countries negotiate agreements. Each of which results in national legislation and the promulgation regulations. The domestic policy and regulatory process is equally complex.

Each national government must implement international agreements at home. This typically involves regulating the movement of goods and services across national borders. This is an administrative function encompassing the recording of shipments, liaising with the public, enactment and enforcement of regulations, the licensing of exports, and collaboration with multiple government agencies including intelligence, crime enforcement, financial, and diplomatic staffs. Within each of these government agencies exist specific administrative operation. Moreover, inter/interagency teams further subdivide bureaucracies, often requiring their own administrations and procedures.

Within this administrative spider’s web sits the decision-maker. Decision makers often share their experience, explaining what may have been done in similar situations. However as stated earlier, the export control process is complex. It is composed of multiple bureaucracies and agreements. The decision-maker may need information about the process and language of regulating, which may reside outside their bureau or immediate functional domain. This policy context is composed of structural, sequential, and linguistic information or taxonomies.

Each adds evidential value to the chain of administrative process. The decision-maker can rely on this context frame for decision-making, provided it is modelled and retrievable.

In this process of classification, precise language is critical for assigning meaning to the export reflected in the form of the export license request. But regulatory language is widely charged as terribly vague, ambiguous, and unclear. Unfortunately, export licensing officers must render decisions in this ambiguous environment, and evidence on which to base his or her judgment and perpetuate the spirit of nonproliferation policy is unclear, as the aforementioned case suggests.

2.2 Ontology Defined

What is an ontology? Jasper and Uschold [2] define the primary purpose behind ontology as “reducing the cost of multiple applications having common access to data.” This may in turn, facilitate inter-operability. Lavery & Boldyreff [3] offer a more refined definition, “a domain specific ontology is a knowledge management tool used to support communication and knowledge reuse about a specific domain.” This interplay between place and time—that of centralizing knowledge and communication, is the heart of ontology. For the purposes of this paper, ontology is best defined in the words of Noy and McGinness [4] as “a formal explicit description of concepts in a domain of discourse.” Conceptually, it is useful to think of an ontology as similar to an office filing system.

Filing systems support an organization’s information needs in that they provide common access to records for a variety of organizational objectives. Customer files, employee files, product information, competitor information is centrally organized and stored for future use. The filing system structures and orders information, knowledge typically stored in the form of paper records but now including both paper and digital objects. This system utilizes the contextual language of the enterprise’s operational vernacular or what information organization researchers have characterized as its “controlled vocabulary.” [5]

This reuse of information is particularly important for government decision-making and should inform the application layer of information systems and metadata resource description. Ontology has replaced the filing cabinet in the ubiquitous platform of the World Wide Web, while the filing system has been replaced by metadata description frameworks. Ontologies may connect information objects, rebuilding semantic and organizational knowledge. This benefit strengthens ontology’s resonance as a method for developing description frameworks. Requirements engineering methods are critical for ontology building; however, one of the key inputs of requirements engineering is frequently dismissed: policy records.

3 Rudimentary Structure Revealed through Documentation

Records professionals are cited as being in a strategic position to influence the information architecture of information systems. [6] Toward this end, scholarship has centered on the elicitation of requirements for documentation systems and the evidential value of records. [7–10] Records can play such a substantive role in eliciting the nature of information objects across such enumerative categories as: taxonomy, administrative and organizational structure, and function. In the export control domain, these three aspects are intricately interconnected, woven together via a complex community of subject area specialists. These relationships between actors, sub actors and the language through which they communicate is embedded in historical records and government publications. Through their analysis, the beginnings of an ontology may come forth.

4 Fields and Description

Content analysis revealed definitive, stable knowledge structures within, between, and across documents. Most contained an area heuristically defined herein as a “header section.” Within this header, numerous fields contained specific and distinct types of information, such as date, document number, and title. When placed with the context of the taxonomy of the policy domain, these fields also depict and described such things as transaction, organization, function, custody, and interdependency. Each of these resultant categories of information also serve as information objects and classes, the backbone of the subsequent ontology. These objects contained within records inform the reader of the context of the documents origin and policy domain knowledge.

5 Taxonomies: Semantic, Structural, Functional

Surprisingly, the structure of the CoCom records remained constant over time. The relevant information on which negotiators, domestic policy analysts, and regulatory staff relied did not change, a particularly telling feature when compared against the various action areas associated with the generation and handling of the records. These action areas correspond to structural and semantic taxonomies and process of policy administration. Within this process resides the agents and language of the domain.

5.1 Taxonomy to Class

When records were compared against the structure of export control regulations, shared classes and a common taxonomy between the structure of CoCom’s record keeping system, the structure of the CoCom records themselves and the structure of the organizational system in the domestic regulations surfaced. This taxonomy linked multiple documents in this policy domain.

Given this relationship, it is clear that a method was in place that would inform policy officials of the precise negotiating history of the specific goods and technologies under the international body of CoCom. Domestic policy analysts and regulators could have relied on the evidentiary value these records and record keeping systems provided, had systems been in place that enabled the retrieval of this knowledge.

Content analysis revealed multiple sub-taxonomies as well. Free floating subdivisions within the body of the Export Administration Regulations, i.e. “parts, components, and accessories” was also tied to various document titles in a variety of different organizations. Export Control Commodity Number is a unique identifying number derived from multiple indices. The categories in these indices reflect commodities, country, the international organization or policy associated with the regulation. These various categories also reflect action areas executed in multiple offices and areas in the administrative chain.

ECCNs form a semantic taxonomy used in multiple classes derived from shared technical or functional qualities between commodities. For example, metalworking machinery is a class identified with the digit 2 in an ECCN. Similarly, parts and components is a subclass in the ECCN which is identified by the letter B. Several categories or facets are represented via the sequential stringing of digits. Similarly, each digit represents a specific office, function, and language in the administrative policy process.

Surprisingly, though the digits representing various classes may have changed over time, the class names remained fairly constant. These classes reflect strategic technology areas. One can trace the controls on a specific technology area over time through the retrieval of documents commonly classified as germane to this technology area.

6 The Ontology Form

The form of the ontology is represented in the corresponding entity relationship diagram. The entities identified in the chart should be read as principle agents, each of which display characteristics or attributes. In the relationships between classes, many subclasses result. Some of which appear as “free floating” in that they may reside within any number of superclasses. This “class hierarchy” is represented within the ontology in the various relationships between the classes and attributes, hence enabling identification, collocation, and retrieval of knowledge.

7 Class, Subclass, and Relationships

Functional and organizational interdependencies were identified across export control records. The following entities and relationships describe the conceptual pattern of interaction between taxonomy, structure, and function. According to Dragomir Radev (2000), the possibility exists for further differentiation by relationship type.[11] From the multiple layers and inter/intra document connections the following entities and relationships were identified:

- **Commodity Control List:** The U.S. list of regulations devoted to “dual use” goods and technologies. It was derived from the Industrial list of NATO’s Coordinating Committee. The CCL *consists of* ECCNs.
- **Export Control Commodity Number:** Derived from several subject indices and it is used as a numerical identifier in the U.S. export control regulations. *ECCNencodes* Commodity Category, Commodity Group, Type of Control, Unilateral or Multilateral, Reason for Control (1-to-m).
- **Negotiation Transcript:** The record of negotiation *NegotiationTranscriptidentifies* ECCN(m-to-m)
- **Reason for Control:** The reason for control is a nominal policy category which may or may not restrict an export from leaving the United States. **Subclasses** consist of regime, Agency, Regulatory Unit, Negotiated Transcript, Regulation.
- **Agency:** A government organization chartered with the responsibility of some aspect of policy and/or administration. The specific bureaucratic body that is responsible for the administration of the regulations. Agency consists of Administrators, Bureaus, Departments, Working Groups. *Agencycreates* Negotiated Transcript (m-to-m).
- **Regime:** A specific, institutionalized understanding dedicated to a common arms restriction goal. Regime consists of Country, agency. *Regime* creates Negotiation Transcript (1-to-m)

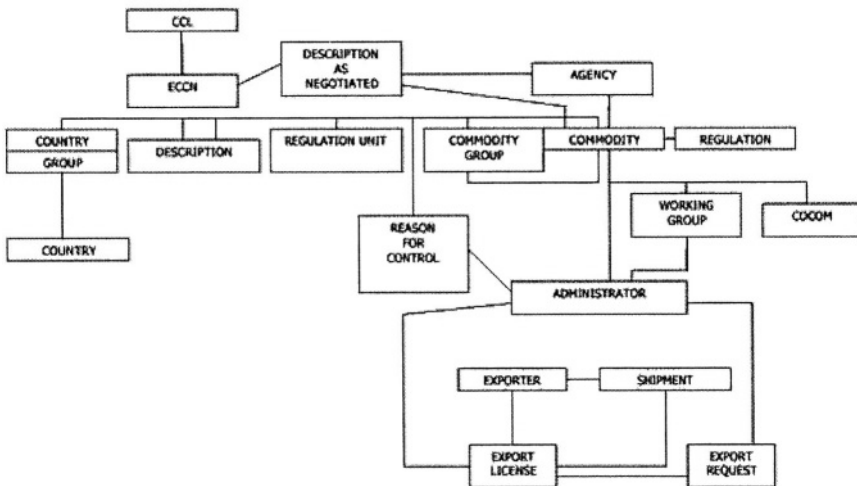


Fig. 1. Export Control Entity-Relationship Diagram

7.1 Relationships between Documents and Organizations

Further analysis of CoCom's records when compared against the structure of the Export Administration regulations reveals unions or intersects of classes of information. This intersection or overlap of classes between these two organizational systems denotes relationships between the two. CoCom records informed decision-making domestically in U.S. bureaucracies. History provides direct lineage between the negotiations in Paris and the subsequent passage of legislation and regulations promulgated under the acts. The tacit relationship between information classes and the benefits it may provide for current decision makers is illustrated via document comparisons. The composition of CoCom document number reflects the descriptive categories contained in the Export Administration regulations. This shared information is aptly defined as class in ontology terms. Relationships between these information objects and their class hierarchy can then be traced and conceptually unified to enable users to retrieve an array information objects which may inform decision making. Because these objects are interrelated, each informing the context of the other, both would provide historical content for a decision, context which can prove crucial for consistent decision making on export licenses over time, context which might inform future policy.

8 Resource Description: XML and DTD

With the conceptual framework defined, resource description may include definitive class and class hierarchies and associations to related classes. These descriptive patterns may be reflected in extensible markup languages such as XML, structuring these classes, hierarchies and associations within document type definitions. A much more exhaustive analysis should precede the development of such items, more exhaustive than the rudimentary analysis reflected in this paper. Ideally this analysis would include more than analysis of content in historical documents, but also substantive interviews with members of the user community. Unfortunately, such developments are beyond the scope and resources of this study.

9 The Benefits: Knowledge Centralization, Sharing, and Preservation

As mentioned at the outset of this investigation, one of the primary benefits of developing such ontologies for E-government systems is centralize knowledge on subject domains. With the structure outlined above, we see an ontology in its nascent stage. The benefits of which include:

- The reuse of critical knowledge;
- the sharing of domain knowledge across a variety of settings, including within organizations, across organizations nationally, and within communities of practice that extend across borders.

- the preservation of knowledge.

As technology advances, so too will its military significance and the aforementioned classes. These changes may be tracked via conceptual concordances. Preserving this historical lineage and context within the widely dispersed, subject specific export control community.

For example, the changes in militarily sensitive technologies are reflected via different commodity groups between 1991 and 2001 as seen in table 1.

Table 1. Commodity Group Comparison

Commodity Groups (2002)	Commodity Groups (1991)
0-Nuclear Materials, Facilities and Equipment	0-Metal-Working Machinery
1-Materials, Chemicals, Microorganisms, and Toxins	1-Chemical and Petroleum Equipment
2-Materials Processing	2-Electrical and Power-Generating Equipment
3-Electronics	3-General Industrial Equipment
4-Computers	4-Electronics and Precision Instruments
5-Telecommunications and Information Security	5-Metals, Minerals, and their Manufactures
6-Lasers and Sensors	6-Chemicals, Metalloids, Petroleum Products, and Related Items
7-Navigation and Avionics	7-Rubber and Rubber Products
8-Marine	8-
9-Propulsion Systems, Space Vehicles and Related Equipment	9-Miscellaneous

One could trace the change in number between categories and the corresponding structural changes, say the transfer of one function from one office to another and the corresponding linguistic differences as evidenced in that office's documentation.

10 Implications

What then does this mean in the context of export license decisions? Primary methods for determining prior action on export license requests require searching of database/s of previous commodity classification decisions. These commodity classifications reveal prior licensing decisions, but they do not reflect subject domain knowledge. The database communicates little to no historical information in terms of how to interpret regulatory language. Documents recording the policy discussions of the formation of export controls would prove extremely useful in this situation, and document management systems may facilitate their retrieval. The formal logic outlined in the preceding ontology would prove helpful for this

task. It would allow for narrowed searching of relevant records and enhanced the subsequent use of natural language search techniques.

With the above ontology embedded within a Web-based system, user's could search for documents associated with specific commodity categories and policies, emanating from different bureaucratic organizations, different staff or administrators, or even different international regimes. User's could share a common, administrative, knowledge base. For example, a user could query for "all documents" with reason for control "nuclear." In a database, the query would take the following form:

```
SELECT Document.identifier FROM Document Descr, ECCN, RFC
WHERE Doc.ECCN = ECCN.ID AND
ECCN.RFC = RFC.id AND
RFC.description = "nuclear"
```

Through resource description standards for the subject domain in the way of custom metadata schemas, descriptive classes would allow for narrowed recall of documents. From there NLP could further refine searches, based upon keyword matching in the querying of the full text of the documents. In both instances, only those documents that discuss nuclear related goods and technology would be retrieved. Policy officials could then rely on the decisions of their predecessors, the negotiations of the international organizations within which these regulations were negotiated, and moreover, memory could extend the walls of their respective organizations. We would see the beginnings of policy memory.

11 Conclusion

This investigation scratches the surface of the potential for ontologies in e-Government Web-based systems. Developers must take into account the specific subject domain as well as the many layers of administration if they are to facilitate resource sharing. At the same time, however, development must transcend the methods of traditional systems building, and include at the forefront of the design the knowledge and needs of the user and user community. Ontology development is indeed a powerful response to that need.

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Ontology-Enabled E-gov Service Configuration: An Overview of the OntoGov Project

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Abstract. For electronic government initiatives to succeed, in addition to modernising the front office, attention should be also paid in order to streamline, re-organise and support the back-office processes of public administrations that provide public services to citizens. Furthermore, actions should be taken to limit the loss of critical knowledge assets during the life cycle of electronic government services. In this paper, the OntoGov project is outlined aiming to develop, test and validate a semantically-enriched (ontology-enabled) platform that will facilitate the consistent composition, re-configuration and evolution of electronic government services.

1 Introduction and Motivation

Electronic government (e-Gov) is a major priority in Europe today and European governments are clearly committed to embracing related initiatives [1]. One of the primary objectives of e-Gov is to increase productivity through higher efficiency and to offer better quality services and innovation based on information technology [2].

For e-Gov initiatives to succeed, in addition to modernising the front office by offering public services via Internet portals, attention should be also paid to streamlining, re-organising and supporting the back-office processes of public administrations that provide services to citizens. Furthermore, actions should be taken to limit the loss of critical knowledge assets during the life cycle of e-Gov services.

The main objective of this paper is to outline the OntoGov project that aims to overcome the above mentioned problems by developing, testing and validating a semantically-enriched, ontology-enabled platform that will facilitate the consistent composition, re-configuration and evolution of e-Gov services.

The remaining of this paper is organised as follows. In Section 2, state of the art and related projects are reviewed. In Section 3, an overview of the OntoGov project is presented. Finally, in Section 4 a summary is provided along with the plans for future work.

2 State of the Art and Related Projects

2.1 State of the Art in Electronic Government

State of the art in e-Gov includes realising the concept of one-stop e-Gov [3][4], especially together with the idea of service portals with life-situation navigation [5]. The basic ideas of one-stop e-Gov are already well-developed and their technical realisation on top of state-of-the-art IT and web service technology is dealt with sufficiently in some running or upcoming projects. What is not solved sufficiently, are the methodological and technological prerequisites as well as the back-office processes, which help turning one-shot investments into one-stop approaches into sustainable, long-term endeavours which can be maintained effectively and consistently over a longer period of time. This idea requires on one hand a higher level of re-configurability and on-the-fly changes of services – which is not provided by today’s web service technology; and on the other hand a well-understood and technically supported knowledge logistics along the horizontally (many implementing sites) and vertically (several levels of decision-making) highly distributed decision and implementation processes of e-Gov services – which is not covered at all at the moment, but can reuse some concepts and approaches from corporate knowledge management (KM) where scenarios like KM in supply-chain integration, KM in virtual organizations, or KM integrations with Business Intelligence for Management Information Systems addresses similar kinds of problems.

Since we consider ontology-based, semantically enriched models a central topic in this area, we briefly state that the use of semantic technologies in e-Gov is still not state-of-the-art. The e-Gov scenario is in some respects a more obvious and promising application field for ontologies than many commercial areas, since legislative knowledge is by nature already “formal” to a big extent, it is by definition shared by many stakeholders, and its formalization should pay off, because it could be reused in many applications. Nevertheless, there are only very few, yet far developed ontology projects in e-Gov. Typical is the IST FP5 SmartGov project that developed an ontology for the public sector [6] and the e-POWER project [7] which employed deep knowledge modelling techniques for “heavy-weight” inferences for, e.g. consistency checks, harmonisation or consistency enforcement in legislation. Although such projects convincingly show in principle the feasibility of ontology approaches in e-Gov, they did not address the matter of service implementation or service integration.

2.2 State of the Art in Ontology-Based Web Technology

The current web is a huge collection of information, but does not yet support processing this information, i.e., using the computer as a *computational device*. Recent efforts around UDDI, WSDL, and SOAP try to lift the web to a new level of service. Software programs can be accessed and executed via the web based on the idea of web services. Though such approaches are first steps into the direction of a web populated by services, the current Web Service description languages still have numerous limitations, e.g.:

- low expressiveness (e.g., no support for types and subsumption and no ability to express constraints);
- no ontology support for expressive data modelling;
- only simple message request/reply patterns that ignore application logic aspects in terms of processes.

Proposals like ebXML and UBL (Universal Business Language) of OASIS have been underlining that existing proposals are more or less purely syntactical and fail to address semantic / ontological issues. Furthermore, standards for process definitions as well as exchange sequence definitions have been proposed such as WSFL, XLANG, BPSS, BPML and WSCL.

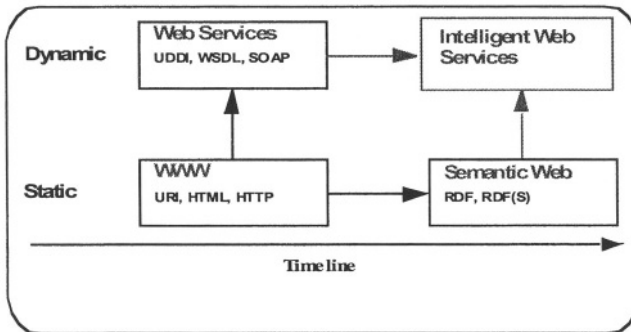


Fig. 1. Semantic Web enabled Web Services

Tim Berners-Lee, the inventor of the current WWW, coined the vision of a Semantic Web in which background knowledge is stored on the meaning or content of Web resources through the use of machine-processable metadata. The Semantic Web will bring meaningful structure to the content of Web pages. Ontologies define a vocabulary with semantically well-defined terms and, thus, enabling precise service descriptions on which mechanisms for *automated discovery*, *composition*, *negotiation* and *reconfiguration* can be built on. Semantic Web enabled Web Services (or Intelligent Web Services) bring together the Web Service and the Semantic Web ideas. They provide mechanization in service identification and discovery, configuration, comparison, and combination.

Semantic Web enabled Web Services are currently being investigated in many places. Two of the most important initiatives are the OWL-S proposal for a Web

service description language from the US, and the WSMO (Web Service Modeling Ontology) in Europe developed for the SWWS and DIP European projects.

3 OntoGov Overview

The OntoGov project will specify, develop and deploy a holistic framework and a supporting platform to improve public service provision by enabling semantically rich representation, evolution and refinement of public processes and services to citizens and businesses.

Currently, in an increasing number of public authorities throughout Europe the public service provision model is comprised of the following parts (Figure 2):

- Data Sources in Back Office
- Processes in Back Office (most of these are now automated or are in the process of automation – this is denoted as “Application Logic” in Figure 2)
- Broker where public services are jointed up. This can be automated, semi-automated or performed manually. In the case of a central point this broker is located at a central public authority (usually a ministry)
- Communication channels handling the interface with citizens and businesses

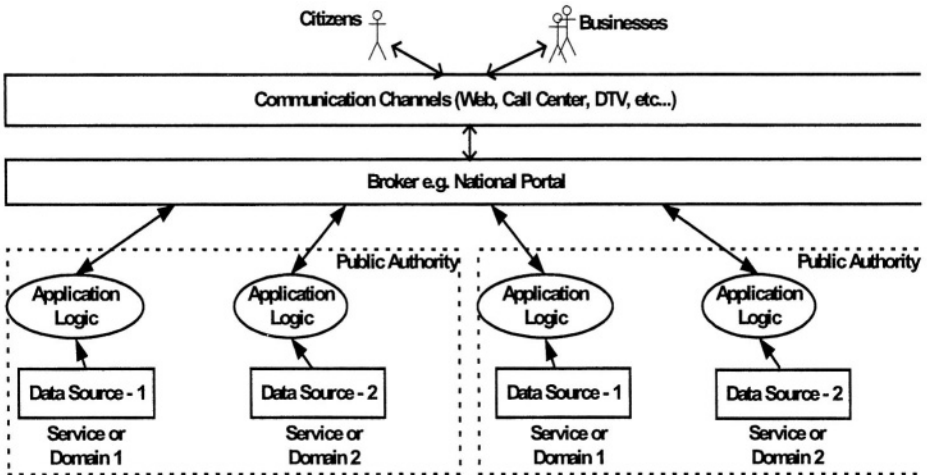


Fig. 2. Current service provision model

The envisaged framework is depicted in Figure 3. The main idea behind the proposed framework is that the existing service provision mechanisms are extended to incorporate, and to a certain degree be driven by, semantics.

The new Semantic Provision Model consists of several components. In a bottom-up approach the work to be done within this project consists of the following steps:

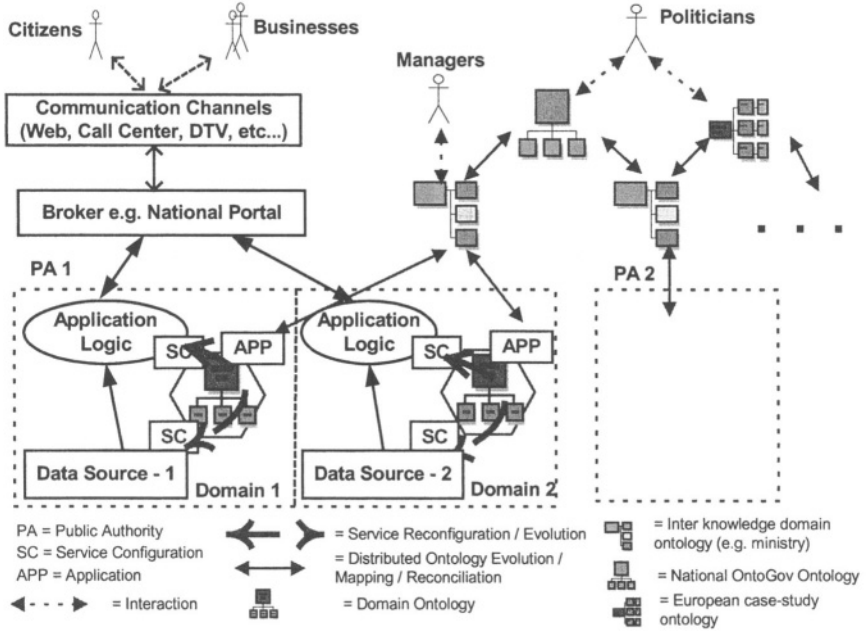


Fig. 3. OntoGov service provision model

- Work at a conceptual level (towards the Framework for Semantic Service Provision)
 1. Identify services (knowledge domains) of particular importance e.g. issuing birth certificate, VAT payment etc.
 2. For each service derive a Semantic Framework (the Domain Ontology) for describing the respective knowledge domain by re-using the findings of the previous step.
 3. From the Domain Ontologies, identify and extract the common concepts and properties that shall form the National Semantic Framework (National Ontology). At this stage this can be realised by defining the necessary mapping/reconciliation/etc mechanisms that will lead to a hierarchy of OntoGov processes.
 4. For some specific services derive a pilot Pan-European Semantic Framework (Pan-European Ontology for that Domain) e.g. Pan-European Ontology for issuing a Birth Certificate.
- Work at a technical level (towards the supporting platform)
 5. Develop the Service configuration modules for automated or semi-automated communication between Domain Ontology, Data Sources and Application Logic

6. Develop all interfaces for different stakeholders (citizens, managers, politicians, etc.) at various levels (local authorities, national focal points, pan-European level).

4 Epilogue

In this paper, an overview of the OntoGov project is presented. OntoGov is a 30-months research and development project aiming to develop, test and validate a semantically-enriched (ontology-enabled) platform that will facilitate the consistent composition, re-configuration and evolution of e-Gov services. Our next steps are to proceed with a detailed specification, development, deployment and evaluation of this platform.

Acknowledgements. This work was carried out as a part of the OntoGov project (OntoGov IST-2002-507237), which is partially funded by the European Commission under the IST programme. The OntoGov consortium consists of the following partners: Planet Ernst & Young (EL), FZI (D), Archetypon S.A. (EL), Indra Sistemas S.L. (S), Barcelona (S), Amaroussion (EL), FHSO (CH) and Swiss Federal Chancellery (CH).

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Simple Life-Events Ontology in SU(M)O-KIF

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Abstract. This paper presents a proof-of-concept research into building an ontology of life-events in public administration and integration of this domain ontology with standard upper ontology. SUMO was chosen to be the upper ontology and SUO-KIF the language of both upper and domain ontology.

1 Introduction

Various approaches have been tried so far in the modelling of life-events. Some of them stressed the procedural nature of life-events, others defined activities as main contents of particular life-events without recourse to their intertemporal relations (see for example LEAP 2, eGOV3, ILEP 4 for different approaches). Our approach consisted of mapping a set of activities contained in the specific life-event instance to a procedural image, thus defining sequential, causal and intertemporal relations between them (see 4).

Models of different life-events share a number of common terms, such as institutions, administrative procedures, rights and duties etc. It would therefore be of great help if a standard vocabulary (ontology) of terms that make up life-events would exist. On the other hand, not only elements which form part of life-events, but life-events themselves could be organized into an ontology of life-events. Such an ontology would consist of all known life-events (i.e. life-events considered so far in various projects) hierarchically organized into a tree with type-subtype and instance-type relations.

2 SUMO and SUO-KIF

To use pre-existing general knowledge about the world, one has to make use of some top level ('upper') ontology and connect it to life-events ontology. Life-events ontology, being a domain ontology, should specialize some standard upper ontology such as SUO, SUMO, OpenCyc, etc.

Alongside with various ontological commitments, standard upper ontology also provides a formal language for the description of types and instances of life-events. Many upper ontologies use first-order logic in a more or less restricted way to express its concepts (Ontolingua and SU(M)O use KIF, Cyc uses CycL, all are dialects of first-order logic).

We have chosen to use SUMO 5 (Suggested Upper Merged Ontology) as an upper ontology for our sample life-events ontology with its SUO-KIF 6 development language. Having said this, our goal in this paper (and corresponding research) was to:

- build a simple life-events ontology with SUO-KIF language,
- connect our life-events ontology to SUMO (connecting concepts from both ontologies in appropriate places, i.e. appending concepts from life-events ontology to lower parts of SUMO ontology and deriving life-event ontology concepts from SUMO concepts).

This simple life-events ontology serves us as a proof-of-concept for the latter building of larger life-events ontology.

3 Sample Life-Events Ontology

We start with the definition of LifeEvent class which will be the root element in our ontology. Since it denotes an intentionally carried out process, we append it to (derive it from) IntentionalProcess class in SUMO, which is a subclass of Process and denoting generic processes. We also define that LifeEvent class be exhaustively and in a mutually disjoint way covered by two subclasses: BusinessRelatedLifeEvent and CitizensRelatedLifeEvent. We also define superclasses for both.

```
(subclass LifeEvent IntentionalProcess)
(partition LifeEvent BusinessRelatedLifeEvent CitizensRelatedLifeEvent)
(subclass CitizensRelatedLifeEvent LifeEvent)
(subclass BusinessRelatedLifeEvent LifeEvent)
```

We could next define a few subclasses for citizens- and business-related life-event classes (see appendix). We limit ourselves here to citizens-related life-events and define four subclasses: family, house, education and employment related classes of life-events.

Note the absence of the partition relation here; partition relation partitiones subclasses of a given class disjointly and exhaustively. In our example this means that we would neither like this partition to be exhaustive (maybe we will want to add new subclasses in the future, such as e.g. HealthRelatedLifeEvent), nor to be necessarily disjoint subclasswise (for example, there is usually expected to be some overlap in family- and house-related life-events as well as in family- and education-related life-events).

On the other hand, we expect that house-related life-events and education-related life-events as well as house-related life-events and employment-related life-events will be respectively mutually disjoint. We write this as:

```
(disjoint HouseRelatedLifeEvent EducationRelatedLifeEvent)
(disjoint HouseRelatedLifeEvent EmploymentRelatedLifeEvent)
```

But since we cannot reasonably expect education- and employment-related life-events to be mutually disjoint, we don't define disjoint relation here.

We go on by defining some more layers of subclasses. Consult appendix for detailed description.

In our research we model life-events for what they mean in terms of administrative procedures that have to be initiated and performed. Life-events thus become description of various activities that have to be carried out in order to solve problems posed by them (e.g. problem of obtaining birth certificate after birth of a child). Life-events which we derive from class Process in SUMO can thus be subdivided in subprocesses. In SUMO they are defined with subProcess relation whose signature is:

```
(domain subProcess 1 Process)
(domain subProcess 2 Process).
```

First we define types of these subprocesses to be IntentionalProcesses (see appendix). Then we define subprocesses for BirthLifeEvent and ChanceOfDomicileLifeEvent:

```
(subProcess BirthCertificateApplicationProcess BirthLifeEvent)
(subProcess PassportChangeApplicationProcess BirthLifeEvent)
(subProcess ChangeOfAddressApplicationProcess ChanceOfDomicileLifeEvent)
(subProcess ChangeOfAddressPersonalIDApplicationProcess
ChanceOfDomicileLifeEvent)
(subProcess ChangeOfAddressDrivingLicenceApplicationProcess
ChanceOfDomicileLifeEvent).
```

Finally we take one of those subprocesses (say BirthCertificateApplicationProcess) and define it in detail in terms of case roles involved (who is the the agent of action, what kind of entity is in the patient role, who is the beneficiary etc). SUMO possesses several processes defined in terms of case roles so we first try to map our BirthCertificateApplicationProcess to some SUMO concept. Since ‘apply’ does not exist in SUMO, we try with mapping of english words from WordNet to SUMO concepts, as available in SUMO Search Tool at 1. Several mappings are possible, the most semantically appropriate is the fourth one: Requesting, asking for something. We then check SUMO internal definition of Requesting process, which is defined as “a request expresses a desire that some future action be performed. For example, the 5th Battalion requested air support from the 3rd Bomber Group. Note that this class covers proposals, recommendations, suggestions, etc.” This seems fine so we choose Requesting as a substitute for applying.

We therefore define BirthCertificateApplicationProcess to be a subclass of Requesting process. Next we have to choose appropriate case (thematic) roles for Requesting process (agent, patient, etc.). We have in mind a sentence like :« Upon a birth of a child, a citizen requests from appropriate governmental body that it issue him a birth certificate.» We define agent of this process to be of type Human , a special kind of Agent in SUMO concept hierarchy. This agent is then connected to the requesting process with agent thematic relation. A governmental body, which is the addressee or recipient in this case, is linked to the requesting process with destination case role. We also define this governmental body to be an instance of Government type.

```
(subclass BirthCertificateApplicationProcess Requesting)
(agent BirthCertificateApplicationProcess ?HUMAN)
```

```
(instance ?HUMAN Human)
(destination BirthCertificateApplicationProcess ?ADMINISTRATIVE_UNIT)
(instance ?ADMINISTRATIVE_UNIT Government)
```

The gist of the sentence is the request that government should issue birth certificate. Issuing a birth certificate is a process on its own and should be modelled as such.

First question to be answered is how is this new process related to the process of Requesting. Since issuing a certificate is a theme of the request process, it must be modelled using the patient case role. Issuing process is then described using Formula class as a second argument to patient role (Formula class denotes a syntactically well-formed formula in the SUO-KIF knowledge representation language, so a process description as a well-formed formula suits this definition).

Next question to be answered is which process in SUMO resembles most certificate issuing activity (Issuing concept does not exist in SUMO). We use SUMO Search Tool again and try to find the most appropriate mapping of verb issue. There are again various options (Publication, Giving, Declaring, Motion, Writing). After a bit of search in SUMO we choose Writing as the most appropriate one because Writing results in class Text which has Certificate as one of its subclasses. So we write:

```
(patient BirthCertificateApplicationProcess
  ( and (subclass IssueBirthCertificate Writing)
        (agent IssueBirthCertificate ?ADMINISTRATIVE_UNIT)
        (instance ?ADMINISTRATIVE_UNIT Government)
        (result IssueBirthCertificate BirthCertificate)
        (subclass BirthCertificate Certificate))))
```

Finally we mustn't forget to declare this formula as an instance of Formula class.

```
(instance (and (instance IssueBirthCertificate Writing)
              (agent IssueBirthCertificate ?ADMINISTRATIVE_UNIT)
              (instance ?ADMINISTRATIVE_UNIT Government)
              (result IssueBirthCertificate BirthCertificate)
              (instance BirthCertificate Certificate)) Formula)
```

These relations are now depicted on figure 1.

4 Integration with SUMO

We can now make connection between SUMO and our domain ontology explicit. Figure 2 presents upper levels of SUMO (beginning from root at the top) and connection points to our life-events ontology in lower levels of SUMO. Connection points are shadowed.

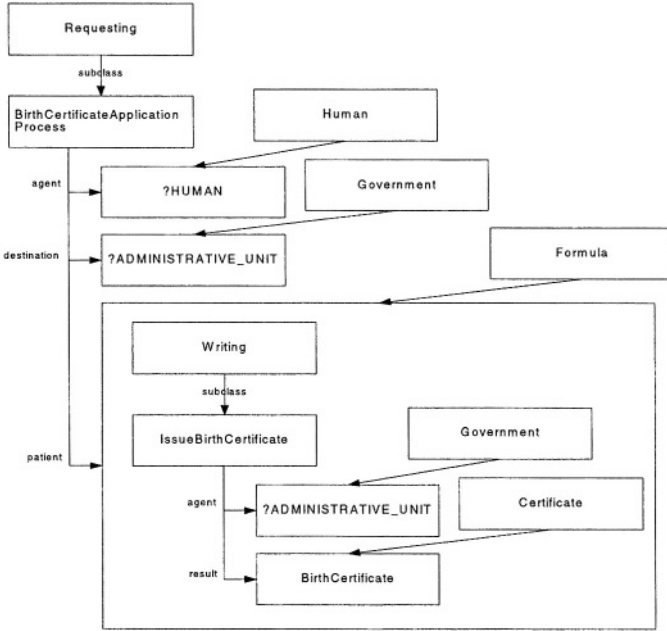


Fig. 1. Specification of BirthCertificateApplicationProcess

In short, SUMO has Entity class as its root element. Entity is partitioned (exhaustively and mutually disjoint subclasswise) into Physical and Abstract classes. Physical is partitioned into Object and Process classes, Abstract is partitioned into Attribute, Proposition, Quantity, Relation and SetOrClass classes. Connecting point for LifeEvent class is SUMO IntentionalProcess class (life-events are processes and they are carried out intentionally). Connecting point for government institutions is Government class which is a (multiple) descendant from Object (one through Agent class and the other through Collection class). Citizen is connected to SUMO under Human class (which is itself subclass of CognitiveAgent and therefore subclass of Object). Documents (like birth and death certificates) are connected to SUMO under Certificate class (which is subclass of Text which is in its turn subclass of Artifact, a product of the process of Making). BirthCertificateApplicationProcess is defined as a subclass of Requesting, which is a special kind of Communication and therefore also IntentionalProcess. The same goes for IssueBirthCertificate process, which is Writing and as such Content Development and ultimately also IntentionalProcess.

5 Conclusions

Life-events can be (and historically have been) modeled using different modelling languages and ontological commitments. We used first-order logic based SUO-KIF language for the description of life-events in this paper for two reasons. First was our wish to be able to express life-events matter as detailed and as succinct as possible.

Second, using SUO-KIF we were able to merge our simple life-events ontology with SUMO upper ontology. This gave us the benefit of not having to define every bit of information for our life-events from scratch and allowed us to rely on predefined general concepts from SUMO. Our future work will be to refine this life-events ontology and to translate some of our models to first-order logic based formalism and connect them to this ontology. We hope that such models of life-events, defined within a common ontological framework, will be both more expressive and more exact than the old ones.

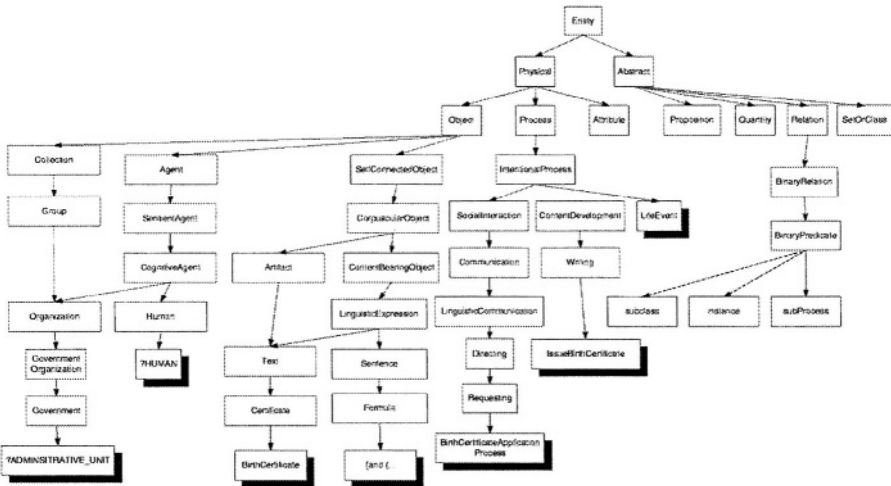


Fig. 2. SUMO and connection points to life-events ontology

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Appendix A: Simple Live-Events Ontology

```

(subclass LifeEvent IntentionalProcess)
(partition LifeEvent BusinessRelatedLifeEvent CitizensRelatedLifeEvent)
(subclass CitizensRelatedLifeEvent LifeEvent)
(subclass BusinessRelatedLifeEvent LifeEvent)

(subclass FamilyRelatedLifeEvent CitizensRelatedLifeEvent)
(subclass HouseRelatedLifeEvent CitizensRelatedLifeEvent)
(subclass EducationRelatedLifeEvent CitizensRelatedLifeEvent)
(subclass EmploymentRelatedLifeEvent CitizensRelatedLifeEvent)

(disjoint HouseRelatedLifeEvent EducationRelatedLifeEvent)
(disjoint HouseRelatedLifeEvent EmploymentRelatedLifeEvent)

(subclass BirthLifeEvent FamilyRelatedLifeEvent)
(subclass ChangeOfDomicileLifeEvent FamilyRelatedLifeEvent)
(subclass ChangeOfDomicileLifeEvent HouseRelatedLifeEvent)

(subclass BirthCertificateApplicationProcess IntentionalProcess)
(subclass PassportChangeApplicationProcess IntentionalProcess)
(subclass ChangeOfAdressApplicationProcess IntentionalProcess)
(subclass ChangeOfAdressPersonalIDApplicationProcess IntentionalProcess)
(subclass ChangeOfAdressDrivingLicenceApplicationProcess IntentionalProcess)

(subProcess BirthCertificateApplicationProcess BirthLifeEvent)
(subProcess PassportChangeApplicationProcess BirthLifeEvent)
(subProcess ChangeOfAdressApplicationProcess ChanceOfDomicileLifeEvent)
(subProcess ChangeOfAdressPersonalIDApplicationProcess ChanceOfDomicile-
LifeEvent)
(subProcess ChangeOfAdressDrivingLicenceApplicationProcess ChanceOfDomi-
cileLifeEvent).

(subclass BirthCertificateApplicationProcess Requesting)
(agent BirthCertificateApplicationProcess ?HUMAN)
(instance ?HUMAN Human)
(destination BirthCertificateApplicationProcess ?ADMINISTRATIVE_UNIT)
(instance ?ADMINISTRATIVE_UNIT Government)

(patient BirthCertificate ApplicationProcess
  ( and (subclass IssueBirthCertificate Writing)
        (agent IssueBirthCertificate ?ADMINISTRATIVE_UNIT)
          (instance ?ADMINISTRATIVE_UNIT Government)
            (result IssueBirthCertificate BirthCertificate)
              (subclass BirthCertificate Certificate))))

```

```
(instance (and (subclass IssueBirthCertificate Writing)
  (agent IssueBirthCertificate ?ADMINISTRATIVE_UNIT)
  (instance ?ADMINISTRATIVE_UNIT Government)
  (result IssueBirthCertificate BirthCertificate)
  (subclass BirthCertificate Certificate)) Formula)
```

Knowledge Management and Modelling in Health Care Organizations: The Standard Operating Procedures

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Abstract. Standard Operating Procedures (SOP) in health care organizations are adopted for diagnostic procedures, laboratory examinations and similar, contain standardized prescriptions and are aimed at helping users to request services in the proper way. In the present paper, we describe a model and a software system for the management of SOP's in a hospital setup (HSOP), derived from similar approaches in the field of clinical protocols. In collaboration with medical experts, we analysed the Procedures Handbook of the City Hospital of Udine, Italy, in order to devise an abstract model for HSOP's and their management. The model has been described with a XML-schema and implemented with XML. A document workflow model has been extracted also, and realized into a workflow management system called HOPERA. Four categories of users have been considered, with different privileges on the HSOP management. HOPERA is a web application implemented on an open-source platform and includes user authentication, authoring features, archiving and retrieving HSOP's from an XML-native database, as well as workflow management tools. HOPERA is being tested in its operational environment, within the Udine City Hospital intranet system.

1 Knowledge Management in Health Care

By Knowledge Management (KM) we mean the set of methodologies and tools to manage the acquisition, organization, distribution and accessibility of the knowledge within an institution, to all the people who need it, whenever and wherever it is needed [1]. In health care organizations, KM is playing a central role within a novel approach to the patient treatment and the quality control of diagnostic procedures. As a matter of fact, the mere contact between a medical doctor and a patient has evolved into a much more complex relation involving several professionals and experts, and associated to a large set of data, information and specialized medical knowledge.

Three basic processes have been individuated. *Sense Making* is aimed at keeping a health care organization abreast with the flow of information coming from the external world (biomedical research results, user demands, new laws and policies, etc). Such bursts of information are to be acquired, connected, analyzed in order to decide whether the organization itself is capable to address

the novel needs. In case of positive answers, the second process - *Decision Making* - is activated to select the strategies and clinical actions to be undertaken. If the answers are negative, a *Knowledge Creation* step is to be devised to produce new knowledge and capabilities to bridge the gap that has emerged. In the present paper we focus on the last step: in particular, we propose a model for the management of Standard Operating Procedures (SOP's), by taking as a case study those adopted in the City Hospital of Udine, Italy. The model has brought practical results: an electronic representation of the SOP's, with a database enabling their storage and retrieval, an authoring system to assist the editing of HSOP's, and a workflow manager supporting the communications.

1.1 Knowledge Creation and Learning

Several kinds of knowledge may be individuated within an organization. The one owned individually and subjectively is called *Tacit knowledge*: quite often it is difficult to single out, but it is strategically relevant and many efforts are to be done to make it explicit and transferable. On the other hand, the *Explicit Knowledge* has been cast in a standard and structured form, so that can be readily found on public documents. Knowledge Creation (KC) is a process of social interaction involving individuals and adopting both kinds of knowledge; four ways to implement KC have been proposed [2].

- Socialization: Exchanging and sharing experiences through observation, listening, simulation. Tacit knowledge is transferred by acquiring technical capabilities;
- Externalization: Converting tacit to explicit knowledge by developing models, protocols, guidelines, procedures;
- Recombination: The existing explicit knowledge is reconfigured to synthesize new knowledge;
- Internalization: The acquisition process by the repeated execution of a task applying explicit knowledge, which brings additional tacit knowledge to an individual.

Learning processes are deeply intertwined with all KC steps, by providing a sort of dynamics controlling the KC strategies. We refer to the key concept of organizational learning, as proposed by Argyris and Schön [3]. It is the set of processes leading the organization to analyse critically its own successes and failures, to continuously revise its working procedures, to introduce and experiment novel solutions. We may say that an organization 'learns' whenever strategies and operational procedures - even those which appear consolidated and shared among multiple actors - change with time. Any individual or team in the organization is charged with a two-fold job: accomplishing his/her own specific tasks and learning from the same tasks in a sort of continuous knowledge-learning cycle.

2 The Standard Operating Procedures

A key issue of KM in health care is developing standard models of behaviour (in its various forms); a few concepts are useful to this aim. As defined in the American Institute of Medicine Report [4], guidelines are “systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances”. Clinical guidelines and protocols identify the best practices derived from the scientific literature, through the so-called *Evidence-Based Medicine* approach, and thus commonly recognised as valid. A SOP is a set of specifications to point out: the purposes of an activity; what should be done and who is in charge to do it; the materials, tools and documents to be used; how they should be checked and registered.

At a first glance, SOP’s may seem similar to guidelines; however, they combine two distinct kinds of knowledge on the process they model:

- general knowledge: the basic rules to carry out a task, often derived from guidelines and protocols;
- local knowledge: details on how the process is to be carried out in the local context, including resources, people, time, etc.

This makes every SOP a unique piece of knowledge, originated from the combination of universal and specific knowledge. Stated differently, both guidelines and SOP’s indicate the sequence of actions recommended to accomplish definite health care operations in the optimal way. They include rigid rules: in so doing, put limitations to unjustified variations, and are intended to achieve uniform, standard behaviours. However, the sequence of actions described by a clinical guideline is in some way universal (with a few limitations), whilst SOP’s are specifically developed for a site at a specified time.

2.1 Representing Explicit Knowledge in Health Care

The universal nature of clinical guidelines and protocols made them a good target for research regarding computer models and representation [7,9,10,11, 12]. On the contrary, until the recent years, the SOP’s appeared uniquely on paper, namely handbooks edited in a supposedly given standard format. In the medical domain, SOPs have been given a formal syntax only by two different research groups, by means of XML [5,6]. However, both are specific of laboratory procedures: the former in Pathology, the latter in chemistry laboratories. Now that authoring and communication tools are widespread due to the Internet, the need of an electronic support to the SOP’s has become apparent, to make them available to a larger community; to make easier the revision cycles as well as the learning and training processes. In developing a method for modelling and representing SOP’s, we took inspiration mostly from the researchers on guidelines and protocols.

We analyzed the state-of-the-art formalisms and concluded that, from our perspective, the Guidelines Element Model (GEM, [7]) is one of the most promising ones, in view of its performances in terms of completeness, flexibility, expressiveness, clarity and reusability. Based on the XML technology, GEM has been

developed as a tool for representation, revision and translation during the whole life cycle of a guideline. It has been proposed as an international standard and already adopted as such by the American Society for Testing and Materials. However, as is, is not adequate for SOPs, thus we just started our study following the same approach.

3 An Ontology for Hospital SOP's (HSOP's)

Ontologies are considered as a key technology for Knowledge Management because they involve a consensus in the way a particular area of expertise is described. This consensus covers not only terminology, but also the way concepts and objects are organized and structured in the domain ([13]). In our preliminary work, we didn't try to obtain an inter-institution consensus on the procedure ontology, but rather to start from a case study, which we considered sufficiently heterogeneous to give insights on the structure and terminology for procedures.

In order to define a model of the HSOP's, we considered as a case study the laboratory and diagnostic test procedures adopted by the City Hospital of Udine, Italy. The HSOP's are currently published on paper, with no formal guidance on the structure: a 355-page handbook encodes all the 509 SOP's, and is revised every three years. HSOP's are being developed and maintained by teams belonging to the department to which the procedures apply; each department involves one or more different test- and examination providers, i.e., laboratories and services. HSOP's are approved by the Head of the department; once approved, they are submitted for publication to the Health Care Direction; at this stage minor adjustments may be done, but the procedure may be also sent back to the department.

By analysing the handbook in collaboration with medical experts, we discovered that HSOP's were not all structured in the same way, but they shared common elements and terms. We normalized some terms, and created a sort of superset embedding the various elements found in the procedures and considered necessary by the medical experts.

To formally describe the model we followed the guideline modelling approach of GEM [8]: thus it has been encoded with a XML-Schema, and the HSOP's encoded with XML. It should be stressed that so far the HSOP's were developed with no underlying model, thus were not standardized on a unique set of terms and entries. This adds value to our preliminary modelling work, because medical experts established a common structure and terminology to be adopted.

3.1 The Logical Scheme of the HSOP's

Two classes of HSOP's have been identified: the *Laboratory test* and *Diagnostic test*, which showed enough differences to be managed separately. The former is composed of 13 elements, the latter of 18.

The model includes a header, whose entries come from the Dublin Core metadata initiative [14], and a body, which includes all the entries found in

the original procedures that were considered mandatory by the medical experts. The header is common to both HSOP classes; the differences arise in the body.

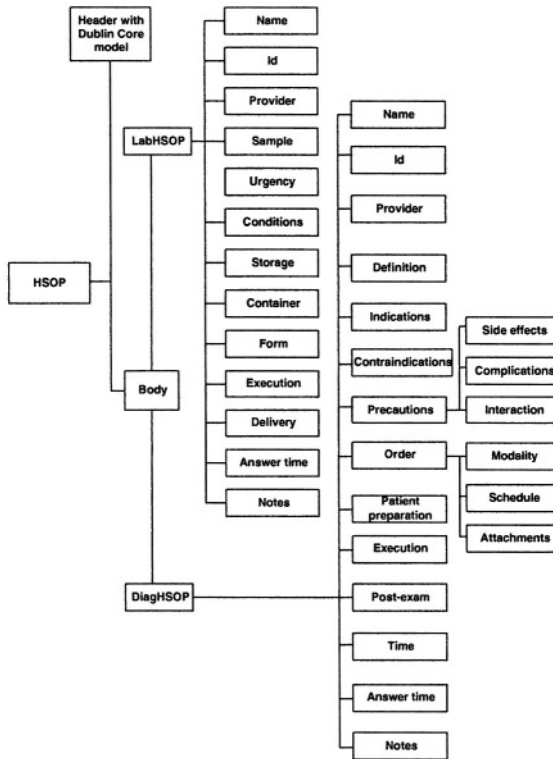


Fig. 1. The HSOP logical scheme

Part of the procedures have been manually converted to XML following the scheme, for testing purposes, but in the automated system (see the next section) a markup helper supports the human operator in correctly encoding all the available procedures.

4 HOPERA: An Authoring and Workflow System

A document workflow model was also developed, based on the three-step process described in the previous section.

Four categories of users have been considered with different privileges on the HSOP management. All the hospital *staff members* may read the procedures already published, but do not take part in the workflow process. *Working group members* may read, edit and create new procedures, as well as pass them to

the *Head of the department*; the latter may read, edit and pass them back and forth; at the topmost level, the *Health Care Director* may read, edit, pass back or publish the procedures. In this way, publishing a HSOP undergoes three steps, each one regarding a category of operators/users; at each step the XML document is marked with the appropriate tags (figure 2).

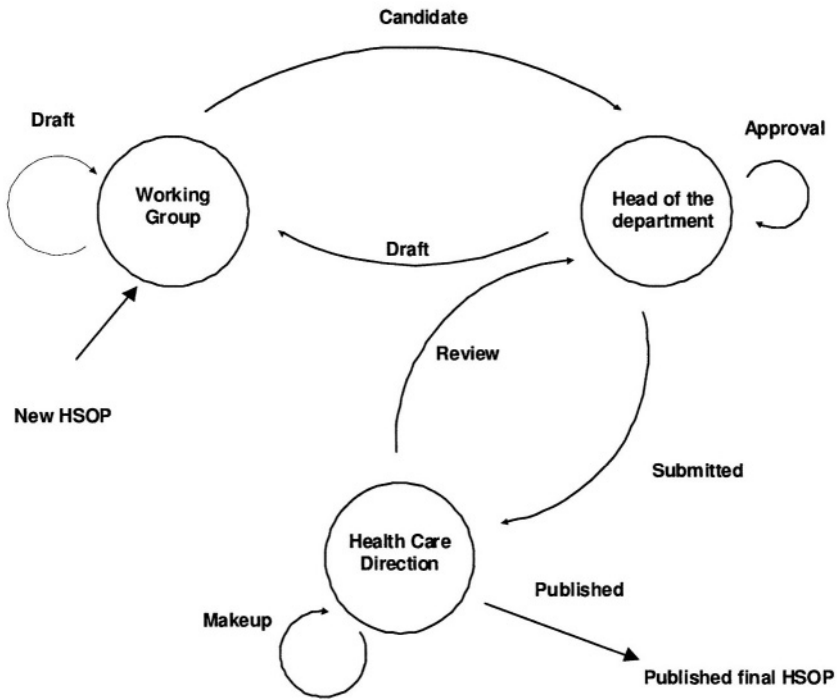


Fig. 2. The HSOP workflow model and the associated tags

A new software system called *HOPERA (Hospital Operating Procedures Editing, Retrieval and Administration)* has been designed for HSOP authoring and workflow management purposes. Both functionalities are deeply intertwined: the HSOP authoring is a kind of social interaction that HOPERA is intended to support. The system adopts an *information-centered approach* to authoring, since the latter is grounded on a well-defined model of pre-existing information. Authored HSOP's are also given an archive to be stored and retrieved for subsequent use, with versioning capabilities.

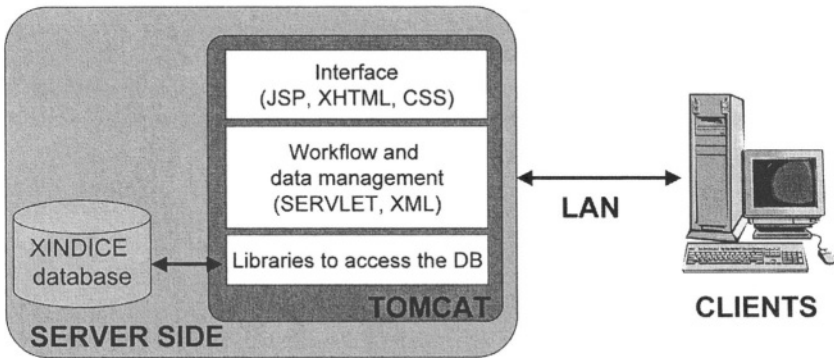


Fig. 3. Architecture of HOPERA

4.1 HOPERA: System Architecture

HOPERA is basically a web application implemented on an open-source platform, and enables the network access by multiple users. The system is composed by three main blocks (figure 3): the user interface, the server-side software modules, and the HSOP database.

The first two blocks have been implemented adopting the Java Server Pages (JSP) and Servlet technologies, which are popular for web applications. In particular, the user interface has been implemented adopting the standard XHTML and the style sheets (CSS). The HSOP database has been realised by means of the XML-native open-source database Xindice (Apache Software Foundation). Within this kind of database, XML documents are indexed as the basic logical units and grounded on the concept of *Collection*, a well-defined group of documents. In our implementation, one collection has been created, with two sub-collections: one containing all documents of the type ‘operating procedure’ (the HSOP’s), the other storing all user accounts.

5 Using HOPERA

The access to HOPERA is through a page that performs the user authentication and classification. The home page is then generated dynamically according to the user category. From that page, users may access, create or modify SOPs.

5.1 Knowledge Access

The hospital staff members may perform query and retrieval actions on the HSOP knowledge base, searching it by letter and by field value on the metadata. Once retrieved a list of browsable HSOPs, a click on the requested HSOP causes the visualization of its content, as in figure 4. Further reference information is available via hypertextual links, e.g., to the protocols governing some specified

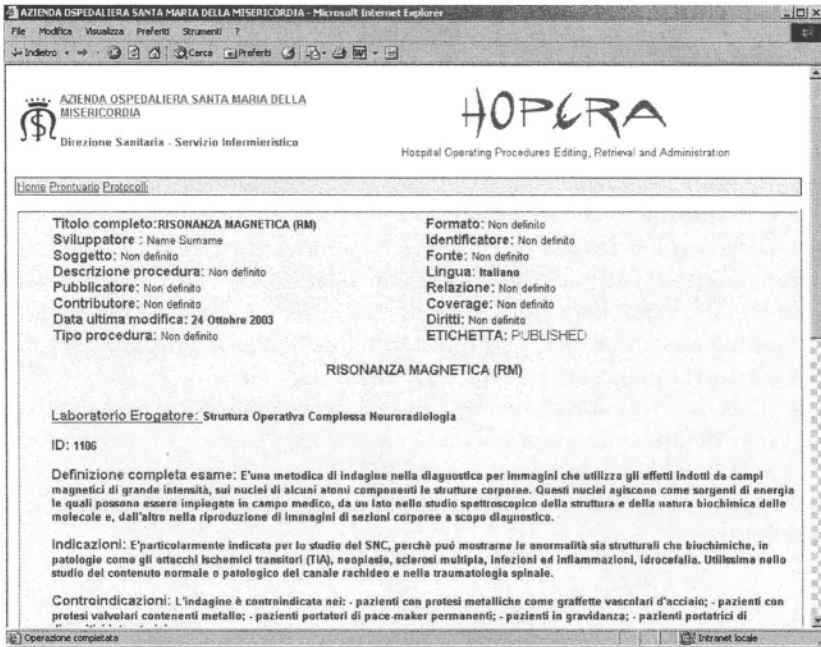


Fig. 4. Visualization of the HSOP concerning the NMR examination

actions, the departments and individual operators involved. Being HOPERA a web-based system, the access may occur from any node of the Hospital Intranet, and in particular from the nurses computers, which are the main users of HSOPs. A typical scenario could be that of a nurse needing to book an NMR examination for a patient: he/she can access the suitable SOP by searching for NMR, then browsing the retrieved information to have guidance in pre-examination patient preparation, eventually checking for contraindications and drug interaction related to the specific patient. There he/she can also find how to deal with the post-examination follow-up, if needed. Of course, the experienced nurse will not need to check all SOPs every time, while young nurses, or even nurses transferred in a new ward, may use HOPERA as a source of either operational knowledge and learning material. This is thus a support to socialization and internalization of knowledge.

5.2 Knowledge Creation

Users of a working group can choose among three options, two of which are creation and modification of HSOPs. The interface provides them with a markup helper to correctly encode the procedure with respect to the model. Modification occurs only among the list of HSOPs still to be published, which includes either procedures to be corrected after examination by the Head of Department or

Health Care Direction, or procedures to be examined in a cyclic process of revision, where recombination occurs of the previous version and external knowledge in the form of novel research results, policies, etc.

In the revision phase, interesting contributions might be provided by users, which are commonly excluded from the HSOP creation process: they can discover problems occurring during execution, errors, unnoticed changes in the real procedure in respect to the modelled one.

In order to exploit these contributions, the most important development we are planning for HOPERA is an annotation system. Every user will be able to annotate HSOP's with personal comments, in order to notify problems encountered following the procedure, or suggested improvements. Working groups may then access to the annotations and take them into account when revising the HSOP's. This is a way for supporting knowledge socialization and externalization. In order to implement user annotations, we are planning to use the Annotea technology [17], which is provided by the W3C Consortium. Annotea allows for metadata-based annotations attached to documents or parts of documents, using web technologies.

6 Conclusions and Beyond...

The main contribution of the present paper is a model of the knowledge involved in the development of standard operating procedures in a health care organization. The main objects of interest, the HSOP's, have been given an abstract representation encoded as an XML-schema; the procedures themselves have been encoded as XML documents, and archived by means of an open source, XML-based archive. The dynamics of the HSOP development process has been captured by a workflow scheme. All models concurred to the design of an automated system, HOPERA, which is intended to support the information flows that have been identified.

An interesting scenario has been put forward and simulated by the automated system: that of knowledge creation within a health care institution. The idea has been verified of a dynamic process of social interaction, involving both explicit and tacit knowledge in a sort of continuous cycle, in which socialization, externalization, recombination and internalization steps are at work. Learning is ubiquitous in such a process and might be even identified with the knowledge creation itself, in such a way that the concept of organizational learning can be given a procedural sense.

HOPERA is being experimented inside the Udine City Hospital Intranet system, which currently provides knowledge management services [16].

Work is still in progress on HOPERA and further developments are planned in the near future, in addition to the annotation system described in the previous section. The most relevant one is extending the system functions with e-learning capabilities, i.e., a way to boost and make more explicit the distribution of knowledge within the organization. The same HSOP models will be adopted

as courseware schemes to design training activities and repositories of learning objects for the staff involved.

By correctly characterizing HSOP's through metadata, and in particular by using controlled vocabularies and terminologies like ICD9-CM and SNOMED, it is possible to unambiguously associate them to specific health care conditions and treatments. This may be applied not only in the passive way we are currently pursuing, i.e., through a procedure browser, but also by active connections with the electronic health care record system. In fact, we may suppose that, when the physician orders a laboratory test or a diagnostic procedure (through an encoded term), the corresponding HSOP (or HSOP's) are automatically recalled, with easier and faster decision making. A similar support could be provided for facilitating the access to relevant scientific literature.

Finally, the same, ubiquitous XML allows to maintain multilingual versions of the HSOP's, thus enabling further contacts and exchanges among health care Institutions in different Countries.

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Architecture of an Active Life-Event Portal: A Knowledge-Based Approach

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Abstract. We propose architecture of an active life-event portal, which draws on knowledge-based concepts and methods. The portal consists of three main modules: logical, data and control. They operate on three levels: topics, life-events and services. We present the functionality and operation of the modules, and propose knowledge representation methods for each level: (1) hierarchical trees for the level of topics, (2) modified eEPC for the level of life-events and (3) modified AND/OR graphs for the level of services.

1 Introduction

Life-event based web portals are developed and organized according to the realistic assumption that most people in a particular life situation do not know exactly which public services they need. For instance, a person only knows what he/she wants to achieve - to build a house, to start a business, to get married, etc. These situations are known as *life-events*. The web portal is supposed to have the necessary 'knowledge' to determine services and administrative procedures that are needed to solve the user's situation. Usually, various administrative procedures (resulting in public service delivery) at different administrative bodies have to be carried out. Thereby, a system that guides the user through the situation and helps him/her to identify the required services and their providers is needed. The web portal that includes such a system is called a *life-event portal* [5].

There are two types of life-event portals. The first, *passive life-event portals*, are based on a hierarchy of topics and life-events. The system allows the user to select topics and subtopics and in this way guides him/her to a particular life-event. When the life-event is selected, the information about public services and the necessary assistance is offered. Examples of such portals are Austrian Internet Service HELP (<http://www.help.gv.at>) and British UKonline (<http://www.ukonline.gov.uk>). There is faultiness in such approach; namely, the same life-event (e.g., starting a business) can differ in some aspects from user to user (e.g., starting an import/export business differs from opening a boutique with clothes). The problem is therefore that an individual life-event offers services regardless of the actual user's problem.

The second, user-friendlier life-event portals are called *active life-event portals*. The core component of such portals is a knowledge-based system: a computer-program based on inference mechanisms to solve a given problem employing the relevant knowledge [3]. The knowledge-based system in an active life-event portal uses a pre-defined structure of particular life-event to form an active dialog with the user. In this way, the user is involved as an active partner in the overall process of identifying and solving problems related to particular life situations. This approach therefore offers public services that better correspond to user's requirements than in the passive life-event approach. Singapore e-Citizen (<http://www.ecitizen.gov.sg>) portal uses such a system within 'starting a business' life-event.

In this paper, the architecture of an active life-event portal, designed within the project *Development of an intelligent life-event portal* in Slovenia, is presented. The project focuses on the development of an intelligent electronic guide through life-events employing the knowledge-based approach. The architecture of the system, its components and basic principles of its operation are presented in section 2. In section 3, methodological aspects of the proposed architecture are presented with special focus on the presentation and selection of formalisms for knowledge representation at various levels of the system. Section 4 concludes the paper.

2 Architecture of an Active Life-Event Portal

The primary goals of an active life-event portal are threefold [11]:

1. The identification of *life-event* applicable to the user's situation and requirements. This can be achieved using a hierarchical structure of topics, an annotated list of life-events, appropriate search mechanisms, etc.
2. The identification of *services* needed to solve a particular life-event. The list of services as well as the order of their application is determined *actively* on the basis of user's answers to particular questions in this decision-making process. The resulting list exactly corresponds to the user's life-event.
3. The identification of an *instance of each service* in the list. This also is a decision-making process that leads to the identification of specific input parameters needed to determine each service instance. For example, these parameters represent different *documents* that have to be provided by the user. For each service instance, the system provides suitable *guidelines*. The list of services with corresponding documents and guidelines represent invoking parameters for service delivery.

These identification tasks are based on data that is either provided by the user, either available in various *databases*. Databases can be *internal* (implemented as part of the portal) or *external* (e.g., public data bases or web services, accessible by the portal using network connections). Therefore, the portal must additionally support: (1) data acquisition from the user through dialogues and forms using a suitable user interface, and (2) data acquisition from internal and external data sources.

In order to fulfill these requirements, we propose architecture of an active life-event portal (Fig. 1). The architecture draws on knowledge-based concepts and methods. The portal consists of three main modules: logical, data and control. The following subsections describe these modules and their operation.

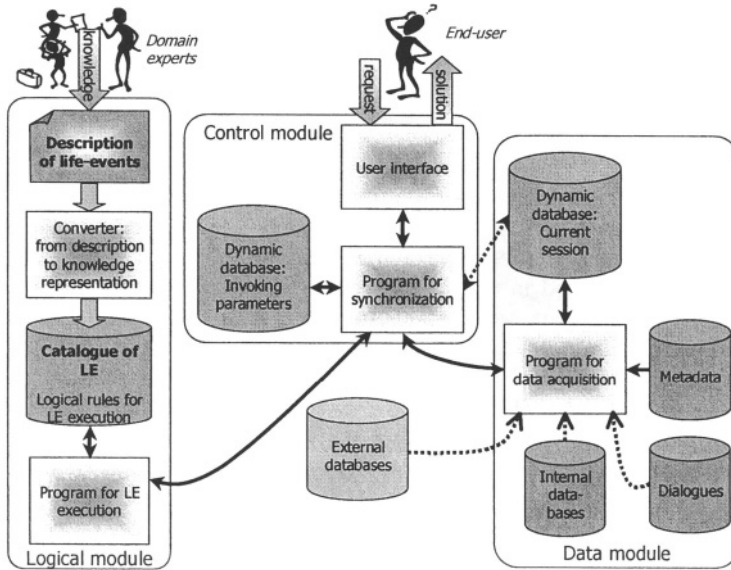


Fig. 1. Architecture of an active life-event portal

2.1 Modules

The basic task of the *logical module* is: given the user's situation and requirements, find the corresponding life-event and the corresponding lists of services, documents and guidelines. The life-event can be identified using a hierarchical structure of topics, which is presented to the user, who searches it and eventually finds the appropriate life-event. An alternative way would be using a suitable searching mechanism based on keywords. The lists of services, documents and guidelines can be then identified using: (1) logical rules, implemented within this module, and (2) user's data obtained from the data module.

In order to facilitate these tasks, the logical module should contain declarative and procedural knowledge about life-events. Declarative knowledge refers to static data about life-events and related objects, whereas procedural knowledge refers to rules of life-event processing. Specifically, the knowledge base of the portal should consist of the following components stored in the *catalogue of life-events*:

1. static description of the *hierarchy* and *properties* of topics, life-events and services,
2. rules for determining the list of *services*,
3. rules for determining the list of *documents* and *guidelines*.

The logical module takes care of the execution of these rules; therefore, in addition to the knowledge base, the module also includes a *program for the execution of life-events* – an inference engine.

It is important that the catalogue of life-events is designed independently on how the user's data is acquired, i.e., in which order, from which sources and through which

dialogues and entry forms. Namely, taking care about all these details may immensely complicate the rules contained in the knowledge base. Furthermore, this would require frequent changes of the knowledge base, for example, even after minor changes of the user interface. Thus, all tasks related to data acquisition are delegated to the data module.

The task of the *data module* is the acquisition and storage of data describing the current user and his/her life-event. Functionally, it serves the logical module. Whenever the inference engine of the logical module needs a particular data item, it makes a request to the data module. The data module first looks if this data item has already been acquired, and in this case transfers it immediately back to the logical module. Otherwise, the data module tries to obtain the item, either through the user interface invoking a suitable data entry form or dialogue, either by accessing an internal or external database. Thus, for each data item a method of its acquisition should be defined. These definitions are also part of the data module.

For facilitating these tasks, the data module should contain the following components:

1. *metadata*: static description of data items and their properties, such as: item name, unique identification code, data type, data source (method of data acquisition),
2. definition of *dialogues* and/or *entryforms* for the communication with the user; in general, each form contains several related data items and is invoked whenever the first data item in this form is requested by the logical module,
3. *internal database*, which contains data available locally, e.g. data about services, service providers and applicable laws,
4. definition of methods for accessing *external databases* and other external sources,
5. *dynamic database* containing already acquired data about the current user and/or the current session with the user.

The role of the third module, *control module*, is integrative. It executes the user interface, and controls and synchronizes the execution of the remaining two modules. It also collects the results of processing in an internal dynamic database, which include the identified life-event and the corresponding lists of services, documents and guidelines. The dynamic operation of this module, which invokes the other two modules, is described in subsection 2.2.

For both the logical and control module, we can determine three levels that correspond to the three basic goals of the portal and through which the portal guides the user from the identification of the problem to its solution:

1. *level of topics*, which serve for the identification of the life-event,
2. *level of life-events*, which facilitates the identification of services for solving the life-event,
3. *level of services*, which facilitate the identification of specific parameters needed to provide the services; these parameters include different documents that must be attached to the user's application; for each service, the system offers corresponding explanation and guidelines.

Using this viewpoint, the logical module describes these levels, whereas the control module takes care of the execution of tasks corresponding to each level.

An important additional part of the logical module is the support of *knowledge acquisition*. Buchanan [2] defines knowledge acquisition as 'the transfer and

transformation of potential problem solving expertise from some knowledge source to a program'. According to the proposed architecture of an active life-event portal, this process has two steps (Fig. 1):

1. With the help of domain experts, life-events are described in the way that is comprehensible to both domain experts and knowledge engineers and which can be easily transformed into some knowledge representation formalism. The module that supports this task (*description of life-events*) is part of the logical module.
2. A special program (converter) is then used to automatically transform this description into selected knowledge representation formalism implemented in the catalogue of life-events.

2.2 Operation of the System

The operation of the portal is initialised by the user's request for solving his/her problem. The first task of the system is to identify the corresponding life-event. The processing starts in the control module, which forwards the request for life-event identification to the logical module. There, the inference engine invokes rules for life-event identification. The execution of rules in turn invokes the user interface, showing the hierarchy of topics and life-events, allowing the user to select the right life-event. The control module saves the selected life-event into its dynamic database and in this way completes the first task.

The second task is to identify services for solving the user's life-event. For this purpose, the control module activates the service identification rules contained within the logical module. Actually, it activates the inference engine, which starts executing these rules. Whenever the rules require a specific data item, such as the user's date of birth or citizenship, a request is made to the data module in order to obtain it. The data module acquires the data according to its internal rules of data acquisition. If the item has been acquired previously, it is immediately sent back to the logical module. Otherwise, the item is acquired either from the user (invoking an appropriate entry form through the control module and its user interface) or by accessing an internal or external database. The data item is saved into the dynamic database of the data module for further use, and returned through the control module back to the logical module.

Based on obtained data, the rules identify services for solving the user's problem. Whenever a new service is identified, it is sent to the control module, which saves it into its dynamic database. In this way, the list of services for solving the life-event is gradually developed and saved within the control module. The list represents the sequence of services and if necessary, indicates services to be invoked in parallel as well.

The third task of the system is the identification of documents and guidelines. For each service contained in the list developed in the previous stage, the control module activates the inference engine of the logical module. Similarly to the previous stage, but using a different set of rules, the logical module processes this request and returns to the control module the list of required documents and instructions.

Finally, the control module presents the developed lists to the user using a suitable presentation. Typically, the system shows the list of services with adequate documents and guidelines.

3 Methodological Aspects of the Proposed Architecture

The gains and benefits that can be obtained from a life-event approach in public service provision are largely determined by the design of life-events and their presentation to the user. An analysis of existent life-event portals [6] shows that life-event is mostly understood only as a topic that simply incorporates different services, what corresponds to a passive life-event approach. In the proposed architecture, a life-event is understood as a *process* that includes *decision-making*, providing a list of services that best suits the real user's problem.

This viewpoint reflects in the methodology developed for the description of life-events and knowledge representation in the catalogue of life-events. The methodology has to deal with the modeling of *processes* (sequential and parallel processing of services), modeling of *data* (user data and data sources), and modeling of *knowledge* (knowledge about life-events). A result of decision-making is not just one service or decision whether a customer is eligible to a public service or not, but *a list of services* with some additional information. Therefore, different candidate formalisms and modeling techniques were considered for developing an adequate methodology:

- *process modeling*: data flow diagram, flowchart, extended event-driven process chain (eEPC), Petri nets;
- *data modeling*: entity-relationship (ER) model, object oriented modeling, semantic networks and frames, XML data model, first-order predicate logic;
- *knowledge representation*: declarative knowledge (property lists, semantic networks, frames, first-order predicate logic), procedural knowledge (production rules, decision trees, AND/OR graphs), uncertainty in knowledge (certainty factor in production rules, belief (Bayesian) networks, fuzzy sets).

In the following, some of these techniques and formalisms are discussed.

An *extended event-driven process chain* (eEPC) models three viewpoints of a process [9]: process, data and organizational viewpoint. It is suitable for modeling a life-event as a process. In addition to this, decision-making can be represented with an appropriate use of logical connectors. The problem with this representation is that it is not explicitly evident which function in a chain defines a decision and which one defines either a service to be included in a list of services, or some other life-event.

Petri nets [7,10] model a process as a sequence of transitions and places. The method allows to model parallelism and decisions (in a way similar to eEPC). High-level Petri nets allow the linking of process and data view. In our problem domain, they can be used for life-event description, but have the same shortcomings as eEPC.

Production rules [1,6] are presented in a simple 'if-then' form: IF condition THEN conclusion1 [ELSE conclusion2], where a condition of one rule can represent a conclusion of some other rule or a simple fact. A desirable feature of this formalism is that each rule defines a small and relatively independent piece of knowledge. Moreover, they can be easily modified by adding a certainty factor to represent uncertainty in knowledge.

A *decision tree* takes as input an object or situation described by a set of attributes and returns a decision – one of the predicted output values for the input [8]. A decision is reached by performing a sequence of tests from a tree root to one of the leaves. In life-event description, this would mean that a result is a single service; this is insufficient for life-event definition. Moreover, conditions in life-events are mostly

independent, what leads to a combinatorial explosion of decision tree. In our opinion, decision trees are therefore inadequate to model life-events.

Representation with *AND/OR graphs* relies on the decomposition of problems into sub-problems. This is advantageous if the problems are mutually independent and can be solved independently of each other [1]. Therefore, AND/OR graphs are suitable to present life-events and identification for service parameters as well. The main problem is that they do not depict a sequence and parallelism what is important for life-events description.

A *semantic network* represents knowledge as a network of relationships among entities, usually in a graph form, where nodes correspond to entities while relations are shown as labeled directed arch between nodes [1,3,6]. A *frame* is an object, designed to represent knowledge about an entity with slots (attribute-value pairs). The data structure within a frame resembles a small semantic network. Both formalisms use a mechanism of inheritance as an inference method and therefore can be used to model a hierarchy of topics and components of life-events.

3.1 Knowledge Representation in the Catalogue of Life-Events

As already mentioned, logical rules for determining a list of services and parameters of services represent procedural knowledge in the catalogue of life-events, whereas declarative knowledge includes static data about topics and their hierarchy, life-events and their components, services and their parameters.

Production rules were selected as formalism for procedural knowledge representation for the following reasons:

- adding new and changing old rules is relatively independent of existent rules;
- they can be relatively easily implemented in different technological environments (e.g. relational databases, Prolog language, any interpreted high-level programming or scripting language);
- they can be easily modified to represent uncertainty if needed;
- other representations, such as decision trees and AND/OR graphs, can be easily transformed into rules.

However, some modification of classic procedural rules was needed. To represent a sequence of services, a new type of production rules was introduced. Typically, the conjunction of conditions does not consider the sequence of testing and service execution; therefore, AND-THEN type of conjunction was added. A rule in the form 'IF condition1 AND-THEN condition2 THEN conclusion' means that first the condition1 and then condition2 has to be tested; that is, the order of services that fulfill conditions matters.

The main reasoning method to draw conclusions from knowledge in the catalogue of life-events is *backward chaining* (also called goal-driven reasoning) [6]. The main goal of the reasoning is: a life-event is solved if the main life-event rule holds. The conditions of that rule are usually conclusions of some other rules. In this way, a chain of rules is established for each condition in the main rule. These chains are searched using *depth-first search* resulting in a list of services and their parameters.

3.2 Description of Life-Events

In our opinion, a graphical form is especially suitable for the description of life-events as it is likely to be more comprehensible to both, domain experts and knowledge engineers, than some other techniques and formalisms. In the following, the selected techniques for each level of the system in the proposed architecture are described.

Level of topics

A model should depict a hierarchical structure of topics. A hierarchical graph (tree), an object model, semantic network and frames can be used for the modeling of topics. We chose a hierarchical graph as it most clearly depicts a hierarchical structure [11].

Level of life-events

For the description of life-events, the following features should be considered:

- *Decisions*: modeling of decisions,
- *Sequence*: modeling of sequence in execution,
- *Parallelism*: modeling of parallelism in execution,
- *List*: a result is a list of services,
- *Data, org.*: a model can be connected to a data and organizational viewpoints.

For each of these features, its *significance* for the description of life-events was assessed using the values: 1- unimportant, 2-important, 3-very important.

The following methods were considered: eEPC, Petri nets, production rules and AND/OR graphs. For each of these methods the *possibility* of modeling each feature was assessed using the values: 1-inadequate, 2- partly adequate, 3-adequate. In this assessment, two criteria were considered: whether a method enables the modeling of feature and how clearly a feature is represented in the method.

Table 1. Assessment of suitability of the methods for life-events description

Feature	Signif.	eEPC		Petri		IF-THEN		AND/OR	
		Possib.	Suit.	Possib.	Suit.	Possib.	Suit.	Possib.	Suit.
Decisions	3	2	2	2	2	3	4	3	4
Sequence	3	3	4	3	4	1	1	2	2
Parallelism	3	3	4	3	4	1	1	2	2
List	3	2	2	2	2	2	2	1	1
Data, org.	2	2	4	1	3	1	1	1	1
average suitability			3,2		3		1,8		2

Both assessments were aggregated into an assessment of *suitability*: how suitable is a method for modeling a feature, with following possible values: 1-unsuitable, 2- partly suitable, 3-suitable, 4-very suitable. The final assessment of the suitability of the method is calculated as an average of assessments for suitability of each feature. Table 1 presents final assessments: eEPC method and Petri nets were assessed as suitable, while production rules and AND/OR graphs were assessed as partly suitable.

We selected the eEPC method. To improve the suitability of modeling decision with eEPC, a new concept (decision point) was introduced; it combines a function, in which a decision is made, logical XOR connector and events describing alternatives of decision. *Decision points* are presented with diamonds, while their outputs (labeled directed links) represent *alternatives*. In our methodology, standard elements of eEPC diagram have the following meanings [11]:

- Functions (presented with rounded rectangles) are called *activity elements* representing *services* and different types of *life-events*. Each activity element is further described with its own model what leads to a hierarchy of models. Models on lower levels can be changed independently of the models on the higher level. In this way, we obtain modularity of the description of life-events.
- *Events* (presented with hexagons) help to control the processing of life-events: they either describe in which state the life-event is at a particular point of time, or identify the time at which a particular activity element is supposed to start.
- *Logical connectors* are presented with circles. With AND logical connectors, the parallelism in the processing of life-event is modeled, while OR connectors indicate alternatives.

Level of services

To define parameters for services, the following two features should be considered: (1) the modeling of decisions and (2) the modeling of combinations of parameters (e.g. supplements to application form). Therefore production rules and AND/OR graphs were considered as appropriate methods. We selected AND/OR graphs as they model combinations of parameters in a clear graphical form. In addition, a new concept similar to an OR node was introduced to represent a decision.

4 Conclusions

We have proposed a detailed architecture of an active life-event portal together with the description of its components, their operation and methods for knowledge representation. The main advantage of the architecture is in a relative autonomy of logical and data module enabling changing rules for life-event execution regardless of the way in which required data are obtained. This also holds for the data module: changing the way to obtain required data does not affect rules for life-event execution. The core module of the architecture is the logical module, which addresses all the key stages of the knowledge management lifecycle: (1) knowledge acquisition (the description of life-events, the converter), (2) knowledge representation (the catalogue of life-events), (3) knowledge use (the program for the execution of life-events together with the control module) and (4) knowledge maintenance (the program for the acquisition and description of life-events).

The logical module contains two distinctive components: (1) description of life-events and (2) catalogue of life-events. These two components effectively implement a two-step knowledge-acquisition process, which has the following advantages:

- all changes in a definition of life-events are made only in the description of life-events and are automatically transformed into the catalogue of life-events;
- the description of life-events is independent of technological implementation of the catalogue of life-events;
- the description is relatively independent of the knowledge representation formalism implemented in the catalogue as it supports different formalisms (e.g. production rules, decision trees and AND/OR graphs).

Considering three levels of the system, different methods of knowledge representation were selected for each level: (1) hierarchical tree for the level of topics,

(2) modified eEPC for the level of life-events and (3) modified AND/OR graphs for the level of services. The model of topics represents taxonomy for life-events classification. The life-event model considers three important aspects of life-events: (1) a life-event is a process defining the sequence, alternatives and parallelism in the execution of services; (2) it may include other life-events; (3) it involves a decision-making process to determine the list of services needed to solve the life-event. The model of services describes the combination of invoking parameters for the service.

A prototype portal based on this architecture is currently being implemented in Prolog. All the modules have been implemented together with the catalogue that includes two life-events: 'starting a business' and 'moving a home'. Further work will be focused on the testing and evaluation of this prototype, with special emphasis on testing the suitability of selected formalisms for knowledge representation. The final goal is to implement a web-based portal based on the proposed architecture.

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Metadata Repository Support for Legacy Knowledge Discovery in Public Administrations

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Abstract. One of the big challenges of public administration is the need to understand and evolve legacy systems for the purpose of documentation, improvement, modification, interoperability, porting, migrations, reuse, redesign and/or redeployment. There is a need for standardization in legacy transformation that will enable integration and interoperability between different solutions. The OMG has issued a request soliciting proposals for a metamodel to capture knowledge from legacy systems (referred to as the Legacy Knowledge). In this paper we examine how a MOF-based repository can support the definition, modeling, exchanging and integration of metamodels created for legacy knowledge discovery.

1 Introduction

Legacy systems can be understood as any useful and deployed software and data that run on specific platform, written in specific language and, normally, has been long time in production environment. Despite their obsolescence, legacy systems present an enormous commercial value and continue to provide a competitive advantage by supporting unique business processes and containing invaluable knowledge and historical data. This kind of operational legacy software often resists evolution because its strategic value and its low ability to adapt through factors not exclusively related to its functionality. Some of such factors are the system's difficulty to be understood or maintained in an effective cost manner, its core business knowledge that is hard to enhance or impossible to replicate, its difficulty to interoperate, or its dependence on old technologies or specific architectures. These systems, even though with enormous investments, they work.

For a large number of organizations the need for legacy migration is usually triggered by certain external events such as the need to provide Web-access to an existing application or the need to abandon an unsupported platform. In [3], legacy migration is defined as the transformation of data and procedures from the old to new system. For government organizations, legacy migration is a crucial part of their day-to-day

business requirements. Legacy transformation provides the means to address these requirements using systematic and low risk approaches.

The OMG has issued a request [6] soliciting proposals for a metamodel representing the structure of the legacy software and its related artifacts (referred to as the Legacy Knowledge). The primary purpose of this metamodel is to provide the ability to document legacy systems, discover reusable components in legacy software, support transformations to other languages, or enable other potential transformations. The metamodel will also enable information about legacy software artifacts to be exchanged among different tools. Standardization of legacy transformation metamodels will reduce the risk of undertaking software improvement initiatives. The ability to share common information across projects that use a variety of tools and processes will lessen the time, risk and cost of software transformations.

Common Warehouse Metamodel – CWM [5] is another relevant OMG specification related to legacy transformation. A primary objective of the CWM is to define a metamodel of a generic data warehouse architecture. Additionally, the CWM specification covers basic transformations among all types of data sources and targets: object-oriented, relational, record, multidimensional, XML, OLAP, and data mining.

OMG's request for a legacy knowledge metamodel also seeks a common repository structure to represent information about existing software assets and its operating environment, creating, though, knowledge bases.

In this paper we present a MOF-based repository system, which will enable the definition, modeling and exchanging of models that represent existing software assets. In this section we addressed the motivation of this work. In section 2 we review main concepts on information and knowledge as metadata entities captured by the concepts and relations described in the MOF Model. MOF and XMI foundations are presented as well. In section 3, a MOF-based repository system is detailed. An e-government scenario application is presented in section 4 and finally, in section 5, final considerations and future work are presented.

2 Foundations

The distinction between data, information and knowledge is often blurred, but for our purpose, data is a raw thing, like a fact represented as an item. Information is data given context, and vested with meaning and significance [8]. Information is made by data with metadata and context and it is inherently static. Knowledge is applied information, that is transformed through reasoning and reflection into beliefs, concepts, and mental models, and that is used to produce results and is learned from experience and happens in the human brain. It is inherently dynamic and changing.

Metadata is information about data and its main objective is to facilitate the access, the management, the processing and the sharing of a great collection of structured and/or non-structured data [4]. The metadata definition is strongly related to the modeling and meta-modeling concepts. Modeling refers to the description of structured metadata representing the data that compose a domain, as well as the relationships among such data. The collection of these metadata encompasses a model of the domain. Metamodeling refers to the ability to represent and manipulate metamodels, which are models that define constructs used when modeling a domain.

The Meta-Object Facility – MOF [5] is a model driven distributed object framework for defining, managing and integrating metadata in software systems. MOF has been designed with the main objectives of being:

- open: it is capable of describing a wide range of metamodels; and
- extensible: it is a core model and is capable of extension by inheritance and composition.

In order to achieve this, the MOF uses a layered metadata architecture, which key feature is a meta-modeling layer that provides a common language that ties together the metamodels and models. The MOF metadata architecture is illustrated in Figure 1.

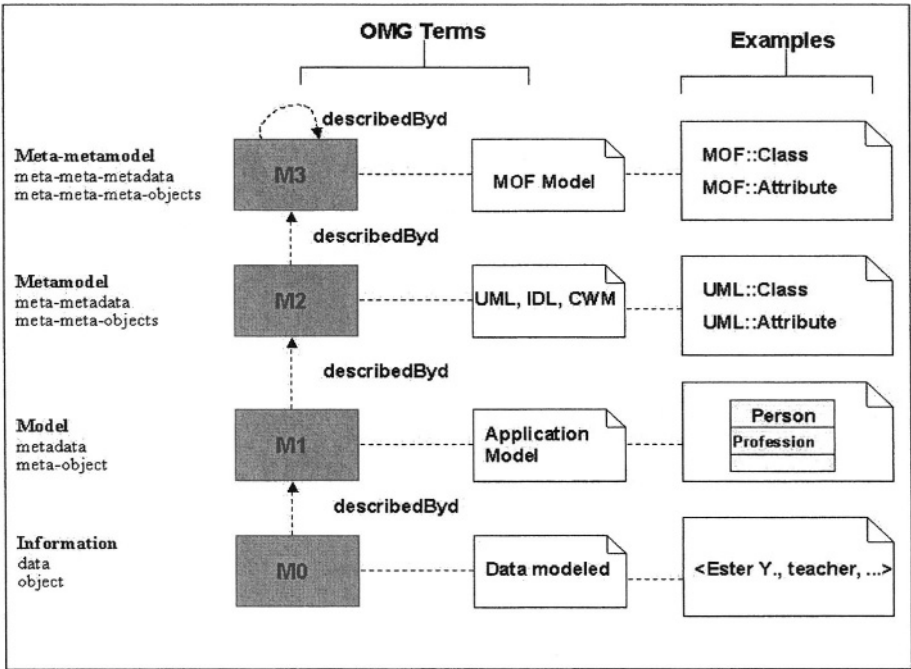


Fig. 1. MOF metadata architecture

The MOF Model, in layer M3, defines an abstract language to describe metamodels. Metamodels, in layer M2, are instances of the MOF Model. A Model, in layer M1, is an instance of a metamodel. Finally, in layer M0 reside instances or data described by M1 models.

Standard mappings provided by MOF and JMI [7] specifications, expose instances of MOF compliant metamodels to CORBA IDL and Java interfaces, respectively. The prime purpose of these mappings is to define a generic framework for managing, in terms of repository, the metadata described by the metamodel. The standards interfaces ensure structural and logical consistency in manipulating the metadata described by the metamodel.

As for the problem of metadata exchange, the OMG has standardized the XML Metadata Interchange – XMI [5]. XMI defines how XML tags are used to represent

serialized MOF-compliant models in XML. MOF-based metamodels are translated to XML Document Type Definitions (DTDs) or XML Schemas and models are translated into XML Documents that are consistent with their corresponding DTDs or XML Schema. XMI is an interchange mechanism to be used between various tools, repositories and middleware.

3 GRM – A MOF-Based Repository System

The Centro de Pesquisas Renato Archer – CenPRA is particularly interested in creating a platform to support the development of Internet collaborative systems in the government context. A central component of this platform is a MOF-based repository to manipulate metamodels from different domains. GRM is the MOF-based repository system developed for this purpose.

In the legacy domain, we believe that work on legacy migration will require different metamodels such as metamodel for data transformation, metamodel for representing languages and metamodel for describing platforms.

According to Bernstein in [1], the goal of a repository is to store models and contents of engineered artifacts, such as software, documents, maps and information systems. In this sense, we define the objective of a MOF-based repository as being to store MOF compliant metamodels. In the next sub-sections, the architecture, main functionalities and GRM implementation details are presented.

3.1 GRM Architecture

The components of a repository system include a database, a repository manager, an information model and tools for populating the database and accessing its contents [1]. GRM is composed by the same components and the basic difference is that the information model is the MOF Model and the contents manipulated are metamodels described by the MOF Model. Additionally, GRM supports XMI format as the mechanism for metadata exchange. Figure 2 illustrates GRM architecture.

The database provides standard database management facilities, such as persistent storage, keys, data integrity and etc. The repository manager and the MOF Model form the repository engine. Services are provided to access and manage the repository itself and the metamodels it stores. Features like version control, check-in/check-out, access control and configuration management are needed for a shared use of the repository.

GRM provides a set of metamodeling tools for the definition, access and manipulation of metamodels stored in the repository. Relevant tools are described next:

- MODL compiler. Meta-object Description Language [DSTC 2001] is a textual notation to describe MOF metamodels. An MODL compiler is an alternative to a graphical editor, providing a way to describe complete metamodels using a textual notation.
- XML DTD/XML Schema generator. This tool, automatically, generates XML DTD/XML Schema for a metamodel by applying the XMI generation rules. The

generated XML DTD/XML Schema is used to validate models against its meta-model.

- Generic browser. A generic metadata browser enables the navigation through the metamodels and their respective models.
- Corba/Java server generators. These two tools are very important in a MOF-based repository system. They automatically generate standard Corba IDL/Java interfaces and their corresponding server implementation. The generated code is a standard software component of a repository, which information system is the metamodel mapped.
- XMI import/export APIs: These APIs enable the streaming of metadata in the XMI format.

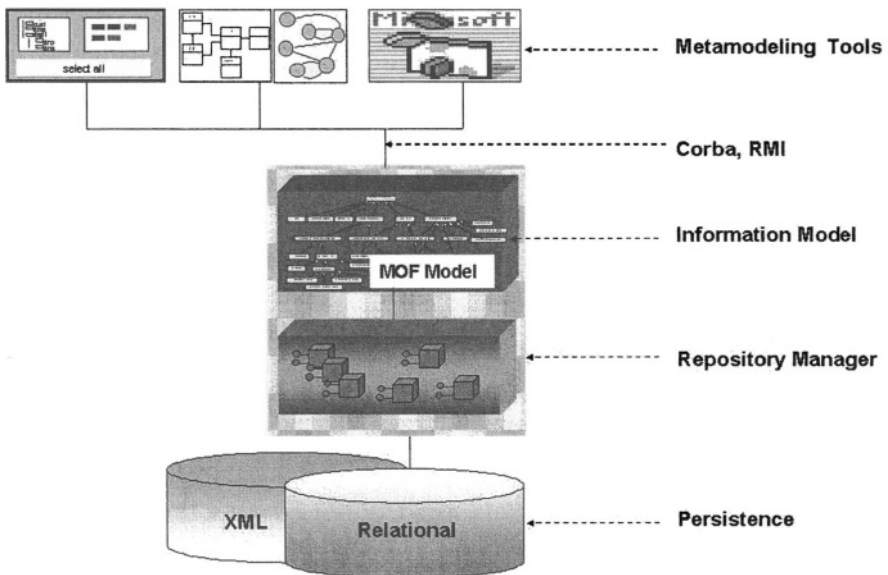


Fig. 2. GRM architecture

3.2 Implementation Details

GRM specific requirements are: i) platform and operating system independence; ii) adherence to open standards proposed in the distributed system context; iii) use of the orthogonality concept when adding a new feature, applying it to any metamodel.

The repository has been realized using the Open Source Complex Information Manager (CIM) [9] developed by Unisys Corporation. CIM is a Java implementation of the MOF and JMI specifications. Its goal is to provide a platform independent metadata infrastructure for developing model driven tools. CIM standard edition is available with the following features: a GUI-based administrative tool for configuring and managing the CIM, Java interfaces generator and metamodel server gen-

erator, XMI importer/exporter, access control and persistence using XMI format files.

At the moment, we have added to CIM an MODL compiler, a XML DTD generator and a generic browser to metamodels and their respective models. We have decided for the implementation of an MODL compiler because CIM comes with only one way to populate the repository: importing metamodels expressed in XMI format. XMI was specified to be a machine exchange format and it is neither succinct, nor easily readable or writable. MODL provides an alternative way to populate the repository. The generic browser provides a way to visualize the metamodels and the XML DTD generator is used to validate models against its metamodel

4 Application Scenario in a Public Administration

In the public administration there are many administrative units, such as agencies, departments and public companies, and each of them contains legacy data used to manage internal processes. Typical problems in this context are the use of different names, structures or scales for the same kind of information, as well as information represented at different levels of granularity, refinement, or precision.

In this scenario, we propose a framework to, effectively, discover, manage and share knowledge among distinct administrative public units. The proposed framework is illustrated in Figure 3.

The Knowledge and Metadata Framework is composed by various MOF-based repository systems, automatically generated by GRM. The information system of each of this repository is a MOF-compliant metamodel where CWM Data Resources Metamodels, CWM Data Analysis Metamodels, CWM Extensions (CWMX) Metamodels and EDOC Entity Metamodel are stored. Metamodels that represent object-oriented, relational, record, multidimensional, and XML data resources compose the Data Resources Metamodels. On the other hand, CWM Data Analysis Metamodels conceive the metamodels that represent data transformations, OLAP, data mining, information visualization, and business nomenclature. And finally, the CWMX is a non-normative model extension to the CWM metamodels [5] that facilitates and enables the access to the legacy system. CWMX consists of: Entity Relationship, COBOL Data Division, DMS II, IMS, Essbase, Express, InformationSet, and Information Reporting.

In Knowledge and Metadata Framework tier, there are others components like:

- The Model Transformation, a component that reads an M1 transformation rule stored in the repository and generates the transformation code that executes the rules on the XMI document containing the M1 model and the M0 data.
- The Legacy Discovery Module, sends requests to the legacy systems and receives an answer as a XMI document containing the requested information (M0 data) and the meta-information (M1 model) that describes it.
- And the Entity Generation Module that receives XMI documents and fills the M0 EDOC Entities, i.e., representations of concepts in the application domain [5], with the M0 data contained into these documents.

For clarification, an example of the architecture's operation will be exposed. In this simple example, it is necessary to fill an EDOC Entity called Citizen resident in the EDOC Module with the resulting information extracted from the legacy system.

The modules present in the legacy system tier receive a request from the Legacy Discovery Module to query their databases to obtain the required citizen information stored into the different database resources. So, the modules realize the query and return the desired information.

Thus, the information (M0) will be encoded together with the respective model (M1) in a XMI document and transmitted to the above tier. In Knowledge and Metadata Framework tier, the XMI document is received by the Legacy Discovery Module that sends to the Model Transformation. The Model Transformation reads the transformation rule stored in the MOF repository and generates the transformation code that executes the rules on M0 data. This transformed data fill the M0 EDOC Entities of the Entity Generation.

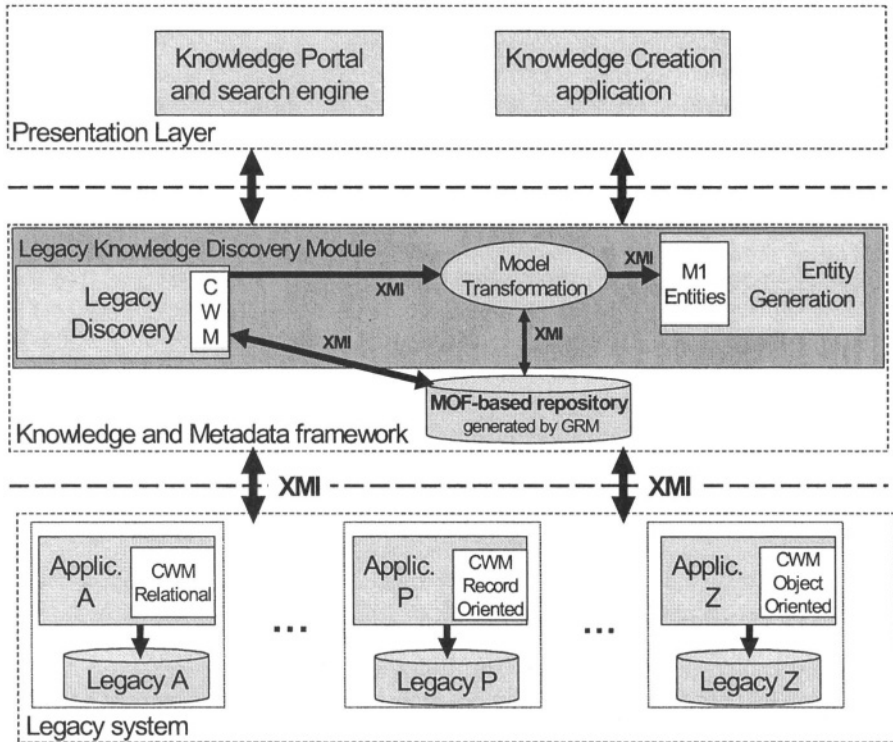


Fig. 3. Knowledge and Metadata Framework

So, the Legacy Discovery Module is responsible for collecting knowledge from the legacy systems present in different database resources and make, the different models of the collected knowledge, available to the others administrative units.

Our approach brings many advantages to government administration and some of them are listed next:

- It provides a formal representation to knowledge;
- It provides an exchange mechanism, allowing knowledge to be interchanged among tools and repositories;
- The ability to share knowledge across public units will improve the understanding of government business and promote data rationalization.

5 Conclusion

In this paper we have presented a MOF-based repository system, which main goal is to support the definition, modeling, exchanging and integration of metadata spread over different legacy systems. Metamodeling tools, an MODL Compiler, Metamodel XML DTD Generator, Metamodel Server Generator, Metamodel/Model browser and XMI Import/Export APIs improve the capabilities to generate metadata that needs to be exchanged among heterogeneous systems in an Internet based collaborative system. New components are being implemented, to increase the functionalities of the open software.

The strength of GRM are: i) it is based on a metamodeling architecture that allows the definition of metamodels from different domains; and ii) it provides a metadata interchanging mechanism that relies on this architecture.

We have presented a preliminary usage of these artifacts in a government scenario, considering that in the public administration there are many administrative units, such as agencies, departments and public companies, and each of them has a lot of physical and semantic heterogeneity in their legacy systems. We think that this government scenario is ideal to exercise the many aspects of meta-modeling structure of the legacy systems and their related artifacts, such as, the ability to document legacy systems, discover reusable components in legacy software, support transformations to other languages, or enable other potential transformations.

Further research is ongoing on the basis of the present work. Research is being developed to define a framework that uses information, about legacy software artifacts, to be exchanged among different tools in order to facilitate the development and composition of e-government services.

The framework shall support all aspects related to service collaboration such as workflow, choreography, contractual interfaces and so on. The metadata for the services description will be extended in order to incorporate all the necessary information for service composition (for example using Web Services Standard WSDL). This information will be mapped and stored in specific MOF-compliant repositories of the framework.

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Knowledge Elicitation and Modeling for E-government

A Practical Approach*

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Abstract. EGovernment is about dealing with knowledge by electronic means. Knowledge has to be collected, organized, shared, and made easily available to citizens and businesses, but also to the government employees.

Knowledge assumes different forms: explicit, encoded for example as laws, decrees, standards, policies, and tacit, embedded in the procedures and routines implicitly enacted by the communities of knowledge workers. To create value these different forms of knowledge have to be combined and made accessible.

We show how Requirements Engineering can be valuable in Knowledge Management for eGovernment, by means of some results from an on-going project about the extraction and analysis of the knowledge embedded in a set of local laws.

1 Introduction

Contemporary organizations, private and public, increasingly rely on their capability of managing and capitalizing their knowledge assets. For a private organization, being able to leverage its knowledge capital means being able to quickly react to external solicitations, also create new knowledge to innovate and compete in a changing environment [11]. Public organizations operate by transforming knowledge, i.e., elaborating knowledge (laws, norms, standards, procedures, administrative rules, etc.), to create and deliver knowledge (policies, regulations, decrees, authorizations, etc.). So, for a public organization, being able to leverage its knowledge capital means to able to provide better services to its customers, i.e., citizens and businesses. To generate value, however, knowledge needs to be collected, organized and shared organization-wide, through easily accessible, understandable, applicable and, above all, tailored to the specific needs, formats. Information and communication technologies (ICT) are crucial in this context.

ICT allow private sector organizations to operate in a knowledge-based network economy, where new alliances and relationships are continuously created (or terminated), and capabilities (production plants, selling facilities, R&D centers) are quickly spread or grouped according the business goals and the available opportunities [20,11]. Similarly,

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ICT are at the basis of the advocated transformation of the public sector towards the eGovernment paradigm [16]. EGovernment means to exploit ICT to increase efficiency, while providing new and higher quality services, mainly through electronic delivery channels. In particular, eGovernment is about dealing with knowledge: knowledge has to be made available to citizens, to businesses, but also to the government employees. Simplicity, customizable formats, and high accessibility are the key factors.

Knowledge management (KM) is therefore widely recognized as a strategic organizational capability [15]. KM is about providing the right information, to the right person, at the right time: traditionally focused on turning raw data into workable and actionable information [15], KM tools and approaches are now required to deal with a softer kind of knowledge, i.e. to add value to the organization processes, data need to be coupled with experiences, lesson learned, employees' skills and ideas [17]. A highly valuable organizational resource is in fact represented by the flow of knowledge embedded in the (often implicit) procedures and routines underlying the organization functioning [12].

How to capture and represent this soft knowledge? How data can be coupled with experiences, skills and ideas? How can we make knowledge electronically manageable?

To address such issues, we argue that an interesting role can be played by methods and approaches recently suggested in the Requirements Engineering (RE) field [18, 5,23]. In particular, we show how RE-derived techniques can be valuable in KM for eGovernment, by illustrating some results from an on-going project concerned with the extraction and analysis of the knowledge embedded in a set of laws.

The idea is to merge information from textual sources (laws) with soft knowledge (experiences, point of views) provided by the user, to build a knowledge repository suitable to: a) allow an effective perspective-based navigation, facilitating access for not skilled users; b) provide support for a normative evolution towards a unified framework, by providing a comprehensive overview of the subject, and highlighting possible conflicts and synergies; c) represent a first step towards an automatic support.

The paper is organized as follows. Section 2 discusses similarities between RE and KM needs. Section 3 introduces the application domain of our reference project. Section 4 briefly introduced an advance RE framework (REF) [9,3,10], which has been adopted as knowledge elicitation and representation tool during the project. Sections 5 describe the application of REF in the project. Finally, Section 6 discusses the results.

2 Requirements Engineering for Knowledge Elicitation

RE is concerned with the definition, formalization and analysis of the requirements that a potential information system must have to accomplish organization specific needs. Traditionally, RE has focused mainly upon the system and its interactions with the users. Recently RE has adopted a broader perspective to encompass the systems application context. By treating the system and its context as a larger social-technical system, and focusing on its overall needs, in fact, the analysts not only are better equipped to identify the right system, but also to improve the context to fully exploit the new system capabilities [18,5,23]. Consequently, appropriate knowledge elicitation techniques and representation formalisms have been suggested to support the analysts in dealing with

the complex issue of capturing high level organizational needs and transforming them into system and organizational requirements.

As discussed above, the functioning of a complex organization is characterized by organization-embedded knowledge, i.e., knowledge tacitly owned by the communities inside the organization that spontaneously emerges through employees' interactions. For example, a group of employees, which shares the common experience (or knowledge by practice) on how to deal with a specific bureaucratic procedure, recognizes itself as having this knowledge. Yet, making it explicit is definitely a hard (and sometimes unwanted) task. So, knowledge transfer is almost impossible to achieve, because, first of all, knowledge identification is denied in principle. The only way to lead these communities to define and thus share their knowledge also outside their boundaries is by improving their capability of analytically, and not only instinctively, apply such a knowledge: enhancing the consciousness of this knowledge is a good vehicle to this end.

Such an issue is very similar to the one that RE wants to address. In both cases, the aim is to capture, make explicit and treatable, the soft knowledge owned by an organization and its communities of *knowledge workers*. In both cases, in addition, the interdependencies among the different actors of the organization have to be recognized and analyzed, in order to identify and understand the embedded knowledge flows, from which the sharable pieces could be extracted.

3 A Case Study

In this paper, we illustrate our RE-based approach to KM in the context of the project *Fortis*, concerned with innovation in forest domain. In particular, we focus on the part of the project related to the understanding and improvement of the legislative regulation of socio-economical aspects of the forest domain in the Province of Trento (Trentino).

The management of the forest areas is far from being an easy task. In the last decades, the economical role of the forests has been significantly modified. Now, the role of forestry does not relate only to timber production, but also to other functions, such as non-wood products (mushrooms and other small fruits gross production), watershed protection, biodiversity preservation, oxygen supply and outdoor recreation [19].

Thus, when considering the forest economical domain, we need to take into account many different stakeholder (e.g., forest owners, associations for environment, Provincial Forest Service, contractors) with different needs, opinions and points of view.

In Trentino, the forest has always represented one of the essential components of local history, both from the economical and the social point of view. In Trentino, forests management is regulated by the Province Autonomous of Trento. In the last forty years, many provincial laws, regulations, and decrees about forests have been issued, and currently the need of a Unified Body of Laws is becoming more and more compelling.

In this context, one of the objectives of the Fortis project is to provide an analysis of such a set of laws and decrees, and to integrate and compare the results of such analysis with the points of view of the economical operators in the forest sector¹.

¹ To collect such perspectives, more than 200 face-to-face interviews with forest owners and managers have been carried on [4], even if, here, we do not report on this part of the project.

4 Introduction to REF

The RE approach adopted to elicit, classify, and analyze the legislative knowledge in the context of the project Fortis, is REF.

REF [10,2,3] is a Requirements Engineering Framework designed to deal with, and reason about, socio-technical systems. Here, the software system and its application context form a larger human and technological system that has to be treated and analyzed as a whole, and the overall needs are the ones to be fulfilled [13,22]. Complexity of socio-technical systems goes beyond working procedures and the complexity of the software system itself: it encompasses the complexity generated by the impact of the system upon the organizational structure, from the business process, to the behavior of the single employee. The basic idea behind REF is to provide the analyst with the right tools to capture the high-level organizational needs and transform them into organizational and system requirements. Application context has in fact often to be adapted in order to exploit the capabilities of the new system. Key factor of REF is visualization; the visual impact of the adopted notation makes it a useful means of communicating knowledge, and a useful repository for collecting knowledge.

REF tackles the modeling effort by breaking the activity down into more intellectually manageable components, and by adopting a combination of different approaches, based on a common conceptual notation. *Agents* are used to model the organization [8, 14,23]. The organizational context is modeled as a network of interacting agents, collaborating or conflicting to achieve both individual and organizational goals. *Goals* [21,1,7, 23] are used to model agents' relationships, and, eventually, to link organizational needs to system requirements. A distinction is made between *hard goals* and *soft goals*. A goal is classified as *hard* when its achievement criterion is sharply defined. For example the goal "*document be available*" is hard, being easy to check whether or not it has been achieved. For a *soft* goal, instead, it is up to the goal originator, or to an agreement between the involved agents, to decide when to consider the goal as achieved. For example, the goal "*document easily and promptly available*" is a soft goal, due to the very subjective nature of the achievement of quality issues like "easy" and "prompt".

Distinguishing between *Goal Modeling* and *Organizational Modeling*, and then further between *Hard Goal Modeling* and *Soft Goal Modeling*, is a key aspect of REF, and helps reducing the complexity of the modeling effort. These activities are part of a cyclic flow, and are supported by a continuous interaction with the stakeholders (Figure 1).

During the *Goal Modeling* phase (Step (a)), the soft and hard goals discovered during organization modeling are refined in terms of more elementary goals, tasks and constraints. In particular, Hard Goal Modeling seeks to determine how an agent thinks to achieve a hard goal, by decomposing it into more elementary hard goals and *tasks* (where a *task* is a well-specified prescriptive activity). While Soft Goal Modeling seeks to determine how an agent thinks to achieve a soft goal, by decomposing it into more elementary subordinate soft goals, hard goals, tasks, *resources* [23,6], and *constraints*. In other terms, Soft Goal modeling aims at producing the operational definitions of the soft goals, thus soft goals refinement has to be reiterated until only hard goals, tasks, resources and constraints are obtained (that is, until all the soft aspects are dealt with). Both soft and hard goals are refined by repetitively asking the agents what they needed

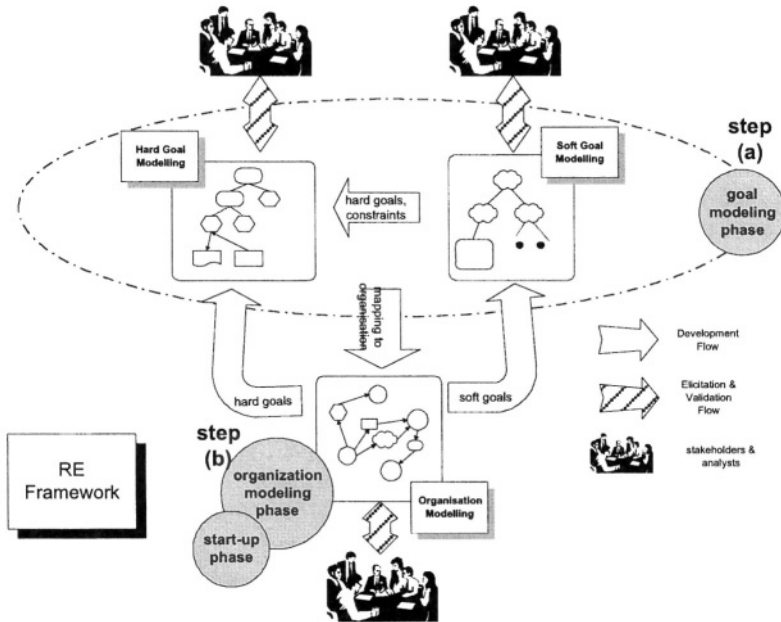


Fig. 1. The REF cycle.

to know, to perform, have delivered or have performed in order to consider the goal as achieved (and by whom, leading in this way to the identification of new agents).

During the *Organization Modeling* phase (Step (b)) the analysts use the information gained during the previous step (see the “mapping to the organization” arrow in Figure 1) to enrich and extend the initial organizational model: i.e., to replace the goals with their models, and to introduce the new agents identified as relevant to achieve those goals. New agents usually lead to new goals, triggering the goal-modeling phase again.

Such a cycle is continued until the desired (and needed) level of details is reached. REF process evolves, as show by the shaded arrow in Figure 1.

5 Applying REF to Knowledge Elicitation

REF is designed to support the identification of the requirements of a new systems starting from the high level organizational needs.

For our purposes, i.e., to propose a preliminary analysis of the set of laws, decrees, and regulations of the forest sector, we need to focus, here, on the preliminary step of the REF process (the start-up phase), required to draw a first organizational model.

Drawing such a model is indeed very critical and crucial. A good —proper and precise— initial model is essential to solve ambiguities and guarantee a faster convergence towards the desired knowledge model, representing the textual facts (laws), capturing the relevant experiences (tacit knowledge), and establishing the basis for further

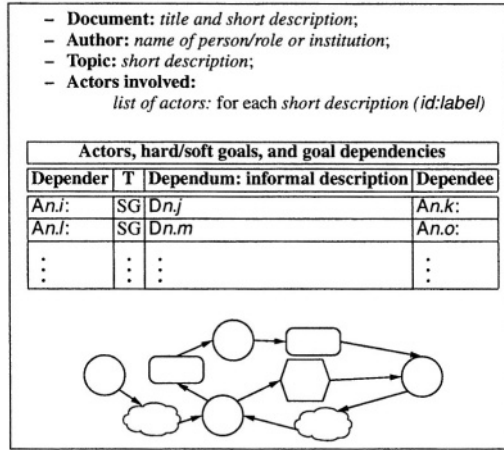


Fig. 2. The elicitation template.

and deeper analysis of the forest sector regulations (detect possible conflicting situations, suggest potential solution, and encompass more stakeholders needs).

5.1 A General Schema for Knowledge Elicitation

Several methods and techniques can be used in order to support the start-up phase, including drawing the model while carrying out the activity of knowledge elicitation. While this could be feasible for small or medium sized cases, especially when the analysts are experts in both the RE technique and the domain, in more realistic cases, it is advisable to structure the knowledge elicitation activity by applying well-defined rules. For example, when the number of actors and dependencies increases with the complexity of the domain (and with the amount of available source documents), or when the analysts need some guidelines (e.g., because having little knowledge of the domain). In the Fortis project, due to the complexity and particularity of the domain, we adopted a methodical approach to collect knowledge, before starting to draw any model.

Thus, we introduced a method to help ourselves, as analysts, and the stakeholders, to organize all the collected information, as, e.g., actors, dependencies, high level requirements, source documents involved, and so on. The method is based on the template in Figure 2, and aims at reducing the gap existing between the requirements/knowledge engineer, and the stakeholders, who may have some difficulties in understanding the transition from their knowledge to the REF graphical models. It is crucial to fill this gap, to reduce misunderstanding and interpretation mismatches between the stakeholders and the analysts, but also to stimulate the stakeholders’ participation.

The process to fill the template (Figure 2) is straightforward. First, by reading the document (the law or decree), all the relevant data, such as the title, authors and main topic, can be easily identified and reported in the template. Then, the REF items (actor, goal, resource, task) and their dependencies can be identified by carefully reading the

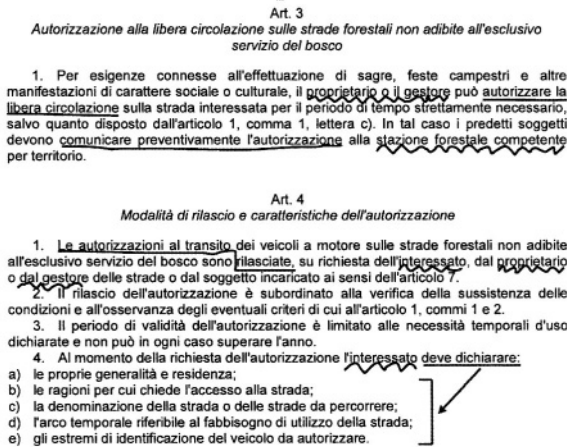


Fig. 3. Example of annotation of a law.

text and underlining their occurrences (see Figure 3). The found actors are listed in the template, while the dependencies are describe in its tabular part. In this phase, a unique label (a short description or acronym) and a unique ID have to be assigned to each item.

This approach has several advantages, among others:

Stakeholders' acceptability. Many stakeholders prefer to deal with tables, as, for some aspects, could be easier to browse them than the corresponding diagrams.

Better understanding of the terms. There are multiple stakeholders involved in the RE process, each with different background, skills, knowledge, concerns, and perception of the problem. It may happen that diverse stakeholders have different interpretations even of very simple terms. The adoption of a tabular format, aside the diagrammatic one, allows them to identify the items that have the same meanings.

Finally, the last step for filling the template consists in representing the tabular information in the diagrammatic format, i.e., the REF organizational model.

The final result is a full portrait of the law through different but complementary formats (i.e., the table and the diagram), which support a better validation by the user.

At the current stage of the project Fortis, we have already developed a quite comprehensive REF model of the forest sector provincial legislation, covering more than 10 different laws and decrees [4]. Here, we can present only a very small portion of it. In particular, we show how the described REF-based approach has been applied for analysing and describing a specific decree of the President of the Provincial Committee. Describing the legal scenario in terms of REF organizational models allows us for a precise account, so that a deep analysis of the related knowledge can be carried on.

5.2 Doc. 8: Decree of the President of the Provincial Committee 20/1/1997, n.2-46

The Decree D.P.G.P. 2-46/97 rules the circulation of motor-vehicles on forest roads in Trentino. In particular, it defines how to apply for and issue authorizations to drive

- **Document:** D.P.G.P. 2-46/97 2-46/97 and following modifications. Provincial Law 23/11/1948 and following modifications - modification of the regulations for the release of authorizations to transit on forest roads not used for exclusive service of forests, approved of with 24 D.P.C.P. June 1994, n. 7-5/Leg.
- **Authors:** President of Provincial Committee
- **Topic:** transit of motor-vehicles on forest roads
- **Actors involved:**
 - Having the right of civic use (A8.1: Having r.c.u.);
 - Forest service office in charge of the territory (A8.2 Forest office);
 - Management body or owner of forest service roads which doesn't have adequate resources for public contact (A8.3: Man.b.o. w/out res.);
 - Commune where forest service roads are (A8.4: Commune str.);
 - Person requesting authorization to use forest service roads (A8.5: Person);
 - Owner of forest service roads (A8.6: Owner f.road).

Actors, hard/soft goals and dependencies			
Depender	K	Dependum	Dependee
A8.6: Owner f.road	SG	D8.1: to guarantee proper use — To guarantee the proper use of forest service roads.	
A8.6: Owner f.road	G	D8.2: to establish rules aut. — To establish rules and procedure for giving authorizations.	
A8.1: Having r.c.u.	R	D8.3: permit — To have a permit to use forest service roads.	A8.6: Owner f.road
A8.6: Owner f.road	G	D8.4: to authorize circ. — To authorize unrestricted use of forest service roads during festivals.	
A8.2: Forest office	G	D8.5: to know aut. — To have knowledge of unrestricted use of forest service roads during festivals.	A8.6: Owner f.road
A8.5: Person	R	D8.6: authorization — To obtain the authorization for using forest service roads for motor vehicles.	A8.6: Owner f.road
A8.6: Owner f.road	R	D8.7: personal data — Model of motor-vehicle, number of plate, motivations, etc.	A8.5: Person
A8.3: Man.b.o. w/out res.	T	D8.8: to give aut. — To give authorizations to use forest service roads for motor vehicles.	A8.4: Commune str.

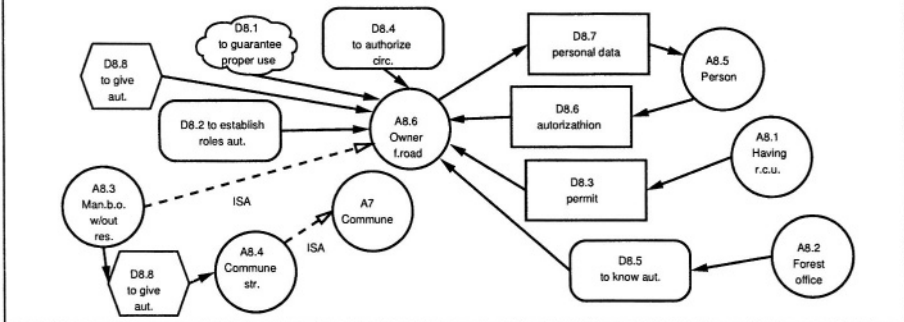


Fig. 4. The filled template for the Decree D.P.G.P. 2-46/97.

motor-vehicles on forest roads. By analysing the decree, the template in Figure 4 has been obtained. It describes the knowledge derived from the analysis, i.e., the list of the emerging actors, their dependencies, and the corresponding REF model.

According with the process illustrated in Section 5.1, the analysis has been carried on, first, by means of a careful reading of the decree itself. Figure 3 reproduces a portion of the decree, in which relevant sentences or terms have been underlined, to better extract all the references to the actors and their dependencies. The template reproduced in Figure 4 contains the final result of the analysis.

In the diagram provided in Figure 4, the actor A8.6: Owner f.road represents a generic owner of forest service roads. S/he has to achieve the two hard goals D8.4: to authorize circ. and D8.2: to establish rules aut., the soft goal D8.1: to guarantee proper use, and the task D8.8: to give aut. (see Figure 4 for an explanation of these labels).

The actor A8.5: Person—representing a generic citizen who wants to drive a motor-vehicle along a forest service roads—depends upon the Owner f.road for the resource—actually, a filled form— D8.7: authorization to drive. At the same time, the Owner f.road depends on Person to obtain all the data (resource D8.7: personal data) that s/he needs to give the authorization (fill the form).

The actors A8.1: Having r.c.u. and A8.2: Forest office depend on Owner f.road for the resource D8.3: permit and the hard goal D8.5: to know aut., respectively.

Finally, let us consider the dependency among the actor A8.3: Man.b.o. w/out res. (management body or owner of forest service roads which does not have adequate resources for public contact, in order to handle the authorization process) and A8.4: Commune str. (the Commune where the road is located). Man.b.o. w/out res. is defined as a kind of (see the ISA dashed arrow) Owner f.road. Because it is not able to issue authorizations, it has to delegate this task (D8.8: to issue aut.) to Commune str. Of course Commune str. is defined as a kind of A7: Commune.

5.3 Initial Model Refinement

Up to here, we have shown how to obtain an initial organizational model in REF. The development cycle of REF has then to be developed, as introduced in Section 4. In the following, we continue our presentation of the REF process exemplifying only few simple steps of organizational modeling, with the aim of showing how this activity, as well as the other REF activities, may support knowledge elicitation, and, in particular, is a valuable tool to help discovering tacit, or implicit, knowledge.

The diagram produced since here, simply derived by reading the Decree D.P.G.P 2-46/97, may lead the analyst to be curious about the possibility that an owner of forest service roads does not have adequate resources to issue authorizations.

Which are these cases? It may be important to clarify this point, to obtain a clear picture of the situation. To this end, the analyst may decide to obtain more details about the real scenario: s/he guesses that some tacit knowledge (not directly emerging from the decree) that some stakeholder may have, could explicitly be represented in the diagram, not only for the owner of the tacit knowledge, but also for the other stakeholders.

Interviewing a stakeholder, some clarification may be obtained, e.g., about the fact that private individual owners may not be able to issue authorizations by his/herself. At the same time, it may also be mentioned that even the Commune itself may own forest service roads. Apparently satisfactory, this new piece of knowledge is reported in a new organizational diagram (see Figure 5). Here, the new actor A8.7: Commune owner—A Commune which owns forest service roads, that are located in its territory, of course—is represented as a kind of (ISA) both Commune str. and Owner f.road. In this way, the diagram in Figure 5 may lead to an inconsistency. Let us assume that a Commune owner does not have the adequate resources to issue authorizations (no evidence that this cannot happen can be found in the decree), thus, that it is a Man.b.o. w/out res.

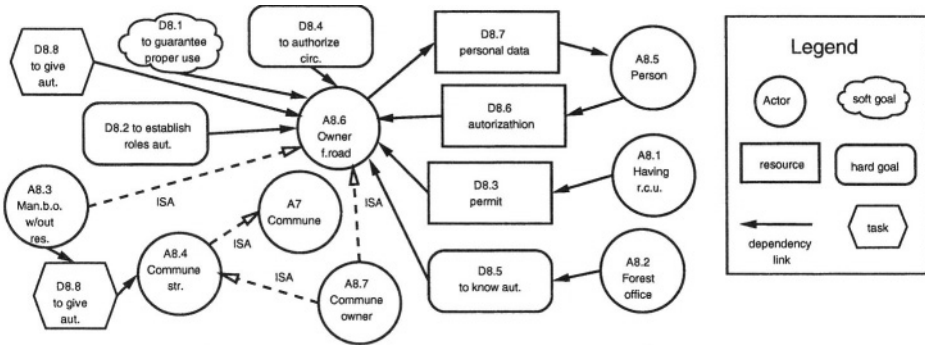


Fig. 5. Revising the initial organizational model.

In this case, accordingly with the diagram, we had that this Commune has to delegate the task of issuing the authorizations to the Commune where the street is locate, i.e., to itself—an evident nonsense!

The solution to this (apparent) inconsistency is quite easy, and quickly derivable simply by using common sense (but tacit) knowledge: every Commune has adequate structures to issues authorizations. Indeed, a Commune is, by definition —given in some Italian laws not included in those considered in the Fortis project— the smallest administrative territorial unit. The correct scenario is depicted in Figure 6. Here, it is explicitly shown that every Commune has adequate resources for public contact (A7: Commune ISA A6: Man.b. with res. —Management body which has adequate resources for public contact), and, thus, that Commune owner ISA² A8.8: Man.b.o. with res. —Management body or owner of forest service roads which has adequate resources for public contact— which, by definitions, has to be disjunct from A8.3: Man.b.o. w/out res.

Of course, for the sake of simplicity, the case presented above is trivial: our aim, here, is just to give an example of how the organizational modelling process in REF may help to discover otherwise implicit, hidden knowledge, also by adopting, to some extent, some kind of consistency checking of the temporary knowledge models. The resulting models, obtained through the REF validation and verification cycle, represent an increasing —and step after step more and more complete and precise— body of explicit knowledge, promptly available not only to the owner of the original knowledge, but also to the other stakeholders involved in the project.

6 Conclusions

In this paper we have shown how an advanced RE framework (REF) —designed to deal with organizational knowledge— can be adopted to propose a practical approach to the complex task of knowledge elicitation, by means of which both tacit and explicit knowledge can be described, combined, and made easily accessible.

²This ISA relationship is derived by reasoning: a different dashed line is used to denote this.

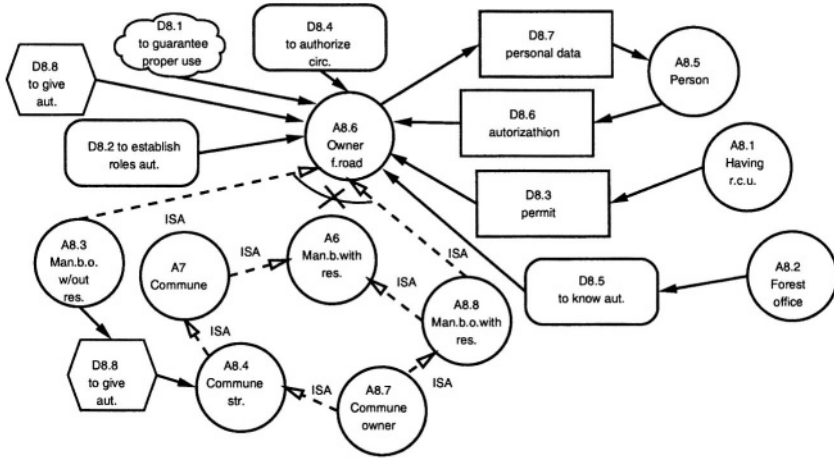


Fig. 6. Revising the organizational model: detecting inconsistencies.

The approach has been illustrated while applied to extract the knowledge from a set of local laws. The adopted example is a small extract from an extensive project, the final result of which is a comprehensive model of the forest management sector in the Province of Trento.

The modeling mechanisms provided by REF—based on the notions of *agent*, *goal*, and *dependency*—combined with a customized elicitation technique, have resulted to be an effective tool, not only to understand and analyze the network of interdependencies that the set of laws create among the different actors of the forest management sector, but also to resolve ambiguities by encompassing the soft knowledge (experiences, point of views) provided by the user.

The result of the project represents a structured and well-formalized knowledge repository (crucial for future automatic support), suitable to allow for an effective perspective-based navigation (i.e., an actor, for example a Commune or a citizen, can more efficiently navigate the knowledge structure according to its specific needs and perspective), to facilitate access for not skilled users, and to provide support for a normative evolution towards a unified framework, by providing a comprehensive overview of the subject, and highlighting possible conflicts and synergies. Future work will address these aspects.

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Designing a Brokerage Platform for the Delivery of E-government Services to the Public

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Abstract. The demand for modernizing government to the benefit of the citizens calls for new approaches to traditional practices. The use of technology in government can enhance the access to and the delivery of public services, thus improving the overall efficiency of government. Online joined-up government refers to the integration of public services from a customer of public services’ point of view. In line with this “consumer-centric” approach, the principal objective of a one-stop government portal is to facilitate seamless access to integrated services that are shaped around everyday life episodes and business situations and comprise service offerings from several public entities. The implementation of e-Government involves not only a profound transformation in the way government interacts with the governed but also the reinvention of its internal processes and organisation. Back-office interconnection and interoperability are key enablers.

1 Introduction

The introduction of Information & Communication Technologies (ICT) and the spread and improvement of communication networks accelerate the transformation of government and its methods of operation. The use of electronic technologies in government opens up many possibilities for improving services to citizens and businesses, for increasing efficiency and reforming traditional paper processes.

Traditionally, government work is divided into sectors (health, education, finance etc) and the resulting responsibilities are assigned to several institutions, each one of which produces and delivers a number of services to the public. However it is often the case that users (i.e. citizens and enterprises), when confronted with a particular life or business situation, need a set of services often originating from several different public authorities. In the present situation the user needs to have full knowledge of the overall process to be followed: the authorities involved, the services that need to be invoked at each authority, the input required for each service, the order of invocation etc.

In order to better serve the demands of citizens and enterprises, public administration is faced with the challenge of adopting a “consumer-centric” approach, providing joined-up services that are user-driven (i.e. are organised and delivered the way the user wants).

Electronic service delivery offers huge opportunities to meet the needs of citizens. The development of unified online access points, where various public authorities collaborate for the provision of integrated services that are structured in a cohesive, theme-based manner and transcend conventional agency boundaries, is regarded as a means to enhance the overall effectiveness of government. Portals of this type offering information and services based on “life-” and “business-episodes” (i.e. everyday life and business situations) aim at providing citizens and businesses with the opportunity to interact easily and seamlessly with all the involved authorities and/or departments, thus hiding away the organisational complexity, the fragmentation of responsibilities, and the underlying interdependencies of the public sector.

Online public offerings fall into two major categories: information and services. Online public information refers to the distribution of official government information, while the term online public services refers to online government applications that are offered to groups external to government such as citizens and businesses. Public services are the concrete products and services an external customer is re-questing.

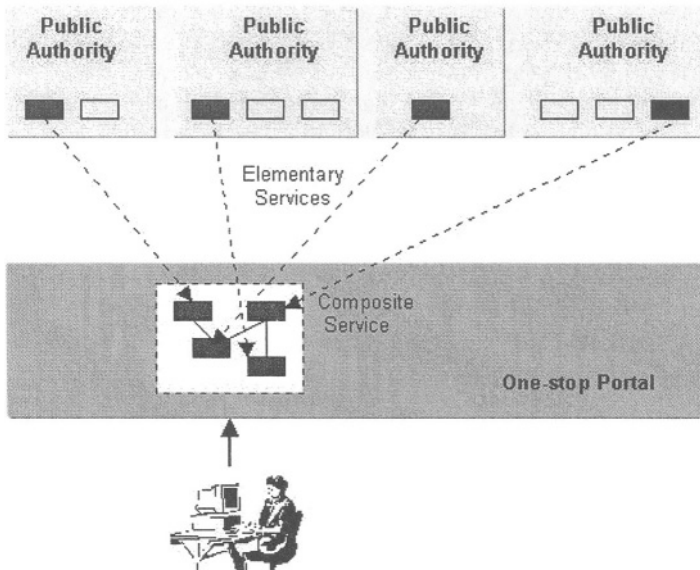


Fig. 1. Online one-stop government: integration of services

The scope of this paper is to investigate the provision of services to the public via a one-stop government portal, focusing on the implications of developing and executing integrated services. In the following sections the lifecycle of integrated services will be analysed, i.e. the development, the provision and the execution phase, focusing on the effects the joining-up of services has on the involved public authorities (business processes, internal organisation etc).

In this paper integrated services will be called “composite services” as opposed to the term “elementary services” that will be used to refer to public services provided

by a single public authority. Several elementary services are joined together according to specific operations flows in order to produce a composite service.

2 Integration of Services

The current trend in e-Government calls for joined-up services that are effective, simple to use, shaped around and responding to the needs of the users (i.e. people's everyday lives and/or daily businesses situations) and are not merely arranged for the provider's convenience. In this way, the users need have no knowledge of or direct interaction with the involved structures of government in order to conduct their business. Back-office interoperability becomes a key enabler of e-Government. Government entities need to be interoperable, in order to allow for data and information to be exchanged and processed seamlessly across government.

In order for a one-stop government portal to be able to respond to the needs of the users, much more than the simple indexing of the public offerings of all government agencies is required. The need for "consumer-centric" services calls for solutions that will facilitate the creation of integrated services by joining together the service offerings of a number of government entities based on the use that the citizens make of them. Consequently critical to the success of e-Government is the development and adoption of new technologies to help manage information and the utilisation of open standards. In particular metadata technologies are expected to play an important role in this effort.

e-Government affects every aspect of how an organisation delivers services to the public: the technological means, the business processes and the human resources. Consequently realising the full potential of e-Government is not merely about bringing existing services online. It involves not only a profound transformation in the way government interacts with the governed, but also the reinvention of its internal processes and organisation and the coherent integration of government infrastructure, systems, processes and services.

In the light of the above, the development of integrated services by completely re-designing business processes from a customer's point of view, is considered to be a non-viable approach, since this would translate into a massive process reengineering wave sweeping across government and calling for the radical reorganisation of public administration (the reassigning of responsibilities, the elimination of redundant processes, the modification of organisational structures etc).

A more viable solution would be to allocate the joining-up of services to the one-stop government portal, maintaining the consolidated configuration of government and the existing assignment of responsibilities and optimising services on an elementary service level (intra-organisation business process reengineering). This means that the internal business processes associated with each elementary service have to be modelled and redesigned, in order to transform traditional processes to one-stop government processes.

The joining up of services at the one-stop government portal can be achieved though the introduction of an integration layer that will be responsible (a) for the joining together of services originating from different public authorities and (b) for the administration of the resulting composite services.

This approach was followed in the framework of eGOV [5], a project that was financially supported by the European Commission under the Information Society Technologies Programme and whose aim was to specify, develop, deploy and demonstrate an integrated platform for realising online one-stop government.

The structure of such a one-stop government platform can be depicted in the form of a three-tier architecture comprising the following layers:

- Communication Layer
- Integration Layer
- Back-office Layer

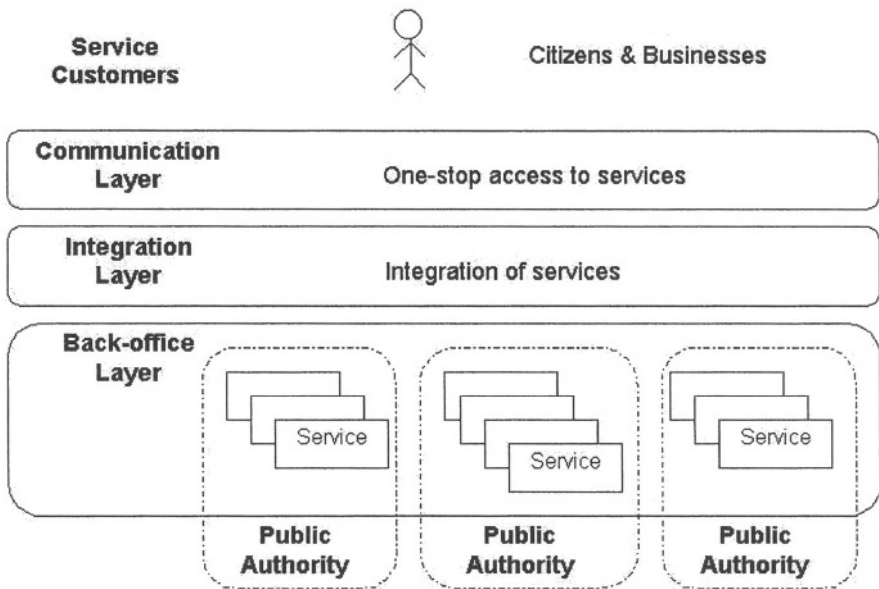


Fig. 2. One-stop government portal

2.1 Communication Layer

The communication layer represents the front-office of the integrated e-Government system, i.e. the one-stop point of access to the public offerings of all sectors and all levels of government.

In order to realise the full benefits from ICT, the integrated e-Government system must allow users to have:

- One-stop access

The integrated e-Government system must aggregate the offerings of different government entities. Users must be able to access public services via a single point of entry even if the services are provided by different departments or authorities. All government services which can be practically and legitimately delivered electronically should be available via the one-stop government portal.

- Seamless access

Users do not need to know how government is organised or which department is responsible for the service that they require. Information and services must be organised in a way, which is both convenient and logical to users.

- Ubiquitous access

The system must support multiple delivery channels, such as call centres, Internet, mobile devices, satellite TV etc, as well as traditional walk-in centres for those who choose not to use online services. Users must be able to obtain information, search and invoke the execution of public services anywhere, anytime.

- Security and privacy

The system must incorporate security mechanisms in order to protect users' information and privacy, by ensuring people accessing information and services are who they claim to be, that the information that they provide to government is protected, and is used with integrity etc.

- User-friendliness

The system must provide users with an easy-to-use, intuitive interface, capable of accommodating both IT literate and first time users.

2.2 Integration Layer

The integration layer is responsible for developing composite services and for managing their execution. In this light, the integration layer is the core component of the one-stop portal, representing the instrument for coupling the front end with the back office.

Life events and business situations are mapped on composite services and composite services are analysed into elementary services. Being at the centre of this process, the integration layer deals with both the structuring and the decomposition of composite services. Consequently, all knowledge associated with a composite service resides at the integration layer: the list of elementary services that are associated with each composite service, the public authorities that are responsible for their execution, the sequence of execution of the elementary services, the required inputs of and the outputs produced by each elementary service etc. In this sense the one-stop government portal could be regarded as a knowledge management system.

The integration layer makes use of the accumulated knowledge in order to provide composite services to the users and to manage the execution of elementary services.

Two-way transparency is required:

- Administrative processes have to be made transparent to the user (the requestor of the composite service).
- Composite services have to be made transparent to the providers of the involved elementary services (the public authorities)

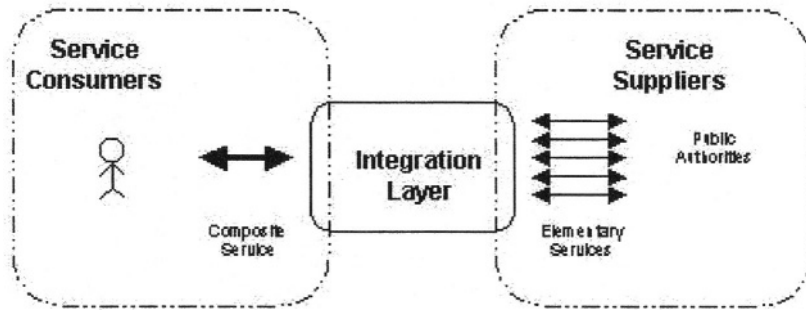


Fig. 3. Role of the integration layer of the one-stop government portal

Technologically the creation of one-stop portals to serve as marketplaces for integrated public services is facilitated by the development of standards like the Web Services Description Language (WSDL). WSDL is an XML (Extensible Markup Language) vocabulary that standardises the description of Web services defining them as collections of endpoints that exchange information about each others' capabilities thus allowing for inter-applications communication. Existing applications can be transformed into web services, while more sophisticated web services can be created from the combination of multiple backend applications related services based on defined operations flows.

Web services enable the development of e-Government platforms that act as intermediaries between the citizen and the government, (a) combining service offerings from multiple authorities into composite services that adhere to the citizen's everyday life necessities and (b) handling the execution of a series of services upon the invocation of a composite service at the portal.

Web services create a common language for the integration of services, while the actual service implementation is regarded as a "black box", i.e. it is of no importance whether the service is executed electronically (automated service execution) or not (non-automated service execution).

2.3 Back-Office Layer

The back-office layer is where the elementary services reside. In the case of automated service execution, service requests are handled electronically, without human interference. In other words the execution of the elementary service is undertaken by a fully automated back office system (legacy systems).

When services are executed automatically within legacy systems a S/W interface component "connects" the e-Government system with the automated service execution system of the local authority. This component receives the service input from the system and returns the service output after the service execution is completed. If the local legacy system and the e-Government system are not interoperable, manual intervention is required for the execution of the service.

When automated service execution is not supported, the execution request together with all the necessary input data is passed to an employee, who initiates the back-office process. This back-office process may consist of several tasks performed

manually and/or involving the use of legacy systems (manual or partly automated back office processes).

In the case, where the service execution is performed manually, some kind of interface must be implemented in order to allow the local service administrator to interact with the e-Government system. By means of this interface the administrator is notified about incoming service execution requests and is provided with all the input data that is needed for the execution of these services.

Each local service administrator has complete knowledge of the service he/she is requested to execute (the input required, the local tasks involved, the output produced etc), but needs have no knowledge of the overall process the user has initiated at the one-stop portal (i.e. the invoked composite service).

3 Execution of Integrated Services

The aim of this section is to investigate the execution of integrated public services. For this purpose we shall examine a composite service modelled after the life-episode “marriage at the civil office” as performed in Greece¹ in a non-automated service execution environment.

Table 1.

Service	Description	Responsible Public Authority
S1	“Getting Birth Certificate”	<ul style="list-style-type: none"> • Municipality of birth of the bride • Municipality of birth of the groom
S2	“Getting Marriage License”	<ul style="list-style-type: none"> • Municipality of residence of the bride • Municipality of residence of the groom
S3	“Arranging marriage date”	Municipality in which the wedding ceremony will take place
S4	“Getting Marriage Accomplishment Certificate”	Municipality in which the wedding ceremony will take place

In Greece, in order for a couple to get married at the civil office, the future husband and wife must each be in possession of a marriage license. A marriage license is a certificate that can be obtained at the person’s municipality of residence. In order to apply for a marriage license a person needs to submit a registry action of birth, a certificate that is issued by the registry office of his/her municipality of birth. With the two marriage licenses in hand, the couple must visit the municipality where they wish the marriage ceremony to take place and arrange for a date for the event. After the end of the ceremony a “marriage accomplishment” certificate is issued.

The aforementioned process that could involve up to five different municipalities can be analysed in a sequence of composite and elementary services, some of which

¹ The process has been simplified.

are performed twice (one time for the bride and one for the groom). Table 1 lists the authorities that are responsible for the execution of each service.

The service execution sequence is depicted in Figure 4:

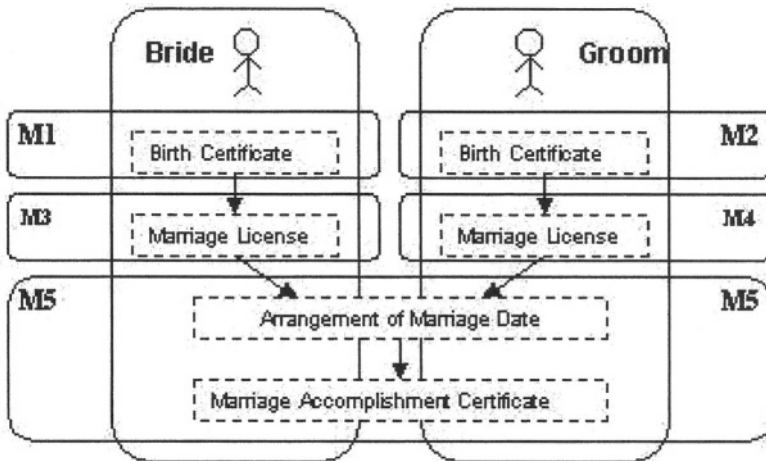


Fig. 4. Service execution sequence

It is evident that Elementary Service 1 (S1, “Getting birth certificate”) at the municipality Nr 1 (M1) and S1 at the municipality Nr 2 (M2) are independent from each other and can be executed in parallel: the requests for the issuing of birth certificates can be processed at the same time by the related municipalities.

Each municipality will receive via the system a service execution request accompanied by the input that was provided by the requestor (i.e. personal data that correspond to the fields of the “regular” application form one would have to fill out at the City Hall for the issuance of a birth certificate).

Elementary Service 2 (S2, “Getting marriage licence”), apart from the requestor’s personal data, also requires the submission of a number of accompanying documents that include his/her birth certificate (i.e. the end product of S1):

S2 at the municipality Nr 3 (M3) cannot start before the successful completion of S1 at M1 although its beginning should not necessarily coincide with that of S2 at M4 (for the same reasons S2 at M4 should follow the execution of S1 at M2 but should not necessarily begin at the same time with S2 at M3).

All required documents for the issuing of a marriage licence are submitted by the citizen and controlled by the system upon invocation of the “civil marriage” service. However it is only after the birth certificate has been issued that M3 should receive the request for the issuing of a marriage licence (accompanied by all the prerequisites mentioned above).

In any case S3 (at M5) cannot start before the completion of both instances of S2 (at M3 & M4): the two citizens must have obtained their marriage licences before they can make a request at the Municipality for the fixing of a date for the wedding ceremony.

3.1 Transparency

From the point of view of any given authority involved in this process it is clear that its tasks are independent of those of the other authorities and that the system (i.e. the integration layer) should hide away the complexity of the execution of the “civil marriage” service.

The public employees monitoring the incoming service execution requests at the involved municipalities need not necessarily be aware that the “civil marriage” service is being executed. What is of importance is that the system provides them with input that will allow the responsible local department(-s) to handle the incoming service execution request.

The involvement of each authority in the “civil marriage” service starts with the arrival of the elementary service execution request and ends with the completion of its tasks (i.e. the elementary service it has been asked to execute).

In other words at some point of the “civil marriage” service execution all involved authorities are prompted by the system to perform a specific task, using input that was provided by the citizen and/or the results of other tasks (services) performed earlier by other authorities. Following the ordering of the “civil marriage” service through the one-stop portal, S1 will be invoked at M1 and M2, where the respective system administrators will have to respond to this request by launching the back-office process for issuing a birth certificate. The end product of this process (the birth certificate) is used as input for S2, together with all the other foreseen prerequisites.

3.2 Service Execution Parameters

The introduction of “unified” data submission forms at the portal side is of paramount importance for e-Government platforms offering integrated services, in order to avoid data redundancy and thus to promote user convenience. The entry fields of these forms should correspond to the service execution parameters of all the elementary services that form the invoked composite service. However the citizen should be prompted by the system only once to provide input that is common to more than one elementary services. For example in the case of the “civil marriage” scenario, not avoiding input data redundancy, would cause the two applicants to fill in their personal data (name, address, place and date of birth etc) two or three times.

This process is subsequently reversed at the service execution level, where the “unified” data submission forms are deconstructed and each authority involved receives all the data needed for the execution of its specific service.

3.3 Notification

Upon successful completion of an intermediary service (i.e. an elementary service forming part of the invoked composite service) the local service administrator has to notify the system that the process was concluded so that the execution of the following sub-service can begin.

The system and the central administrator must also be notified in case of service execution failure, which would cause the whole composite service execution to abort. The elementary service interface should allow the local administrator to report the

reasons that have hindered service execution. Depending on their nature the reasons that caused the elementary service to abort should also be made known to the service requestor.

In any case the local service administrator should be able provide feedback to the system with regards to the execution of the elementary service.

3.4 Delivery

After the successful execution of service S4 at M5 the end product of the invoked “civil marriage” service (i.e. a “marriage accomplishment” certificate) is produced.

Via the elementary service interface the local administrator at M5 notifies the system about the successful completion of the process and/or forwards a copy of the certificate in picture format to the service requestor.

The original “marriage accomplishment” certificate may be sent to the applicant via regular mail or using any other delivery method the citizen has selected among the ones that are available.

In case multiple delivery channels are supported for a specific service, the requestor’s preference must be conveyed by the system to the local administrator and through him/her to the responsible department of M5.

Particular attention should be given to the way the end products of the intermediary services are handled, since they only serve as input to some subsequent service and are not of interest to the composite service requestor (such is the case of the birth certificate in the “civil marriage” example). From this point on the end products of the intermediary services will be called intermediary products (of the composite service).

Should a local authority X (Auth. X) forward its end-product (Product X) directly to the authority Y (Auth. Y) that needs it as an input for the execution of the following service? Would a notification sent to Auth. Y via the system regarding the successful completion of the previous service be sufficient? Should intermediary products be delivered to the applicant as well?

According to today’s common practice and the regulating legal framework, the employees of Auth. Y would need to have all input before hand (including the certificate produced by Auth. X) in order to execute their tasks (associated with the requested service). However in an integrated one-stop e-Government environment, it is clear that it would be more convenient to “substitute” intermediary products with internal certificates. The system could send Auth. Y the service execution request accompanied by all the required input, except of Product X (i.e. the end-product of the previous service executed at Auth. X). Instead of that Auth. Y would receive a certificate created by the system confirming that Product X has been produced and containing all the parameters that are associated with or are included in Product X and are of use to Auth. Y for the execution of its tasks.

In case Product X is a certificate, a copy of the certificate in picture format could be forwarded to Auth. Y or a legally binding “message” containing a copy of the certificate’s content, the date it was issued the details of the person who signed the original document etc.

It is clear that the public servant at the local authority, not only must be able to notify the system about the successful completion of the service, but he/she must be in position to transfer the outcome of the service back to the system for further use, if

not in the form it was produced, at least all useful (to the following service) parameters that are associated with it.

This could require the introduction of electronic reply forms at the e-Government system – local service administrator interface, allowing the public employee to fill in all the required parameters that would then be forwarded to the next authority.

3.5 Controls

It should be noted that some tasks that are performed at the portal side upon service invocation, such as user authentication, qualification checks of service prerequisites etc, can simplify the process that has to be followed at the public authorities and thus relieve them from a considerable overhead of traditional service execution. However in order to ensure the legal validity of the process all controls and qualification checks performed at the portal should be reported to the local authority executing the elementary service.

4 Conclusions

In this paper the concept of joined-up government was investigated from the point of view of the public administration.

The development of a unified access point to public services, where various public authorities collaborate for the provision of integrated services, can help reduce the inconvenience that customers face as a result of the strict division into sectors and spheres of responsibility in central and local government.

The improvement of customer services implies the redesigning of public services from a customer's point of view as part of an overall transformation of government from an "administrative" to a "service-oriented state".

This concept requires the reorganisation of the public sector and the reengineering of its processes. Connectivity and interoperability are key enablers in this effort. Critical to the success of e-Government is the development and adoption of new technologies to help manage information and the utilisation of open standards.

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How to Develop E-government: The Italian Case

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Abstract. The objective of the present paper is to analyse, longitudinally, the development of e-government in Italy from the middle of the '90s to the present. The author uses an approach based on the theory of governance which has been applied permitting the singling out of three different phases and main issues that an administrative renewal of this level involve. However it does not seem possible to make any evaluation about this evolution as it is at too early a developmental stage.

1 Introduction

E-government is a wide field. It concerns many disciplines both in the sphere of social sciences and natural sciences. Therefore this work is very partial. Its scope is to analyse, from a particular point of view, the evolution of this phenomenon, in Italy, from its beginnings in the middle of the '90s to the present.

This point of view is based on an interpretative grid related to the theory of governance as proposed by Kooiman (1999). At the base of his analysis are social interactions. These interactions are investigated through three different levels of analysis. The first one considers functional aspects: interactions that regard procedures and regulations. The second level refers to the structures in which they take place or, in other words, the institutional setting. The third level concerns the social acceptability and the legitimacy of interactions.

This three level analysis will be applied to e-government development in Italy, which has been subdivided into three phases. The phase of community networks and the first municipalities that decided to support this phenomenon, the spontaneous phase in which the majority of governmental organizations, at all levels and autonomously, built web sites, and the phase of policies in which, at the national and regional level, plans have been introduced to regulate e-government development. These three phases were then analysed according to Kooiman's grid. From this analysis emerges, in a comprehensive way, the main determinants of each phase. However it does not seem possible to make any evaluation about this evolution. We are at too early a developmental stage and for this proposal a comparative analysis with other countries at a similar level of advancement would be more useful. This notwithstanding, taking into consideration social acceptability and legitimacy of e-government interventions sheds light on key issues for the future.

2 The Concept of Governance

Kooiman's work (1999) will be taken as point of reference and his interpretation of governance will take us to e-government analysis. This approach is in the wake of the general theory of a system (Boulding, 1956, Ashby, 1958). Therefore governance is seen as an entity formed by constituents that are interrelated with each other. That is, each part is dependent and yet, at the same time, affects other parts. This analysis focuses just on interactions in order to examine main characteristics of social-political systems.

Interactions that steer us in this study because of their *diversity*, *dynamics* and *complexity*. *Diversity* suggest the idea that governance has to face the multitude, often of different nature, of individuals and organizations that are involved in the public sphere. *Dynamics* emerge as the result of the tensions between change and conservation, between special interests and common interests and between systems and their environment. Finally *complexity* is the consequence of the different nature, form and intensity of interactions.

In this intricacy how is it possible to put order and orientate ourselves in order to understand the nature of governance? A distinction between the *intentional level* and the *structural level* of interactions can be useful for this proposal. In fact the intentional level is formed by images, instruments and action conditions. That is, a conception where the system came from, where the system is and where it needs to be (images); a set of tools that permits the shift to the desired position (instruments) and support and consensus necessary for implementing the required tools (action condition). However this *intentional level* is strictly related to the *structural level* that is represented by culture, resources and power (Kooiman and Ass., 1997). In other words, images, instruments and action conditions are embedded in the *structural level* and each intervention into the system is the combined effect of both these two levels of interactions.

To sum up, *diversity*, *dynamics* and *complexity* concern the modalities of interactions and the configurations through which they take place. On the other hand the *intentional level* and the *structural level* regard more the foundation, the logic of interactions and what gives them a possible shared meaning.

The next step is to give a comprehensive analysis to these two aspects: the modalities of interactions (*diversity*, *dynamics* and *complexity*) and the logic of interactions (the *intentional level* and the *structural level*). And this is possible recurring to the so called governing *orders* and governing *modes*.

What are governing *orders*? What are governing *modes*? Let's start from the former. Governing *orders* represent, mainly, activities executed by actors involved. It means everything concerns the mission of the system taken into consideration. From the direct supply of a service, for example, to the strategy and values on which it is based. On the other hand, governing *modes* do not regard activities but actors. Namely, who and in which way activities are implemented.

Governing *orders* are subdivided into first-order governing, second-order governing and meta-governance whereas governing *modes* in self-governing, co-governing and hierarchical governing.

3 Governing *Orders* and Governing *Modes*

The examination of governing *orders* starts from the first-order governing. This order regards day-to-day activities, routines and procedures in concrete governing situations employed for solving problems or taking opportunities. Concerning opportunities, Kooiman (1999) maintains that the challenge of present-day societies is not only the problem-solving one but also about creating collective opportunities. The private sector and market, that used to be considered the main forces for creating opportunities, are not sufficient anymore whereas a combination of private and public seems more effective.

Both the problem-solving question and the opportunity creation question emerge from the so-called modalities of interactions (*diversity*, *dynamics* and *complexity*). The former comes out because of tensions in the in the social-political system then necessitating the intervention of the *intentional level* and the *structural level*. The latter, even though it is a product of *diversity*, *dynamics* and *complexity* too, requires what we have called images at the *intentional level*. Only images can make sense of the context and start how to intervene into it through instruments and action conditions (the other two elements of the *intentional level*).

Therefore the first-order governing, as concerning common activities, is mainly related to the modalities of interactions (*diversity*, *dynamics* and *complexity*) and only in the case of the opportunity creation it becomes fundamental the role of images (an element of the *intentional level*). This is a phase in which substantial changes are not required, both in the *intentional level* and the *structural level* (culture, resources and power), in order to intervene in the socio-political system (see Table 1).

What does happen when the performance of common activities becomes out-date, dysfunctional, and not effective anymore? It is this range of questions that introduces the second-order governing. This order that does not concern anymore day-to-day activities or problem-solving and opportunity creation but the institutional setting in which these activities take place. To put it differently, it regards the balance between needs and capacities of a social-political system. Therefore, what kind of intervention do the combination of the *intentional level* and *structural level* support? Does it fit to problems and opportunities at stake? Answering these questions has to do with the second-order governing.

It is at this point that the governing *modes* question emerges. Governing *modes* are nothing but models through which interactions take place or, in other words, how these interactions are institutionalised and in which type of institutions. Kooiman singles out three of these modes: self-governing, co-governing and hierarchical governing and is intuitive to recognize how this subdivision refers to the new institutional economics (Williamson, 1975, Ouchi, 1980) (See Table 1).

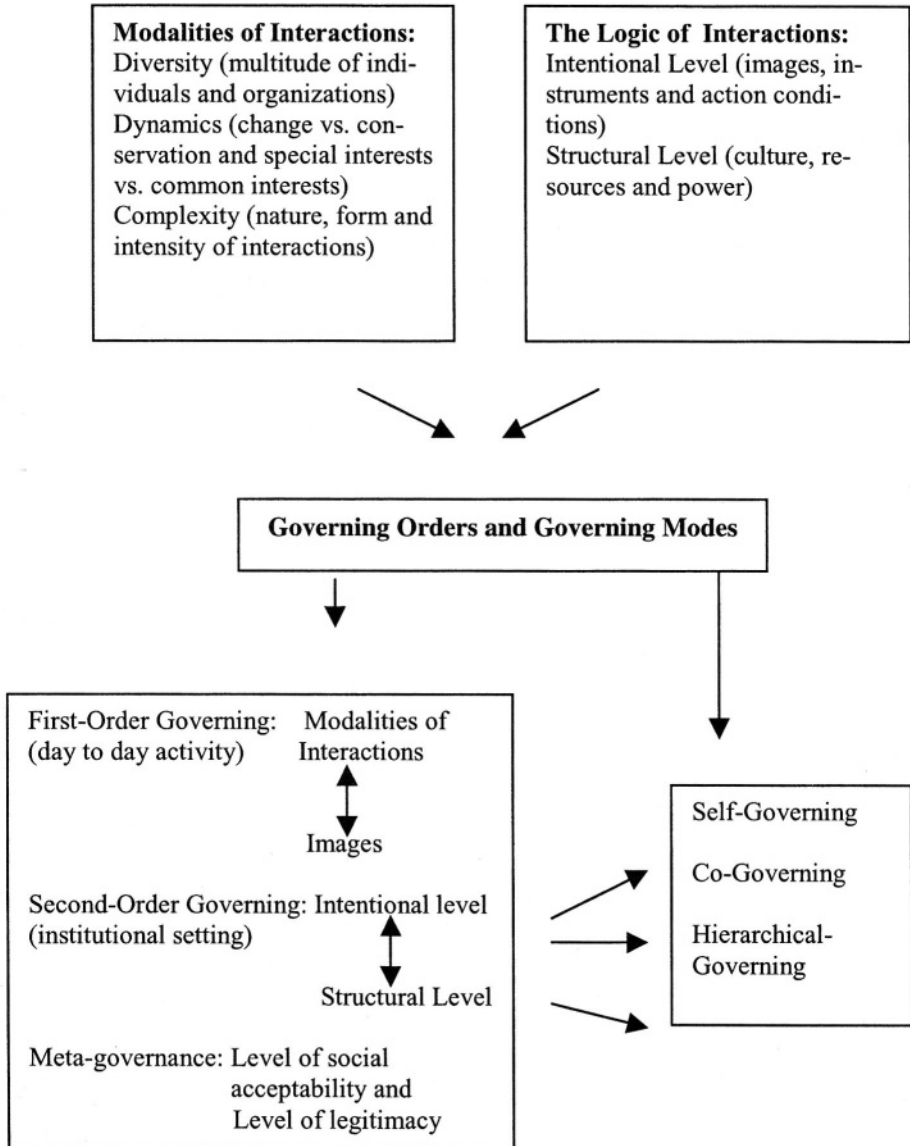
In fact self-governing, even though is not directly connected to the market institution, recalls an horizontal and self-regulating coordination among actors and each player is free to pursue its own goals. In this institutional setting interactions take place without any constraint and naturally, contributing substantially to the functioning of modern societies.

Co-governing: differently from the previous case actors are not free to pursue their own goals but they are negotiated among them. However, even in this case coordination is horizontal, there is not a central and dominating governing actor, and is carried

out through mutual adjustments. Networks are an example of this mode of governing that often are based on existing established relationships present in the society.

Hierarchical governing: this is the typical way of governing based on policies and legal and administrative rules. In this case coordination is not horizontal but hierarchical and formal, goals are imposed from above and interactions take place in an environment characterized by hierarchical institutions.

Table 1. From interactions to governance



Whereas first-order governing concerns day-to-day activities and problem solving and opportunity creation, second-order governing the institutional setting in which first-order governing takes place, the meta-governance regards the framework of managerial and political standards in which the other two orders evolve. Managerial standards refer to the social acceptability of governance conditions, for example a certain level of taxation, and political standards refer to level of legitimacy through which issues are handled. To say different, what and who rules governors and their governing. Then it is not enough to analyse how a system works; what is crucial is to see at what social costs and at what degree of representation. Otherwise there is the risk of implementing problem solving and opportunity creation in an inefficient, ineffective and probably also illegitimate and unjust way (see Table 1).

4 E-government in Italy

4.1 The First Phase

The first cases of e-government in Italy date back to the middle of the '90s. As opposed to the Anglo-Saxon world - and particularly the U.S. and Canada where community or civic networks emerged spontaneously from the society for sharing information and debating several aspects of the social life of a specific neighbourhood (Beamish, 1995) - in Italy the role of local governments has been crucial from the beginning. Of course, even in Italy's case the so called free nets typical of the U.S. appeared and were managed directly by groups of citizens, but soon their importance vanished in favour of networks supported by local governments.

What were, at that early stage of development, the contents of e-government? As it has been already mentioned, this period was characterized by civic networks and new forms of political organization. Unlike the past, without the mediation of political parties or other representative organizations, citizens can now be an active part of the political process and community management. So network technologies can be seen as instruments that support both a socializing effect, promoting new ways of reciprocal exchange, and a transformative effect leading to alternative modalities through which it is possible to intervene in the political arena (Ciborra, 1993). Probably, using a term in fashion in these days, it is e-democracy that best represents the nature of e-government in its first phase.

4.2 The Second Phase

The scene changes profoundly in the second half of the '90s. The establishment of the internet protocol and of the world wide web standard have provoked an explosion of governmental web sites. Probably what best represents the last few years of the 20th century was the information effect. For sure e-democracy instruments have been refined and improved but they did not significantly spread to local authorities. On the other hand the majority of municipalities have built web sites that simply provide in-

formation. Normally it is possible to get information concerning the administrative and political structure, who covers specific roles, official documents, plans and proposals etc.

These are the characteristics of the second phase of e-government. Now pressure from civil society is not as important as in the first phase. What has emerged is what new institutionalism calls mimetic isomorphism (Powell, DiMaggio, 1983). That is, organizations start up imitative processes when they face difficulties coming from their environment, emulating solutions or interventions commonly applied in their own sectors. This caused a dramatic increase in the number of local authorities building their on web sites.

4.3 The Third Phase

Recently things have started changing again and we can see the beginning of a new phase. What is the reason for these changes? The purpose of these changes is to modify the level of interactions between citizens and the public administration through information technology. Lately web sites, for example, do not only permit access to information but also interaction with that information. For example, it is possible to download forms for executing administrative dossiers (one-way interaction), to complete directly a dossier as in the case of tax calculation (two-way interaction) and to effect money transfer (transaction) (RUR, 2002). However, data related to these more advanced ways of interacting show that the majority of local authorities are still stuck at the information level or the one-way interaction level. Nevertheless, this trend suggests that we are moving from the information effect to the service effect. That is, information technology does not only support the information background necessary to obtain a service but it also permits the complete execution of a service.

The '90s and the beginning of the new century represented a period of administrative reforms that deeply affected public administration functioning. Specifically, relationships between central government and local government were remodelled, shifting power from the central state to the regions and other local authorities. The inversion of competences (local authorities execute all administrative functions except ones explicitly given to the central state whereas before it was the contrary) and the establishment of the subsidiarity principle (administrative functions have to be assigned to the authority level closest to citizens as long as this is possible and effective) were among the most important reforms and have an important effect on cooperation between the central state, the regions and other local authorities. These reforms do not directly concern e-government but it is clear how they have facilitated its development.

4.4 E-government Policies

It was the 1st e-Government notice of the year 2002 that has given an important impulse to e-government projects at the national level because of its 120 million euros available as co-funding. These funds were awarded to support 98 projects for services

to citizens and companies, and 40 projects for realizing regional and territorial infrastructures.

In order to confront this scenario the Ministry for Innovation and Technology (MIT) actively participates in the regional programming stage and has established new agencies.

The Regional Competence Centres for eGovernment (RCCs) are probably among the most important ones. In fact, each region has its own centre, supported both by the MIT and the regional level, in order to increase cooperation among regional and local authorities, among regions, and between the central government and the regions.

Among the principles underlined by the 1st e-Government notice there is the “Aggregation of the proposing agencies, to maximize the number of administrations involved in funding”. This principle is important because it has given the chance for institutionalised spontaneous forms of programming among local authorities independent of their level, size and location.

The PEOPLE project and the POLIS–ComuneAmico.net project are just two examples. PEOPLE brings together, until now, 56 municipalities and 1 province representing a total of about 7.5 millions inhabitants spread in 13 regions whereas POLIS–ComuneAmico.net reunifies, until now, more than 200 municipalities and 5 provinces spread in 14 regions representing about 4 million people. These projects are similar, both awarded by the 1st e-Government notice funds, even though POLIS–ComuneAmico.net has been designed for supporting small and medium size organizations. Each of them has a leader that coordinates the different local authorities in charge of the developing a specific service that will permit the creation of a federation that can offer to citizens and companies more than 100 services online, at least in the PEOPLE case.

Therefore e-government policies tend, on one hand, to centralize or, better, to coordinate and bring order to the spontaneous surfacing of e-government applications typical both of the so-called first phase and second phase, pushing regions to introduce specific plans based on EU suggestions and establishing new control organisms and, on the other hand, continue to support what is emerging naturally from the territory as shown by the PEOPLE project and POLIS–ComuneAmico.net project.

5 Governance and the Italian E-government

Free nets or community networks can be seen as side-effects provoked by an innovative technology and its amateurs. They constituted a small system but, because of *diversity*, *dynamics* and *complexity*, using the terminology introduced before, things changed substantially and now we can talk about e-government. Why? Simply because of the problem solving question and the opportunity question that are the main points of the first-order governing. In other words, socio-political systems on one side have seen the opportunity to use information technology in order to offer new services and new modalities in order to intervene in the political arena, while on the other side, this technology has become an effective problem-solving instrument.

Passing to the second-order governing, we ask what was the institutional setting that characterized this first phase of e-government? Namely, how problem solving

and opportunity creation have been controlled and enabled. A cooperation between institutional actors (local authorities, EU, universities etc.) and social actors (civic networks) constituted this institutional setting. And were its governing *modes*? For sure we are not in a situation of hierarchical governing. At this stage any actor imposes goals, or whatever. Whereas what probably better represents this situation is the so-called mixed-mode between self-governing and co-governing. Self-governing because the institutional context that had characterized the first phase is based on actors' free choice to be involved. On the other hand we cannot exclude that, somehow, goals had been negotiated and that this is a typical co-governing mode.

Concerning the meta-governance or third-order governing we should inquire about the social acceptability of the governance condition and its level of legitimacy. The first phase of e-government was not problematic on these issues. It was mainly a spontaneous phenomenon that came from society and we have no data regarding particular lobbying activities by free nets that force us to think about a legitimacy issue (see table 2).

The second phase of e-government was characterized by the diffusion of the internet protocol and the world wide web standard that provoked the so-called information effect. This effect responds to the problem of ameliorating relationships between citizens and public administration and it concerns the first-order governing of this phase. Even in this case public administrations take advantage of information technology in order to face a sensitive issue like that which regards citizens' information.

In this phase the institutional setting varies in comparison to the first phase. The reduced involvement of civil society and the leading role played by local authorities delineate a significantly different second-order governance and, if we consider governing *modes*, the mixed-mode between self-governing and co-governing changes toward systems that are more self-governed because negotiations among actors had left space to local authorities' autonomous decision processes of.

Issues presented by meta-governance are more important at this level. First of all the so-called digital divide concerns the social acceptability of e-government since the entire population still doesn't have access to e-government. Of course, during the first phase, only a very small slice of the population could take advantage of the services offered by new technologies. This doesn't mean, however, that the issue was not relevant (see Table 2).

The analysis of the third phase is quite a bit more complicated compared to the previous ones. To pass from the information effect to the service effect means taking into consideration the so-called back office and the entire public administration structure. It is a completely different matter then considering only the front office.

Technological innovations, administrative reforms and pressures from civil society caused a stir of *diversity*, *dynamics* and *complexity* that resulted in on-line services as the public administration's new frontier. This is what has emerged, in few words, from the first-order governance of the third phase. That is, a scenario that places traditional modalities side by side with new ones supported by information technology in order to execute day to day activities.

Of course this has had tremendous effects on the institutional setting. At this point local authorities and, particularly municipalities, are no longer the protagonists of e-government development. A shift toward the central level and, mainly, the regional level is taking place. On the other side, the spontaneous aggregations of local authori-

ties are emerging that recall the dynamics that characterized the first steps of e-government development.

Table 2. Governing orders and Governing modes of the three phases of Italian E-government

	First-Order Governing	Second-Order Governing	Meta-Governance
First Phase	Information Technology offers new modalities of interactions	Institutional actors and civic networks cooperation (mixed mode between self-governing and co-governing)	Spontaneous and limited phenomenon
Second Phase	Internet protocol and www standard diffusion ameliorate citizens-public administration relationships	Leading role played by local governments (Self-governing mode)	Digital divide: only a small part of the population uses e-gov. services
Third Phase	e-gov .policies introduction and entire public administration back office involvement	Regional plans and central gov. agencies integrate municipalities action (mixed mode of hierarchical governing, co-governing and self-governing)	Digital divide: only a small part of the population uses e-gov. services

More in detail, through the analysis of governing *modes*, one realizes that for the first time hierarchical governing plays an important role. Regional plans, the constitution of Regional Competence Centres for e-Government and the Ministry of Innovation and Technology harmonization activity are all signals of hierarchical coordination. On the other hand, as shown by the PEOPLE project and by the POLIS-ComuneAmico.net project, co-governing is again becoming a relevant modality for the implementation of e-government and administrative reforms that tend toward greater autonomy for local authorities. This suggests that self-governing is still on op-

tion to pursue. This is a typical mixed-mode in which all the three governing modes live together.

Concerning meta-governance, even in this phase, the digital divide seems the main issue (see Table 2). From the technological point of view, and probably even from an administrative point of view, it seems that e-government can be effective in a reasonably short time. But what about the percentage of citizens and companies that take advantage of it?

6 Conclusions

This paper has tried to delineate the development of e-government in Italy from its first steps in the middle of '90s to the present, from a period in which only a few thousand people and very few municipalities were involved to a project of public administration renewal that regards millions people, all administrative levels, public investments, companies, the European Union etc.

For sure it too early to evaluate this process. Moreover, until a few years ago, it was substantially a spontaneous phenomenon and, only in the recent years, has it become the object of policies first at the regional level and then at the national level.

These policies, in part, try to regulate this spontaneity in order to avoid spoiling public resources in technological duplications and programming overlapping, and in part focus on an equilibrated diffusion of on-line services all over the country both through legislative instruments and coordination agencies.

Moreover these policies have been introduced contemporarily to important administrative reforms that have shifted power from the central government to local governments, allowing the latter greater autonomy. This autonomy, on the one hand, has permitted the streamlining of bureaucratic procedures and regulations, while on the other hand has become an obstacle to the whole public administration coordination.

Therefore it is difficult to say if the harmonization objective will be reached. It certainly will not be achieved in the short run, both because of the nature of e-government implementation, the characteristics of administrative levels and the diversity of socio-economic conditions of the country. On the other hand, a loose coordination could reveal itself not an insuperable barrier given past e-government development.

The range of policy instruments in recent years shows the nature of the issues at stake while trying to control, on the one hand, the excessive deregulation and, on the other hand, trying not to hamper the spontaneous growth of this form of government.

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Modeling the Penetration of the Information Society Paradigm

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Abstract. Recently it has become obvious that the creation of an information society in accordance with the eEurope objectives presumes governmental support. The programs and action plans, that are to support and accelerate the transition, have been developed in almost every country. However, at developing the strategy the policy-makers have to consider the complexity of the environment and the diverseness of potential effects. This complicates the forecast of the impact of the different measures. The scope of the research was to set up a model in order to support decision- and policy-makers. With the model the ones responsible will be able to estimate the impact of different measures, and the alternatives can be compared with each other.

1 Introduction

Since the possible advantages of the development of Information Society and the disadvantages of a delay have been understood the decision-makers have tried to support the development. In forming Hungary's desired strategy the e-Europe goals – laid down by the EU – were taken as a basis: [1]

“By 2005, Europe should have

- modern online services
 - ◆ e-government
 - ◆ e-learning
 - ◆ e-health services
- a dynamic e-business environment and, as an enabler for these
- widespread availability of broadband access at competitive prices
- a secure information infrastructure.”

The national strategy on Information Society (Hungarian Information Society Strategy – HISS) was accepted by the Hungarian government in November, 2003 [2]. The strategy relies on former strategies like the National Information Society Strategy – NISS, adopted in May 2001. The goals and the programs intending to achieve these goals of HISS are completely in line with EU strategies, strategic programs and the eEurope+ and eEurope 2005 action plans.

The action plans are made to help obtaining the main goals by creating actions to draw the real situation towards them. However, we have encountered a few difficulties already. During the creation of action plans we have to face some problems, as during the decomposition one has to pay attention not to lose the original focus. It can often be experienced that our action plans are defocused and they are not able to support us in answering the original question. Another problem factor is getting realistic feedback on the process to achieve our goals.

Naturally, the development of the actions must be continuously observed in order to bring in the necessary corrections. These results however, cannot be defined in all cases and the collection of data can cause difficulties. For this purpose we used the aspects of the eEurope Benchmark 2005.

The European Commission has drawn up a list of twenty basic public services to be benchmarked. These include twelve public services aimed at individual citizens and eight for businesses. By identifying the main factors of the Information Society, these benchmarks offer help in the structure for data collection and can be used as starting points for model creation. The benchmark indicators ensure the international comparison as well.

2 Difficulties in Strategy Creation

The decision-makers can use many tools to support the development of Information Society. Some of these have a straight effect on the economic processes. These are the direct economy stimulating steps, the effects of which are easily measurable and can be simply evaluated. Nowadays these direct influencing tools are being replaced with indirect solutions. Their effects usually last longer and affect every actor of the economy, but the evaluation of the results is highly complicated. Such indirect tools in building the information society are:

- Citizen friendly administration
- Improvement of education and health care
- Improvement of administration

The fact that the decision makers cannot foresee the necessary resources for the actions can raise difficulties when forming the specific plans. The complexity of the problem comes from the chain reaction possibility of the effects of our interventions. An accelerator effect is also present because of the connections of the economic participants. This acceleration drives the effect of our action even further and causes further changes. This way of acting has an impact on every actor but the results can only be observed later.

This accelerator effect and its impacts on the economy must be estimated and it must be built into the model in order to achieve a more effective decision-making. Nevertheless the governmental actions bring results that can hardly be measured. Such result is for example the higher sufficiency of the customers caused by a possible improvement of public services. Despite the difficulties in their evaluation the impacts of these actions cannot be disregarded.

Another important problem is the estimation of the time factor during the development of the action plans and measurements. After some time supplementary sup-

port could be necessary in order to achieve our original goal. However, the final goal is to establish a self-sustaining system by making self-financing possible. An indispensable condition for this is the creation of an economical balance where the supply and demand of the services are more or less equal. As long as the society cannot achieve this aim, supplementary actions are necessary. We can see that forecasting whether the necessary balance can be achieved with the current preconditions and predicting the time when information society will reach the state of sustainability have a high importance.

On basis of the problems mentioned above, the need for a method to determine the effectiveness of governmental actions in different areas is apparent. Neither the EU strategies nor the national initiatives provide a measurable technique to define the desirable points of intervention and to evaluate the effectiveness of the actions, although they do contain indicators for estimations.

2.1 International Comparison

Former and ongoing research projects have been funded by the European Union in similar topics. The most relevant ones under the Fifth Framework Programme are as follows. ISCOM [3] (The Information Society as a Complex System) is mainly concentrated on the innovation aspects and trying to initiate an agenda for social science use.

SEAMATE [4] (Socio-Economic Analysis and Macro-modeling of Adapting to Information Technologies in Europe) is a research on the economic and social impact of information society technology on the Member States and also Norway and Switzerland. It also includes an E3ME (Energy-Environment-Economy Model Europe) for macro economy.

E-LIVING [5]: Life in a Digital Europe is based on longitudinal household panel studies to collect data to explain and model the effects of information society technologies on the everyday life of EU citizens. The main focus is on the social and cultural factors.

These research projects are aiming at predicting the effects of the newly discovered technologies on society and economy and also helping policy-makers in applying the right measures regarding information society. These projects are focusing on the EU-15, and thus they do not deal with the problems of the newly joining countries. Applying system dynamics in the modeling of information society is also quite unique in our research. With this methodology it is possible to give advice for the decision-makers about the most effective ways and the most effective points where spending can have the most beneficial effect on creating the information society.

With Hungary's accession to the EU a proper method to measure the effectiveness of spending is even more substantial. To be able to use the EU funds in an efficient way a weighting system for the different areas is essential. To solve these difficult issues a modeling approach is very suitable. Our research has been aiming at these questions.

3 The Model of Information Society

3.1 Methodology

To minimize the foreseeable difficulties we decided to use System Dynamics (SD) tools for modeling, research and interpretation of the results. Developing a useful model is difficult enough; using modeling to help implement new policies is even harder. As in our case the basic data were incomplete and the actions of the sub-systems were hardly predictable the deployment of a well-formed framework was a must. Since effective modeling rests on a strong base of data and understanding of the issues, the rules and instructions of framework inspired us to disclose the problems thoroughly.

System Dynamics – a technique created almost half a century ago [6]– made it possible to represent the factors of Information Society in all their detailed complexity. SD also helped to form the model in a way that it helps in creating deductions regarding the operation of real-life processes. The model itself was created with the help of the SD modeling software VenSim.

3.2 Model Description

In a recent nationwide research the relevant influencing factors of the penetration of the information society paradigm were thoroughly investigated. The sub-models are based on statistical variables, mainly defined by the EU Benchmark 2005. The logic of the model can be demonstrated with the following figure.

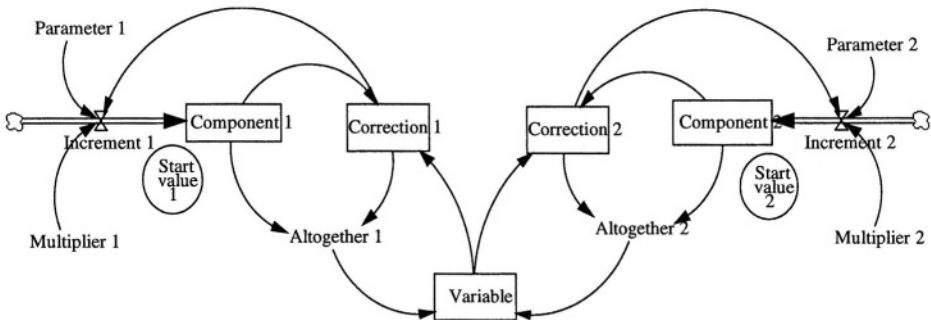


Fig. 1. The Logic of the Model

In the model each variable is made up of some components. During the examination of the simpler parts we only have to consider the effects of two components at the same time, but in the more complicated parts of the model the development of the variable is influenced by more than ten components. We have statistical data for the value of the variables to start with that later can be regarded as given values. During the simulation, these start values are increased by the multiplier that can be established with statistical data series or with professional estimate. The development of

the components can be influenced by the acceleration rate through the alteration of other variables.

By taking these factors into consideration the values of the components valid for the given period and determine the value of the desired variable. The appropriate weights of components permit the differentiated consideration of the effects. The components have to match the value of the developed variables. The corrections reduce the potential failure of the model, as without correction the value of the components can secede from the weight of the variable. With the correction we can ensure the consistence of the simulation model.

The complex model is built up of seven sub-models:

- E-economy
 - ◆ B2B
 - ◆ B2C
- Quality of Access (Expenditures on Security)
- Infrastructure Development
- Public Service / Administration
 - ◆ Services for Individuals
 - ◆ Services for Enterprises
- Corporate Access and Use
- Individual Access and Use
- Tariff, which are connected to each other.

The scheme of the model can be seen on the following figure.

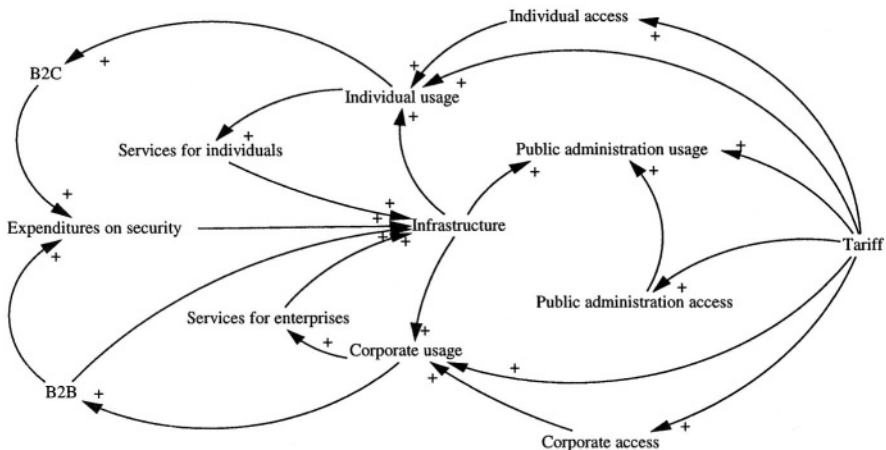


Fig. 2. Overview of the Information Society Penetration Model

Each sub-model contains 2 to 12 components, connected through the growth ratio. The connections between the sub-models are inserted with specifiable parameters,

therewith assuring that the strength of cross-effects can be regulated. The accelerator effect influences the growth of the individual areas in a direct or indirect way. As the growths of the different partitions are not the same, the indicators' value will lead to several combinations. The model starts with realistic statistical values and the different strategies and policies are translated into the concrete values of the growth parameters.

The model can be used to conduct several simulations depending on the scenarios and partly on the decision makers' attitude (more market-oriented or committed to the public expenditure). These scenarios are constructed on the basis of different preconditions – supplemented with the examination of sensitivity – and they are giving the most important results of the modeling. The results of the model were examined in three scenarios: (1) a basic situation, (2) entrepreneur-friendly policy (3) service-state oriented policy – supply stimulation and supplier state – and demand stimulation.

Based on the simulation and the sensitivity analysis, one of the most important conclusions of our research was, that on midterm horizon the increase of the state investments and expenditure (supply) and the intensive demand oriented strategy have approximately the same effect.

4 Knowledge Management Aspects

It must be clear that a model can be of use for policy making and decision support only if the right data is used as input. Right means that all the necessary information about the subject is collected and the quality of the data is good enough. The problem is that collected data usually do not match with each other and the expectations from the model side, thus threatening the usability of the model. To achieve their goal researchers must define the entities and relations of the factors involved in model making. EU benchmarks can be used, but further processing is needed. Another aspect is to create the conceptual framework of the model and to create the categories and factors that can be used in the model.

For these purposes Knowledge Management methods can be used very efficiently. The ultimate tool to map entities and relations is ontology building [7]. Ontologies can be used to represent the structure and conceptual framework of the model, and it can be a reliable background for further research. Our current model is planned to contain an ontology, although at the present time the completion of the specific part is still to be made and needs further efforts.

Another point where connections to Knowledge Management are of great significance is strategy creation. The process of creating the deployable Information Society strategy can be made using our model, but different approaches still might be taken into account. Collecting and uniting the already existing knowledge – concerning different areas of Information Society – is a classical example of Knowledge Management cases, and for that reason already existing KM tools can be used.

5 Results of Modeling

Applying the methods detailed above a multitude of simulations can be made and various conclusions can be drawn. In this paper we can only illustrate the most im-

portant implications regarding the two basic concepts: entrepreneur-friendly and service-state oriented policies. Further analysis still can be made. The interpretation of data is always partly affected by convictions; however in this case the results of simulations create a well-defined and determinate basis.

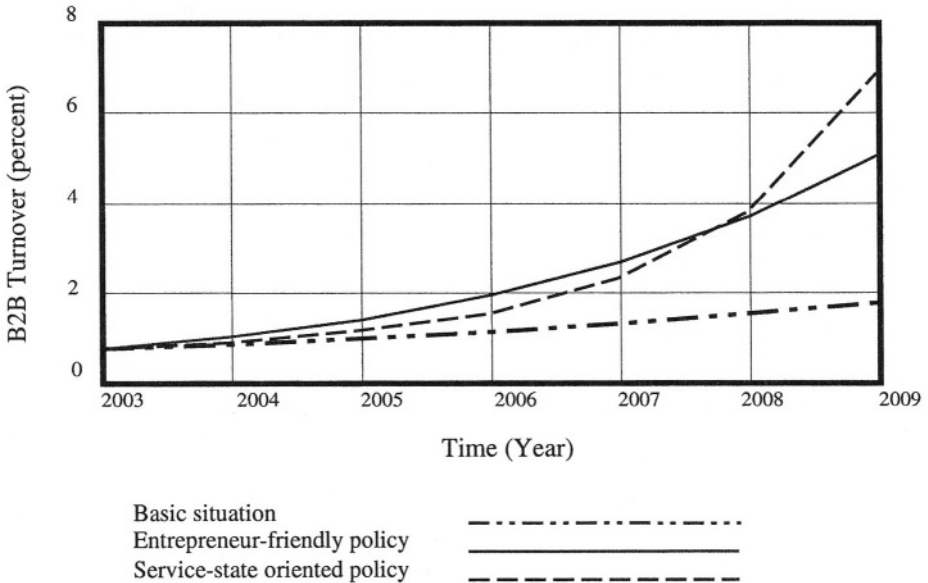


Fig. 3. Effects of different strategies on B2B turnover

The main conclusions of our research up to the present are the following. As it is visible on Figure 3 the B2B electronic commerce penetration shows only very modest growth throughout the examined period of time, if no governmental intervention is involved. The participation of the government by creating a catalyzing effect seems to be necessary. Supporting the enterprises ensures faster growth in the short terms; in longer terms the “service-state” oriented policy is more effective, though.

If the government would like to witness a quick growth in information society penetration, the most advisable thing is to create a package of subsidies for enterprises, to help them create online content, offer valuable services and boost electronic commerce investments. On the other hand it must be considered that service-state oriented policy seems to be more valuable on a longer timescale, thus creating online content, and offering public services has a greater effect on IS penetration. Both of these scenarios could be realized, but it is obvious that a mixture of these policies would have the best possible results. To give financial support to enterprises in the short term creates the necessary content and penetration, on which further spending – now focusing on public services can have an even more favorable outcome. By creating the critical mass of usage in the first place additional growth can be expected helped by the wider possibilities.

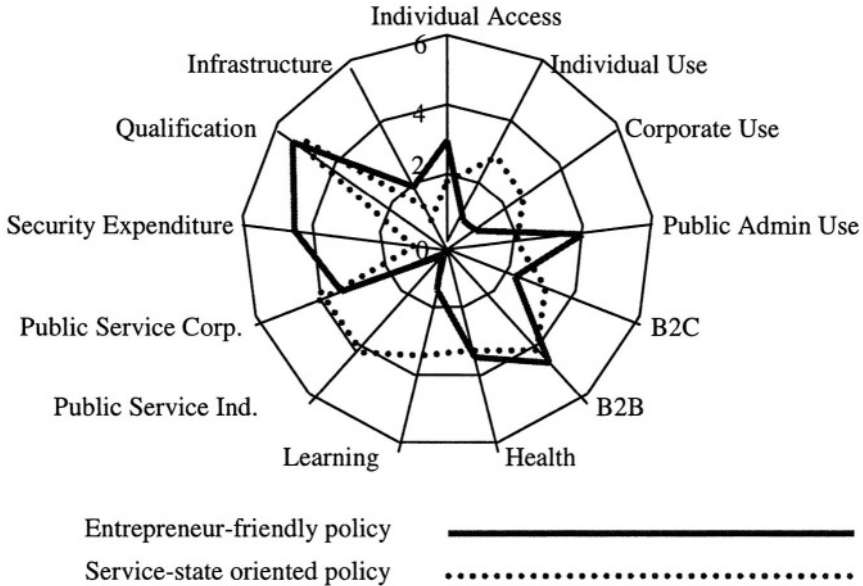


Fig. 4. Comparison of scenarios

On the other hand it must be seen, and Figure 4 gives a clear view, that both scenarios thus both types of policies have a strong positive effect on the overall penetration, although the accents are shifted in some places. The most considered factor – business-to-business commerce – seems to be similarly enhanced by both policies, at least on the middle terms. Based on the graph that shows the growth ratios of the separate indices until 2007, the deduction can be made that the payments made in different sectors have different effects on the parts, but the whole picture is brightened up by both.

All this concludes to the implication that Information Society building requires the intervention of the government in the short terms, however the penetration is expected to grow by itself – or rather by the actions of the participants – from a point onwards. The Information Society can become a self-sustaining system.

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Formal Models for a Legislative Grammar – Explicit Text Amendment

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Abstract. In this paper we will present a method for mining information within legal texts, in particular in regards to corpora of statutes. Text mining, or more in general Information Extraction, can provide a valuable help to people involved in research about the linguistic structure of statutes, and, as a side effect can be the seed for a new generation of applications for the validation and conversion in the legislative domain.

1 Scope and Assumptions

For the communication of legislative sources through the Internet, the parliamentary and governmental institutions of many countries¹ have begun a process of converting their “deposits” of these into a standard format for facilitating the retrieval and display of texts.

The XML mark-up language seems to be the tool deputised for reaching this scope². In fact, this language combining its dual nature as a mark-up language and a Web standard, is able to form the common ground for action both “at the source”, namely, legislative drafting, and action “downstream” relating to the publication of the texts and the identification of tools for accessing legislative information [2] [10].

In Italy, the introduction of the XLM language for processing legislative instruments was proposed and experimented in the “Norme in rete” [Law on the Net] Pro-

¹ See, for example: the data bank of legislative instruments of the Australian State of Tasmania at <http://www.thelaw.tas.gov.au> and the DTD relating to the parliamentary acts in the United States on the site <http://xml.house.gov>.

² Although standard languages are available, it is nevertheless necessary to reconcile the use of these languages for the man-machine dialogue with the citizen’s access to and fruition of information. Access to and fruition of the mass of public data, although transmitted by machines, cannot be achieved with artificial languages, but only with non specialised communicative formats like natural language.

Therefore, it appears that the automated processing and recognition of natural language, has a fundamental role to play in this man-machine interaction.

ject, solicited by the Ministry of Justice, financed by AIPA (Agenzia per l'Informatica nella Pubblica Amministrazione) [Agency for Informatics in the Public Administration] and developed under the guidance of the Istituto di Teoria e Tecniche dell'Informazione Giuridica (ITTIG) of the Italian National Research Council. The project has produced, amongst other things, the DTD rules adopted as a standard by AIPA3 for the on-line publication of Italian legislative instruments.

In order to adopt this language as a standard and, above all, for the conversion of the legislative instruments in force into the format provided for by the DTD rules, two factors, in our opinion, must interact.

Definition and promotion of a “controlled” legislative language

Rules for law-making or techniques for legislative drafting have introduced unambiguous and recurrent elements into legislative instruments, whereby it is possible to identify a more controlled language in legislative language compared to natural language. In fact, specific rules of orthography, lexicon, syntax, style and structure for the drafting of legislative instruments have been adopted. A collection of these rules is to be found in a Circular⁴ issued, in 2001, by the President of the Council of Ministers, and the Speakers of the Chamber of Deputies and the Senate and adopted by the Government and Parliament. The Circular updates an earlier one of 1986⁵. For drafting their legislative measures, almost all the Regions in Italy have adopted the “Rules and Suggestions for Drafting Legislative Texts” Manual, a set of rules that are almost the same as the state rules, compiled in 1991 and updated in 2002.

These rules have been applied and complied with in the drafting of legislative instruments enacted by the State and Regions since the end of the 1980's⁶. Leafing through the legislative documents, it cannot be said that these rules have, up until now, been strictly and uniformly applied by all law-makers. However, some analyses of sample texts have shown that the use of the legislative drafting rules is spreading.

The drafting of other legislative documents (such as the regulations of local authorities, collective contracts, etc.) is not bound by these rules. It can, however, be said that it is widespread, in practice, to make reference to these drafting rules, even if their application depends on the sensitivity and knowledge of the draftsman. On the other hand, many initiatives are underway for the formal and binding adoption of the State/Regional drafting rules by all those persons who produce legislative documents. The “Norme in rete” [Law on the Net] Project has contributed to accelerating the process for spreading and receiving the legislative drafting standards, drawing attention to their utility for electronic processing, whilst still maintaining that the main

³ AIPA Circular, 22 April 2002, “Formato per la rappresentazione elettronica dei provvedimenti normativi tramite il linguaggio di marcatura XML” [Format for the Electronic Representation of Legislative Provisions by Means of the XML Mark-up Language]. The text can be consulted at: <http://www.normeinrete.it/standard/Circular-xml.htm>.

⁴ Circular 20 April 2001, no. 10888 of the Presidency of the Council of Ministers, “Regole e raccomandazioni per la formulazione tecnica dei testi legislativi” [Rules and Recommendations the Technical Formulation of Legislative instruments], published in the Gazette Ufficiale No. 97 of 27 April 2001. The same rules have also been adopted by the Chamber of Deputies and the Senate with identical circulars by their relative Speakers.

⁵ Circulars of the Speaker of the Senate, the Speaker of the Chamber of Deputies and the Presidency of the Council of Ministers of 24 February 1986 (G.U. No. 123 of 29 May 1986, Supplemento ordinario No. 40). For an in-depth illustration of the rules for legislative drafting in Italy and in Europe see: [16] [17].

⁶ For the historical framework of Italian legislative drafting, see [25].

purpose of these rules is to guarantee greater clarity in and ability to understand legislative instruments.

At the same time, research into legal theory, legal language, and legal artificial intelligence have contributed to the definition of the syntactical and semantic structures and to morphological and lexical behaviour peculiar to the legal discourse.

Use of tools for natural language recognition

It is evident that the presence of common rules consolidate the definition of text models, which the interdisciplinary studies we have just mentioned describe with ever increasing exactitude. It is also evident that this modelling assists in the automated recognition of the structures of legislative instruments and their tagging according to the XLM standard. In fact, this tagging will be difficult to obtain from the law-maker as it is extraneous to the tasks and objectives involved in his/her normal activities. If other professionals do it later, it may provoke an often unsustainable increase in the time needed and the costs involved in building and managing the legislative knowledge base, structured according to XLM standards.

It is within the perspective of the implementation of a parsing system efficient for the automated recognition of the structures of legislative instruments and the subsequent tagging and conversion of these texts in XML format that we shall now begin the description of the research presented here.

2 The Method

For this research, the methodological approach can be subdivided into the following phases:

1. identification of the technical tool for the implementation of the parser and the extraction of the information;
2. identification and description of the models, on the basis of legal rules;
3. identification and description of the textual structures expressing the defined legal models;
4. choice of the sample of legislative instruments to be analysed, compilation of the grammar according to the syntax of the pre-selected parser and the automated analysis of the sample.

In the following paragraphs, we shall attempt to define and describe these phases.

2.1 Identification of the Technical Tool for the Implementation of the Parser and for Information Extraction

The suitable tool for the recognition and tagging of a legislative instrument has been identified in the Sophia 2.1 system of parsing which uses the methodology applied to finite state automata and the finite state transducer: this is software which is flexible and configurable and which enables rules and specific models (already defined or in the course of definition) to be formalised.

In particular, we are working with this software on analysing and tagging the first sample of legislative instruments in the following phases:

- normalisation of the entry text, properly tagging all those structures and textual segments that can be recognised on the basis of characters or, in other words, without resort to or consultation of the lexicon-dictionary;
- lexical (syntactical category) and morphological (flexion passages) analysis of the text in input;
- disambiguation of the syntactical category of the words (*Part of Speech Tagging*);
- partial syntactical analysis (called *chunking*), aimed at identifying the minimum syntactical groups present in the text in input and at grouping them in constituents;
- semantic analysis and identification of the relevant conceptual structures in the text in input;
- conversion of the analysed document from the original format (Microsoft® Word, HTML, RTF, txt, etc.) into the XML format, according to the established DTD.

2.2 Identification and Description of the Models on the Basis of Legal Rules

The application of a device for parsing, like the one described here, requires a set of rules to be written for the identification, in the texts, of linguistic structures which are bearers of the information we wish to extract. We can call this the compilation of a specific grammar of the domain or of the corpus of the texts to be analysed.

The grammar is made up of a set of models defining the linguistic structures; in turn, the models include one or more rules representing a linguistic structure which are subsequently compiled according to the syntax of the parser for the text analysis and the information extraction.

Computational linguistics indicates the extraction of the set of rules and models from the corpus of the texts directly linked to the domain to be dealt with as the most efficient method for constructing the grammar [9]. In other words, we are trying to reconstruct rules and models *a posteriori*, extracting examples of linguistic structures.

The application of this methodology to legislative instruments, however, overlooks the specificity of the nature and function of these texts.

The legislative instrument has, by definition, a prescriptive function, or in other words, it influences the behaviour and status of the addressee, who cannot escape from this function.

In virtue of this, the request (it is based on the same principle of representative democracy which legitimates and, at the same time, binds those who draft legislative acts, namely, the legislator) is that the legislative instrument responds to a set of rules that dominate and, at the same time, stand beside, integrate, and sometimes modify the rules that make up natural language (in our case Italian).

These rules can be defined as legal rules. The category is broad and varied; it includes within it rules with prescriptive force, that vary strongly based on the source from which they come, to whom they are the addressees, the sanctions they bring with them, etc.. For example, as we shall see, it is the Constitution (that has the highest rank among the legislative rules) which determines that the legislative delegation

must contain a period of time⁷ within which the Government must enact the legislation which is the object of the delegation.

A “list” of the prescriptive nature of these rules can be drawn up, starting from the legislative sources which, in turn, have different degrees of binding power in accordance with that which is defined, more precisely, as the hierarchy of sources⁸.

With regard to other rules, the discussion is whether they have or do not have general legislative value. Amongst these, there are Ministerial Circulars and Circulars of other public authorities (for example, the Speakers of the Houses of Parliament). They are, nevertheless, without doubt, legal rules and have prescriptive force with regard to the employees of that Ministry or public body, as they are, in any case, administrative acts. The rules for drafting legislative instruments, which are very important here due to the fact that they have the specific role of regulating the structure of the legislative instrument, are usually enacted with this type of act.

Concerning the validity and effectiveness of the models constructed on the basis of these rules, we would like to add several considerations. We are able to list three characteristics on which their efficiency largely depends:

- ❖ *Flexibility* of the model, which must adapt to the many structural, functional and thematic characteristics of legislative instruments, which use that extremely changeable and unpredictable vehicle known as language.
- ❖ *Precision* in the definition of the model itself, thanks to the presence of the legal rules which are in many cases detailed and precise and for the prescriptive nature of the legislative instrument, it goes without saying that reconciling flexibility and precision constitutes a crucial point in the construction of the models.
- ❖ *Authoritativeness* with which the model must be endowed, in order to be shared by and held to be valid by all the users of the system. It is clear that this authoritativeness is more guaranteed if the model is derived from the legislative rules, in the strict sense, according to their hierarchy whilst it will be less guaranteed by those rules which only the drafter must follow. It could be more or less guaranteed, to a different extent, by models based on consolidated practices, legislative theories shared by the major part of legal authority, and so on. We can, nevertheless, say that greater precision could correspond to “more authoritative” models, greater flexibility should correspond to “less authoritative” models.

⁷ Article 76 of the Constitution states: “The exercise of the legislative function may not be delegated to the Government unless principles and guiding criteria have been determined and solely for a limited period of time and for defined objects.”

⁸ Traditional legal authority classifies legislative sources into primary, sub-primary and secondary sources. This distinction then opens the way to further specifications, still the reason for discussion today among jurists who present exceptions and specific cases, making the hierarchy complex and articulated and not always very clear. Without taking into account that this scheme is then subject, over time, to changes in relation to modifications in the powers of the law-makers and to the creation of new law-makers or the abolition of existing ones (in fact, the rarest case). Primary sources include, in order: the Constitution, constitutional laws and regional statutes, ordinary laws and *decree-laws*; regional laws are considered sub-primary sources; within secondary sources, there are government regulations, decrees of the President of the Republic and of the Government (President of the Council of Ministers and Ministers), whenever they have legislative value. For an in-depth and better description of the scheme we have explained briefly here, see: [18] [11].

It should further be noted that very authoritative models have greater communicative value (they are directed at and basically are accepted by everyone), whilst as authoritativeness gradually diminishes, the models assume an always increasingly interpretative value, that is, they are a “subjective” definition of the function of the single textual structures or of the entire legislative instrument.

If we can, therefore, talk about “Communicative Models” and “Interpretative Models”, it becomes fundamental to evaluate the how they are used to chose whether to refer to the former or the latter.

For example, for the description of a legislative instrument, for the purpose of communication *erga omnes*, we cannot fail to refer to a “communicative model” and the use of an “interpretative model” could be dangerous and misleading.

2.3 Identification and Description of the Textual Structures Corresponding to the Defined Legal Models

For the implementation of the grammar that will then be utilised by the parser, it is necessary to integrate the models extracted from the legal rules with the linguistic rules. It must, however, be clarified that some linguistic rules, in as far as they regulate the drafting of a legislative instrument, are already received as legal rules, in particular, as law-making rules and, therefore, their binding power is reinforced.

We can say, for example, that the legal rules prescribe that a type of amending provision, is manifested through the action of substituting parts of the text; the linguistic rule of synonymy enables us to say that the action of substitution is expressed through verbs: to substitute, to change, to alter, etc... In this case, the linguistic rule goes to integrate itself with the legal rules, in the construction of an efficient model for the purpose of the function of parsing the text. The integration may, however, also concern cases in which the legal rule is not so much integrated but the grammar of the legislative instrument is completed, going to describe the linguistic structures, to which the legal rules do not correspond⁹.

From textual practices¹⁰, we can extract rules that go to form other models of linguistic structures found in legislative instruments (or to integrate those models obtained with the legal rules). These are models extracted on exemplifying bases, resorting to the analysis of texts according to the methodology practised by computational linguistics.

Clearly, these models do not have the same precision and, above all, the same prescriptive force of those constructed on the basis of legal rules. We have, therefore, only used and implemented them in the parser as a residual category.

⁹ For example, for the *novella*, the legislative drafting rules provide for well identified functions (integration, repeal, substitution) to each of which one or more linguistic structures correspond which are also carefully described in the law-making rules. We can also find *novelle* with a replacing function in legislative instruments: they arrange the repositioning of a part of the text from one point to another of the article. The replacing *novella* is not, however provided for or regulated by the rules on law-making.

¹⁰ The term *practices* is used here in accordance with its common meaning of recurrent behaviour (in our case, the behaviour of recurrent drafting) and not in the technical legal sense that classifies them among the sources of the law.

We call these last models “malformed” models. This is not so much because they are not correct from the linguistic point of view, but to contrast them with those corresponding to the legal rules, indicated in the previous paragraph, which we define as “well-formed”.

Nevertheless, legislative instruments contain linguistic structures that do not correspond to the models described, because the texts may contain actual legal and linguistic errors.

In these cases, we complete the grammar to be implemented in the parser, with rules (we define them as “case-based” rules) which represent exceptions to the models: they are actual errors or exceptions to the rule, just like exceptions in linguistic grammars.

2.4 Compilation of the Grammar and the Automated Analyses of the Sample

The compilation of the grammar in the syntax of the chosen parser takes place by using the Workbench of the system described in paragraph 2.1., through drafting legislative rules, that formalise the defined models and permit the automated identification of the described linguistic structures and the information extraction.

The choice of the sample of legislative instruments to be analysed must obviously respond to the representative criteria of the legislative linguistic domain, from which we intend to extract the information. In describing our research, we indicate the following criteria for identifying the sample which is the object of this initial analysis.

The analysis of the sample can then be carried out in subsequent phases in order to:

- evaluate the results obtained;
- integrate and modify the well-formed models defined *a priori*;
- identify and formalise case-based malformed models and rules;
- extend the analysis to a gradually widening *corpus* to verify the efficiency of the parsing system.

3 Initial Analysis and Applications

We have decided to experiment the method described for the automated recognition and extraction of three typical structures of legislative instruments, structures representing:

- legislative delegation;
- express textual amendment or *novella*;
- express external textual reference.

Among the many structures making up a legislative instrument that are defined by other legal rules¹¹, the choice fell on the structures listed above, mainly for two reasons:

¹¹ We have in mind, for example, penalties, financial provisions, and provisions regulating the entry into force and the being in force of legislative acts, etc.

1. They are precisely defined structures, both legally and linguistically, by the law-making and other very binding legislative rules.
2. They perform the principal function¹² of legislative links, that is, links between different legislative instruments, a very important function for both the purpose of any action or use of the texts (we are thinking about the compilation of the coordinated text here), and for the purpose of the reconstruction of the inter-textual dimension, which, together with the contextual dimension is fundamental in a linguistic textual analysis. It is our intention, in fact, to continue our research, attempting to analyse and formalise the other legislative structures that express links, such as prorogation or suspension.

In the following sections, we shall, therefore, present:

- for legislative delegation, the legal analysis for constructing the model;
- for the “*novella*”, the modelling of the text structure on the basis of legislative and linguistic rules and an initial formalisation of these rules in the parser’s syntax.

4 Legislative Delegation

Legislative delegation from Parliament to the Government is provided for in the Constitution (article 76), which lays down the rules, to which the delegation provision must comply:

- it must be conferred on the Government;
- it must contain a term within which the Government has to enact the delegated act;
- it must specify the object of the delegation;
- it must contain the guiding principles and criteria to which the Government has to adhere in the exercise of that delegation.

Parliament can lay down conditions that the Government must comply with (request for opinions, hearings, enactment of other acts, etc.). These conditions are not set out expressly in the Constitution, but legal authority and case law hold that Parliament is free to insert them in the delegation.

It is clear that these rules, having been dictated by the Constitution, have the greatest binding force. A legislative instrument that fails to comply with them could be challenged before the Constitutional Court and could be changed only with an amendment of the Constitution and not of an ordinary law or other legislative acts.

An ordinary law (Law of 23 August 1988, No. 400) then specifies the constitutional rules and adds the ways in which some special types of delegations must be complied with. In particular, Article 14 (3) and (4) state:

3. Whenever the legislative delegation refers to many objects open to being regulated separately, the Government may exercise it through more than one subsequent act on

¹² It cannot be said that this function is unique, but it is certainly the most important, apart from being easily identifiable and formalised. For example, legislative delegation has the role of transferring powers from a party to another and also carries out, in support of the former, the connecting role between the delegant act and the delegated act.

the aforesaid objects. In relation to the final term laid down by the delegation law, the Government shall periodically inform Parliament on the criteria it is following in organizing the exercise of the delegation.

4. In any event, whenever the term provided for the exercise of the delegation is more than two years, the Government shall ask the opinion of Parliament on the schemata of the delegated decrees. The opinion shall be expressed, within sixty days, by the Permanent Commissions of the two Houses of Parliament which is competent in the matter, specifically stating any provisions held not to correspond to the guidelines of the delegation law. The Government, within the following thirty days, having examined the opinion, shall re-transmit the texts, with its comments and with any amendments, to the Commissions for a final opinion that shall be given within thirty days.

These provisions add at least three rules to the regulation of the structure of the delegation provisions:

- the delegation may contain more than one separate object;
- the Government may enact more than one delegated act when there is more than one object;
- whenever the term provided for the exercise of the delegation is more than two years, the Government must seek the opinion of the two Houses of Parliament according to a defined procedure.

Furthermore Article, 14 (1) of the same Act lays down that the act (or acts) with which the Government exercises the delegation shall be called a “legislative decree”.

The binding force of these rules is no longer that of the Constitution, but of an ordinary law. Therefore, it can be amended by another ordinary law. A court may decide not to apply, for the case it is called upon to decide, a delegation provision finding it to be in conflict with what has been established by Law 400/1988, but the Constitutional Court could not find a provision of delegation not complying with the provisions of Law 400/1988 unconstitutional (and therefore completely void).

It should be remembered that the rule used is a rule of 1988: it does not, therefore, count for prior delegation provisions, just as the constitutional rules for delegations prior to 1948 do not count. The definition of delegation structures before these dates will, therefore, be less binding or they will have to draw on other rules¹³.

As we have already mentioned, the rules for drafting legislative instruments for Parliament and the Government are to be found in Circular of 20 April 2001, No. 10888. In particular, Article 2 also deals with legislative delegation and regulates, in detail, the structure of this provision:

“Provisions containing legislative delegations, pursuant to Article 76 of the Constitution shall list the following elements: 1) the addressee of the delegation (the Government); 2) the term for the exercise of the delegation and any term for the enactment of additional or corrective provisions; 3) the object of the delegation; 4) the principles and guiding criteria (that must be separate from the object of the delegation). The term “delegation” shall only be used when there is a legislative delegation with the formula: “The Government is delegated to adopt...”. Furthermore, the

¹³ In the pre-Republic legal order in Italy, the exercise of delegation and the relative delegated acts were regulated by Law 100/1926, even though the institute of legislative delegation was pre-existing and, in general, exists in all legal orders that provide for the separation of legislative and executive powers.

proper name of the act (legislative decree) to be enacted shall always be given and it shall be specified whether the delegation can be exercised with one or more acts. The delegation provisions shall be found in a special article. An article shall not contain more than one delegation provision”.

We have already mentioned the legislative value and prescriptive force of a Circular is, without doubt, of a lesser degree than those of the Constitution or of an ordinary law.

It is, nevertheless, equally as evident that the laws are drafted (or corrected) by the drafter, who, based on the responsibility of his/her job, knows and complies with legislative drafting rules.

It is worth making the observation once again, relating to time, which we already made in relation to the Constitution and Law 400/1988; the Circular is actually of 2001 and, therefore, the legal and linguistic constraints imposed by it on the structure of the delegation can only be found in the most recent legislative instruments and, gradually, as we go back in time, we may come across variable structures.

Keeping in mind the prescriptive and temporal restrictions, to which the set of rules we have attempted to identify and describe are subject, we can argue that they form a well-formed model, from the legal point of view, of the structure of the legislative delegation.

On the basis of this model, we can try to describe the text by inserting the tags or qualifiers of the elements making up the structure, as in the following example:

<ADDRESSEE> The Government of the Republic <ADDRESSEE> <ACTION OF DELEGATION> is delegated to enact, <ACTION OF DELEGATION > <TERM> within eighteen months from the date on which this Law comes into force <TERM>, <DELEGATED/ ACT/S> one or more legislative decrees <DELEGATED/ ACT/S > <OBJECT DELEGATION> laying down additional provisions of the legislation on privacy and personal data protection, <OBJECT DELEGATION> <GUIDING CRITERIA> complying with the following principles and guiding criteria: a) to specify the way in which personal data used for historical, research and statistical purposes shall be processed, taking into account the principles found in ... <GUIDING CRITERIA> (Law 31 December 1996, No. 676).

Such a description should subsequently enable the structures to be identified on the basis of the legal rules to be specified and set out in detail, also from the linguistic ¹⁴ viewpoint, and then to move on to the compilation of the rules for the implementation of the parser and the analysis of the corpus, as we shall see in the following paragraphs, for the other structures which are the object of our research.

¹⁴ For example, we shall determine and describe the linguistic expressions through which the term is expressed, which may vary within the flexibility permitted by the legal rule. Therefore, we may have expressions of the kind: “within 6 months of the entry into force of the law”; “within 3 months of the end of the first biennial from when the new law comes into effect” and many others. Nevertheless, we may have other legal rules that help in defining these expressions. For example, it is once again a rule of law-making that requires that the period of time is expressed in months when fixing a term (another structure whose formalisation will also serve in this case).

5 Express Text Amendment or Novella

5.1 Definition of the Structure and the Constituent Elements

Amendment provisions, according to Sartor, fall within the main types of legislative links, classified on the basis of their impact on the legal provision involved. Amendments distinguished from the other large branch of referrals or references, are legislative links characterised by the fact that the active provision affects the passive provision, eliminating it, changing the text or changing the legal significance (whilst leaving the text unchanged). This effect is, instead, lacking in the referral, where the active provision avails itself of the passive provision to complete its meaning, without influencing the latter [23].

In relation to the nature of the impact of the amendment of the provision on the passive provision, we distinguish between textual amendments, time-based amendments (that influence the period of time of the applicability of the passive provision), material amendments, (that amend the legislative content of the passive provision without affecting the text). We shall only look at the first type, the express amendments of the text which, traditionally, lawyers in Italy call the *novelle*.

Indeed, it is perhaps more correct to say that the function of express legislative amendment is expressed through the following three aspects:

- *the structure of the novella, made up of an introductory part, called sub-paragraph¹⁵ and a part that contains the express textual amendment;*
- *the characteristics of the amending legislative act and the amended act: indispensable for subsequently being able to reconstruct the amending links between the different legislative sources;*
- *the citation with which the document to be modified is cited, that expresses the legislative reference (also a textual reference), a fundamental element of the amending provisions.*

On the basis of the three aspects mentioned here, we have endeavoured to define and describe the qualifying elements of the amendment provision. The description, which is set out here, is derived from the rules for legislative drafting and from the analysis of a sample of approximately 100 amending provisions found in 8 State legislative instruments (the four so-called Bassanini Laws and other legislative instruments related to them), enacted between 1968 and 1999.

Type of amending act: indicates the type (Law, Decree-law, Decree of the President of the Republic, Legislative Decree, etc.) of the legislative act in which the amendment is found. It serves to quickly reconstruct the links between the provisions when there are amendments and it is composed of:

- *Name of the act, Date, Number:* these indicate the essential elements of the amending legislative act, both in the full citation and in its simplified form;

¹⁵ Understood as the ‘part of the provision that introduces the amendment’: it contains the purview aimed at specifying the relationship (substitution or integration or abrogation) between the provision in force previously and that provided by the textual amendment. The new sub-section generally ends with a colon, followed by the textual amendment placed between inverted commas.

- *Position of the novella*: this is the position, within the amending text, where the amendment provision is found, in order to identify the amendment formula with precision, and also to immediately highlight at what level of the structure it is present.
- *Object of the amendment*: this indicates the object of the amendment in the strict sense (or, in other words, whether the amendment affects the entire act, or a part of it, which paragraph, subparagraph, etc.). This element is also important from the point of view of the structure, because when a part is modified, the effect of the amendment also reflects on that of a directly superior level, in particular, on additions or repeals.

Type act to be amended, composed of:

- *Name, Date, Number of the act to be amended*: these elements indicate the characteristics of the legislative act to be amended, the type of act and the essential elements of the document.
- *Action*: this element describes the action of amendment; it should only take on standard values, sometimes in combination: *repeal, substitution, insertion, addition*, but may take on other values (for example: *replacement*).
- *Expression*: it is the linguistic form with which the amendment is provided for, enclosed by inverted commas or other orthographic signs (colon, brackets, etc.), which delimit the amendments. The expression contains the enunciation that provides for the action, up until the colon that introduces the new text.
- *The text of the amendment*, which, on the basis of the drafting rules, is enclosed within inverted commas and preceded by a colon.

Furthermore, some textual elements (prepositions, adverbs, conjunctions, etc.) have been identified, which act as connectors and qualifiers of the various elements of the amendment provision [8].

Once the elements making up the amending provision had been identified and described, we were able to propose a classification based on two of the elements we believed to be particularly important: the action of amending and its object.

In particular, on the basis of the action of amending, a distinction can be made among the following: repeal, integration and substitution.



Fig. 1. Definition and structural and semantic classification of the explicit text amending provision

As far as the object is concerned, the amendment, instead, operates on either a part (supra-part, article, paragraph, etc.) or on a part of the legislative discourse. It is obvious that each of the identified actions can operate on both the object “*part*”, and on the object “*part of the discourse*”.

5.2 Formalisation of the Rules and Implementation of the Parser

Each of the types of amendments identified, on the basis of the given classification, was formalised in the syntax of the parser we used. In this way, we got a set of recognition and extraction rules of the “well-formed” amending provisions, based on the models extracted from the Italian regional rules on legislative drafting.

As we mentioned earlier in the introductory part (paragraph 2.3), once the “well-formed” models of amendment were implemented, we moved on to an analysis of a corpus of legislative texts aiming at two goals:

- to verify the validity and flexibility of the formalised rules for the recognition and extraction of the amending provisions, also in cases where the linguistic structure used in the text is not exactly the same as the given model;
- to identify the structures of amending provisions which, although they are logically, legally and linguistically correct, cannot be reduced to formalised models.

For example, the action of integration may, in turn, be divided into actions of addition or insertion. We, therefore, evaluate, on the basis of surveying the corpus, whether to divide the model of the action of integration into two sub-models and, as a result, to implement new rules in the parser.

And, furthermore, during the preliminary analysis of the texts, we found, even if sporadically, the action of relocation which, will probably be inserted in our taxonomy as an autonomous category and will require us to write a new rule. In fact, although it is not foreseen by the drafting rules, this action seems to perform a specific function of legal amendment and one that is logically correct and expressed with its own linguistic structure.

In writing the rules which implemented the amendment model we mainly used three of the eight modules included in Sophia 2.1 workbench: the compounder, the lexical semantics module and the sentence level semantics module.

In the compounder module, we defined the nominal syntagms important for the purpose of identifying, within the part, the position in which the amendment will act (the final, the last, at the end, before, etc.).

In the second module (LexSem), we, instead, defined the verbal voices, with the various synonyms, corresponding to the various actions of amending (to substitute, to repeal, to insert, to add, etc.).

But it is in the semantics module where it is possible to write the necessary rules for the semantic analysis and for the identification of the significant conceptual structures in the input text.

In fact, in this module, it is possible to build the rules that make up the models to be extracted. The pattern of this module will be made up of the previously assigned semantic categories. These semantic categories also interact with lexical, morphological and syntactic categories, just as with previously defined macros within the semantic module.

Naturally, a variable must correspond to every value attributed to the semantic category which is indispensable in the case where we wish to extract an important

datum and therefore to create a template or also where we want to identify the beginning and end of the XML tagging, as in the case of the amendments.

For example the amending structure indicated in:

To Article 4 of Law No, 41 of 28 February 1986, the following paragraph was added, at the end, “6 bis (text of the paragraph)”.

is translated into the following pattern of the Sophia parser:

```
REFB+ [M_ALLCAT] *+REFE+PUNCTX?+INTEGRATION:startpos+ (PUN
CTX+END:endpos+PUNCTX) ?+PARAGRAPH_I:vtypenov+PUNCTX?+IN
VERTED COMMAS:startnov+ [M_ALLCAT] *+INVERTED COM-
MAS:endnov
```

As can easily be seen, the action of amendment was formalised in the semantic category INTEGRATION whilst the syntagm “*at the end*” which indicates the position of the integration of the *novella*, was translated into the semantic category END.

Apart from the category PUNCTX which identifies the punctuation found in the discourse, the other categories identify, in a fairly intuitive way, the inverted commas that delimit the *novella* and the reference to the paragraph, whilst the macro [M_ALLCAT]* identifies all that which is found within the inverted commas.

Two tags have also been introduced which identify the beginning and end of the reference (REFB and REFE). As we have already mentioned (parag. 5.1), the fundamental element of the amending provisions is the explicit legislative text reference with which the document to be amended is referred. The rules of recognition and extraction of the explicit text references have been implemented in a prior phase of the Project¹⁶, and have been used to define the methodology we have already described and which we are currently perfecting and applying in the formalisation of the amending provisions. These tags are, therefore, only used to identify that portion of the text which contains the reference which is recognised and extracted by a different set of rules.

We intend in this way to obtain a modular formalisation of the text structures, making it possible for every module to integrate, in the phase of the recognition and extraction of the information, with the already created modules with the objective of building an actual grammar that will enable a large number of segments and gradually more and more segments of the legislative discourse to be recognised.

An initial analysis of the text in input will, therefore, allow us to identify the reference found in the amendment and to tag the beginning and end, whilst a second analysis of the same text, will identify the structure to be amended. As already noted, the semantic categories REFB and REFE will enable the parser to identify the beginning and end of the reference found in the amendment.

Therefore, the working hypothesis we are proposing provides for the formalisation of other legislative structures in the syntax of the parser and for integrating the vari-

¹⁶ For the description of this phase of the project, see: [5]. It is worth noting here that the initial analyses carried out on laws passed in the 1990s making up part of the selected legislative corpus, confirm, for now, that, thanks to the models of regular citations compiled in accordance with the parser’s grammar it was possible to identify and extract over 95% of the explicit legislative text references, conforming to legislative drafting rules.

ous modules obtained, according to the system we have just described for the amendment and the reference.

In extending this methodology to other parts of the legislative discourse we plan to proceed in such a way as to permit immediate applications which leave aside the construction of a “universal legislative grammar” that, obviously, can only be a long-term objective. For example, the automated formalisation and recognition of references has led to a useful application for building automated links among legislative measures stored in a database or simply available on the Internet [21].

The formalisation of the amending and delegating provisions may lead, within a short time, to other applications, as we shall discuss in the following paragraph.

6 Applications and Future Developments of the Project

As is well-known, the analysis, recognition and relative tagging of the amending provision are indispensable for the compilation of a co-ordinated text.

The condition to which the repeal exemplified below is subjected, must in some way be picked up by the person who wishes to process the text for co-ordination purposes.

“No. 3) of letter a) of paragraph 1 of Article 5, with regard to competence in the tourism sector, of Law No. 41 of 28 February 1986, is repealed”.

In this example the repeal is partial and change the meaning of the referred disposition but leaves unchanged the text.

The approach we propose, making use of a linguistic parsing tool, should be able to pick up or at least highlight cases of this kind.

Similar considerations can be made for delegation provisions.

The importance attributed to the processing of this kind of provision, is due to the interest we have in being able to monitor the moment in which the different delegations attributed to the executive will expire [12].

However, the determination of this term creates some difficulties deriving from the way in which the *dies a quern* is expressed. Also, for the purpose of this investigation, it may be thought that it is necessary to resort to tools which allow not only for a purely statistical and probabilistic analysis.

Finally, we believe that we can also apply the methodology we have illustrated here to projects for the control of the quality of legislation.

In fact, we have seen, from several parts, renewed interest in legislative-drafting analysis (LDA) whose aim is to evaluate the quality of the legislative text and its effect on the legislative order in force.

Today, qualitative-type analyses are an important sector of legislative drafting whilst, attempts at LDA that use quantitative methods based on drafting rules and the co-ordination of legislative texts and tending to evaluate the quantity of the errors with respect to the rules are, instead, limited.

These attempts at quantitative evaluation are, however, developing within the technical support structures of legislative institutions and have given encouraging results

like those obtained by the Working Group of the Regional Council of Tuscany¹⁷ which has prepared an index of the quality of the regional laws of Tuscany¹⁸.

The Working Group has defined the concept of the quality of laws starting from the assumption that quality is to be understood as the relationship between the text of the law and the legislative drafting rules.

The rules under examination were those which, having a high technical profile, could be directly applied by regional legislative offices and they were, therefore, considered easy to apply and identify.

The analysis based on the comparison between the application and the failure to apply the rules within a regional law was conducted in successive passages, each one of which corresponding to a qualitative aspect of the law.

The Working Group drew attention to the rules-quality factors which were on the whole applied with greatest recurrence in 39 laws.

In this way and on the basis of their frequency of application in the sample corpus, a weight was given to the single rules-quality factors (from 1= not important, to 5= very important).

However, in this sector, it appears several requirements cannot be done without [20].

The first is the necessity to use methods and tools which enable reliable and comparable results to be given.

In particular, the following appear to be indispensable:

- tools for the automated recognition of natural language so that the text structures that do not comply with the legislative drafting rules can be identified. These tools are even more necessary for the analysis of extended corpora, on which the work of a large number of specialist is required;
- reliable “metrics” for measuring the errors that are found and the subsequent preparation of these measurement in statistical indexes aimed at expressing the quality levels and, consequently, at making comparisons.

Natural language processing methods, by now consolidated and used also for the recognition of legislative texts, on the one hand, and statistical techniques for checking quality, that are wide-spread in many sectors of production, on the other, can constitute the technical-scientific support for successfully introducing quality control of legislative texts.

The second necessity which seems impelling is to involve and co-ordinate centres of excellence at the highest scientific level in the fields of documentation and legal, linguistic and statistical processing and the control and evaluation of quality.

¹⁷ The group made up of officials from the Tuscany Region (Loredana Balloni, Bruna Berti, Antonella Brazzini, Spartaco Farulli, Domenico Ferraro, Teresa Gottardo, Maria Cristina Mangieri, Massimiliano Mingioni, Antonio Prina and Lucia Silli) is co-ordinated by Dr. Carla Paradiso of the Legislative Quality Service of the Regional Council of Tuscany.

¹⁸ *Indice di qualità: la sperimentazione del Consiglio regionale della Toscana. Percorso e metodologia*, by the Working Group for the Application of the Unified Drafting Manual, the Application and Monitoring of the Rules Applicable Ex Officio, in the Proceedings of the Seminar on Rules for Drafting Uniformity and Quality Index of Laws: The Experience of the Regional Council of Tuscany. Seminar, Florence, 19 September 2002.

In fact, a rigorous and constant discussion amongst specialists in the humanities and sciences is needed, especially if this relationship is consolidated and adds to a long experience, a great opening to the most advanced developments¹⁹.

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¹⁹ The place in which these centres of excellence should be seems to be Florence, where, for well-known historical and cultural reasons, the Istituto di Teoria e Tecniche dell'Informazione Giuridica (ITTIG), the prestigious Accademia della Crusca and two University Departments, the Department of Public Law and the Department of Statistics can be found, which are at the height of excellence in their various sectors. After several informal meetings which took place in 2001, these centres have decided, during a meeting held on 23 September 2003 at Ittig, to collaborate together on national and European research projects in this domain.

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The Legal Atlas ©: Map-Based Navigation and Accessibility of Legal Knowledge Sources

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Abstract. For many reasons citizens, businesses and civil servants need access to regulations. The traditional approaches to provide access to these regulations are not satisfactory to these users, which have to cope with vast amounts of often interfering regulation. Normal questions like “where can I do this kind of activity” or “is this activity allowed here” are hard to answer in traditional web-based services environments. There are many attempts to create one-stop-shop-front ends to eGovernment, but these are seldom build from the perspective of the user. The Legal Atlas© approach offers an innovative approach, an approach that already has shown to be beneficiary to its users.

1 Introduction

To meet citizens demands in improving governmental (e-)services, government usually combine two approaches:

1. Deregulation, i.e. diminish the amount of rules and eliminate conflicting ones.
2. Improve accessibility, i.e. provide e-services, make the regulations transparent to citizens and businesses etc.

Knowledge about what is allowed, forbidden, permitted etc., also called ‘normative knowledge’, is essential for citizens and businesses when moving around in our modern society. Many citizens perceive an overkill of governmental rules, which forces them to visit multiple ‘service desks’ without getting many results. Furthermore finding your way in the labyrinth of rules and regulations is a challenge on its own.

Since regulatory power of the governments is based upon creating rules and enforcing them, we have strong doubts if reducing the number of regulations will ever generate sufficient results. In the constitutional system of the Netherlands e.g. there are yet over 75000 rules and despite political statements there is no limitation to this number noticeable. If we could accept that we have to deal with huge amount of rules, we can start thinking of solutions on how to cope with them.

In this paper we will show an eGovernment approach that helps citizens, businesses and civil servants to cope with a vast number of rules in their day to day decision making processes. The approach is abased upon standardized knowledge re-presentations. We advocate that the approach explained in this paper offers a powerful

means to client satisfaction, especially when there is a strong interaction between the building blocks of central laws and local regulations. A prototype system has been build to give a proof of concept, containing state-of-the-art navigation techniques that help to find ones way among different layers of legal content. This system enables the navigation through four layers of laws and regulations, European, national, regional and municipal. Early results with using the system in the Netherlands and demonstrating it at different occasions indicate not only high user satisfaction but also feasibility in the implementation in other Europe's nations.

The three fundaments

The DTCA obtained considerable experience with in depth (legal) process automation to counter the vast consequences in the area of execution and law-enforcement when tiny changes were made to the tax laws. The University of Amsterdam and other partners were involved in the E-Power project¹ and others were we elaborated upon the preliminary results from the POWER programme and applied the approach on highly 'mechanical' domains other than taxes like insurance and human resource management. One of the goals that should be achieved when applying the POWER-approach is to automate the process of adaptation to changes in the regulations. When for example a small change occurs in the laws regulating payments of insurance premium related to personnel it would save everybody a lot of trouble if the system would absorb the change, adapt the legal domain model, calculates the consequences for the execution derivatives and tells the administrative apparatus of the clients where to make the adjustments in their models.

The perspective of the law being represented as a knowledge object in a set of objects (possibly implemented in a relational database environment) rather than being represented as texts as a xml-hierarchy representing article structures, became an important modelling notion leading to the Legal Atlas²© approach. It would enable the client searching among local and regional laws to query legal systems comparable to querying databases. It would enable the ultimate transparency of local regulations in the sense that the citizen could ask "where can I do this?", instead of: "can I do this in place such and such?". The where-can-I-do-this query requires much more than a good website from a well-organized municipality; it requires some way standardisation of local regulations across all municipalities of a region or country. It requires the means to aggregate the legal information of all those municipalities into one system which the citizen can hold his case against. Such a eGovernment system would either require a unique coding for all local and regional legal functionalities effecting citizens or it would require a semantic mapping of the legal terms and legal procedures affecting those required functionalities of citizens. In the ideal world the system would have the advantage of both eGovernment architectures. Only in that way the client of the service could regard his case in the light of aggregated data in a way and oversee the consequences. Only that way there can be a perspective on maintainability and consistency of the ever-growing legal system as a whole.

A third field which influenced the development of the Legal Atlas© approach was the awareness that legal content of the type regional and local law had a feature that has been neglected thus far (since almost none cross-jurisdiction knowledge-based systems have been developed); the geographical element, location or jurisdiction.

¹ <http://www.lri.jur.uva.nl/~epower/>

² The legal atlas was developed in the context of the ADDWIJZER project of the eContent programme

This feature is getting more and more important if we model legal knowledge-based systems at European scale (because of the jurisdictions of national laws). Looking from the top of the hierarchy down, it becomes clear that European legislation and national law usually provide us with a generic set of norms while regional and local regulations add more specific rules that are applicable within a specific geographical area or context. From the perspective of the citizens it is not only vital to know which regulations are valid within their municipality or region (e.g. per zipcode); it is equally important to know exactly how a certain geographical area is governed by a certain law or set of rules. Municipalities are the local branch of eGovernment and the local regulations are the instrument to govern the actions and decisions of people in their daily lives. Those decisions and actions affect in most cases a situation “some-where” in an area with certain constraints, rules and permissions. The Legal Atlas© provides access to the world of regulations through a map-view on the legislation. Such a map-based view on the law has to be powered by a different kind of software than regular content management systems and database management systems offer. It also extends functionalities normally supported by the systems used for creating technical drawings and support tasks like environmental planning (Geographical Information Systems or GIS). In the Legal Atlas© approach we make use of the main characteristics of content navigation using GIS systems, i.e. that the user can generate drawings of maps representing different features of a certain area, which overlap each other. In the case of GIS those drawings are not merely pictures represented in Jpeg or GIF format. They are dynamic database generated “maps” containing data, i.e. a set of attributes per object represented. The background against which the data-map is projected is a selection of the map of the earth on a certain zoom level. Municipalities operate at 5000-to 10,000 (i.e. scale 1:5000 to 1: 10000). Regions operate generally on 25,000 to 100,000 and country maps are 250,000 to 500,000. It has only recently been possible to publish dynamic maps using the internet in HTML because of the size of the data files and the capacity of communication channels needed. A typical application area for the Legal Atlas© system is urban planning where the user would e.g. “navigate” the content by interrogating the system and having feedback via a map-representation as well as more traditional representations. An example is a request for information about “industrial areas allowing for hindrance levels > 3” or “a planned glass house area”. This type of information could be presented on a map covering multiple municipalities (probably with scale 1:25,000). For more detailed questions like the type of buildings allowed and the level of noise allowed during recreation the user could zoom in to find regulations applicable within one municipality (presented at a map with scale 1: 5000). If we want to offer this type of functionality using the internet, quite some bandwidth is required and a plug-in is need as well to manage to have reasonable response times. Especially opening different layers of data at different zoom levels is quite demanding.

2 The Method

For the first version of the Legal Atlas© prototype it was chosen to first concentrate on modelling the law. For localization a unique code that indicates the regional and local areas was used. It was decided to investigate the semantic decomposition of the

related legal texts at a later stage. This paper reflects on the early findings of the first version of the Legal Atlas© prototype.

The unique regional coding scheme was developed in the DURP³ programme in the Netherlands. DURP stands for “digital exchange of spatial plans” and its goal is to support the interoperability between different layers of government while dealing with zoning plans. The unique spatial functionality coding is based on the IMRO standard which adheres to the NEN 1878 norm for data interchange⁴. The Netherlands are recognised as the front runner in Europe in spatial data warehousing and standardisation according to the Inspire survey carried out in the spring of 2003⁵. This is not surprising if one realises that 16 million people have to share only 41.000 square km in that country. The innovative part of the IMRO coding is that it not only contains a system creating object-uniqueness of the spatial functionality. The coding is also legally binding: the thus coded areas on the map tell the user what is allowed and what is not allowed based on the prescription (“voorschrift”), the legal text inseparably related to that coding. The Legal Atlas© makes use of this coding scheme to enable the user to query the underlying legal system using very detailed coloured maps representing legal constraints and possibilities.

The regional layers of data were provided by The Province of South-Holland⁶ that maintains a number of databases (Thematic Spatial Data Infrastructure) about the economy, the environment, our cultural heritage and the public infrastructure. Regional information is aggregated content by nature. For crossing different regions (especially when crossing national borders) we would need one European unique coding mechanism for those data layers and their meaning. The EUROGI initiative will hopefully reach that objective one day in the future. It has come to our attention that also other countries and regions in Europe are experimenting with the same type of legal standardisation. This indicates that European standardisation is a matter of some urgency to avoid new interoperability problems and unnecessary costs. In the Netherlands an initiative aiming at establishing at least a national standard is initiated by the IPO, the inter-provincial e-Government organisation. For the Legal Atlas© prototype lack of an existing standard was not too problematic, since only a limited set of regulations that didn't originate from the Province of South Holland was included in the prototype.

3 Early Findings

In August 2003, 8 in-depth 2 hour interviews were conducted with help from Dr. David Newman from Queens University Belfast with Notaries, building specialists, environmental specialists, legal experts and event organisers. For the purpose of the interviews a “Flat” HTML dummy prototype was build of both the back office and the user interface of the system. The purpose of the dummy was to engage into a dialogue with the interviewees based on concrete representations of the early ideas. The

³ Ministry of VROM (Spatial planning , Housing and the Environment)

⁴ See also www.ravi.nl

⁵ see also EC-Inspire commissioned by Eurostat and DG env, page 2

⁶ with thanks to Nienke Mier, Peter Meijer and Frits v Gulick of the Province of South-Holland

interviews were further supported by the definition of a set of real life scenarios or cases for which the system was meant as a helping device.

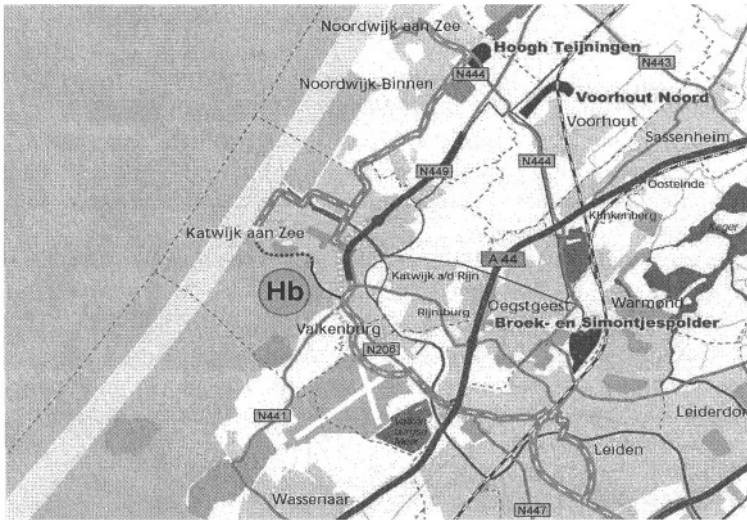


Fig. 1. Dummy map interface showing habitat area's for feed back purposes

The main results of these interviews were that the system was regarded as a potentially very beneficial and that users would like to see two additional features: more freedom of choosing relevancy of thematic map layers and more contextual data, like infrastructure and business types. The feed back encouraged the research team to build the first real dynamic prototype in the autumn of 2003. During the summer and the autumn 3.5 gigabytes of content was collected from 10 municipalities, five large infrastructural sources and the chamber of commerce to “fill” the prototype in combination with a vast amount of content obtained from the Province. This dynamic prototype proved to be a great improvement. It could for example help the citizen to establish the influence on their decision making of the Malta treaty or the Habitat legislation since their effects were displayed on a colourful map affecting a certain geographical area (see figure 1.). A text retrieval approach using e.g. Google or another text based search engine like Verity (see figure 2.) would never show the legal significance of that treaty in the same way as the Legal Atlas© did.

4 Technical Platform

As the technology platform for the Legal Atlas© Autodesk Mapguide 6.3 was chosen, because it seemed to be the most interoperable and open family of GIS products available and it works seamlessly with the market leader ESRI. The municipalities involved recommended this platform for practical reasons like implementation and user friendliness. Mapguide does require a plug-in which can be made auto-downloadable via the Autodesk website. After a number of surveys based on the con-

siderable experience with Content Management Systems of the web company Framfab we have chosen the product “Flexiweb” of ISIS as main user interface. Flexiweb is an ASP-shell around Mapguide enabling the combination of SQL queries of legal texts in conjunction with GIS retrieval of related map objects. It took considerable time to configure the APS-shell to allow different scenarios and additional text categories.

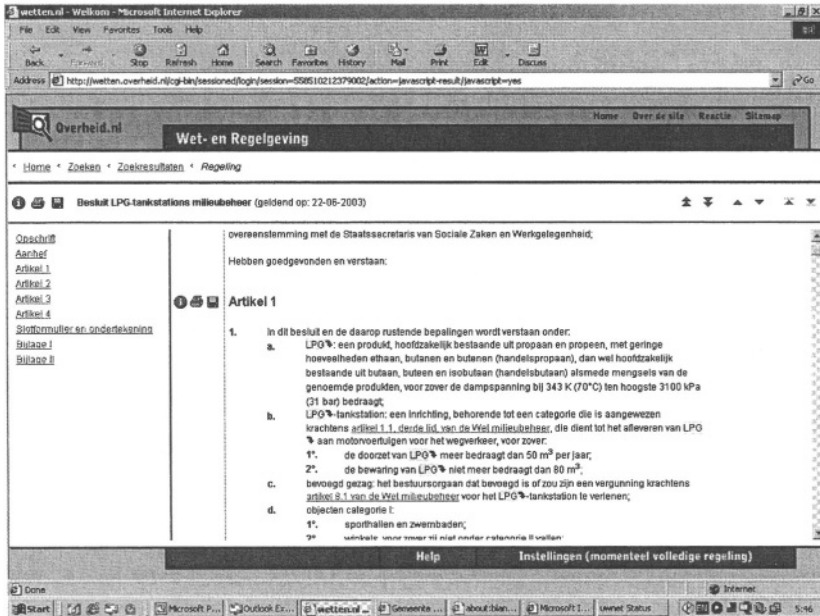


Fig. 2. Dummy text interface showing legal text related to LPG

5 An Example of Two Types of Legal Constraints on a Map

The Habitat legislation concerning the conservation environment and the Malta treaty legislation related to cultural heritage were translated by regional authorities into area's with a certain “value” level. Industrial area's can have a certain hindrance level attached to them. By connecting these levels with their respective legal constraints we can visualize the local implications of law application.

A number of user scenarios were defined to represent the typical decision processes where a citizen requires fast access from multiple eGovernment services to reach his goal. Figure 3 illustrates the scenario of the event organiser looking for a spot along the coastal line where he could organise a beach party involving alcoholic consumptions. The map shows the coastal line near Katwijk. The bright green area is Habitat-regulation protected and he would certainly face objections from the bird watchers there. The local Katwijk-related relevant legislation turns up the law on alcoholic drinks when queried on the keyword “alcohol”. He will also be able to find out the rather strict rules on the use of soft drugs. The user now either applies for the

required permit in Katwijk or seeks an area governed by less strict regulations. The coloured spots represent different types of economic activity obtained from the chamber of commerce like camping sites or restaurants. The bleus and other (non-bright) greens indicate planned regions for different types of natural environment preservation.

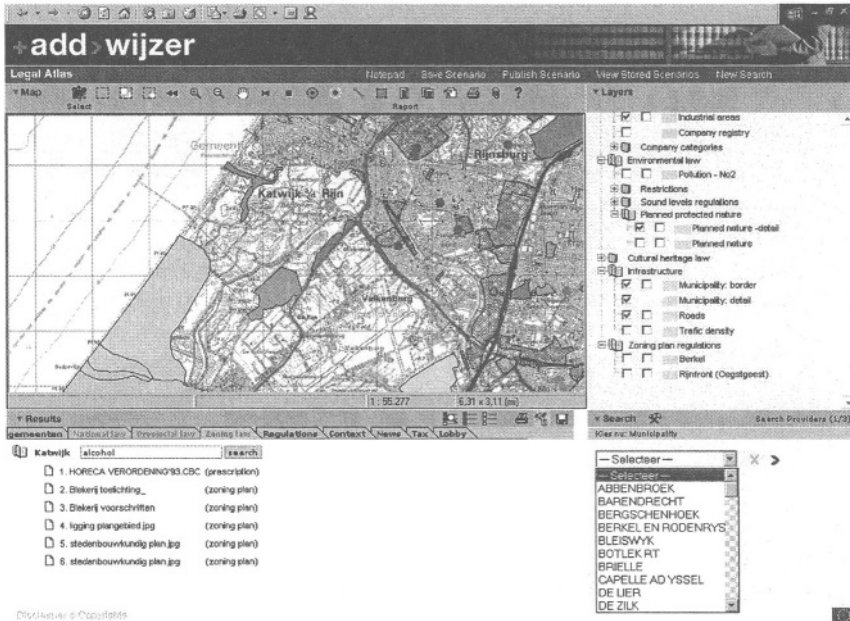


Fig. 3. Result set showing relevant legal constraints for event organisers in Katwijk

With the IMRO codification system the function of a defined area can directly be related to a law (“voorschrift”) applicable in that area. Fig. 4 illustrates another legal map object representation. It highlights a selected spot in blue the central square of a neighbourhood in the city of Dordrecht as a specific area with a specific code called “c” for “centrumdoeleinden” meaning city centre purposes (coded as IMRO 310101).

The content type “habitat” in the Katwijk example is an area derived from a higher law. The centre square in the Dordrecht city example is based upon a local regulation. Both have in common that they are objects which effect can be generated and visualised from a database query.

6 First Experiences

The prototype has been demonstrated in November 2003 to more than twenty national delegates at the 4th meeting of the ‘Group to Promote Public Sector Information (PSI)’ in Luxembourg where it was received very well as an example of transparency of PSI. The prototype has also caused some major changes in the metadata strategies for local law applied by the Ministry of Internal Affairs in The Netherlands. The nine

municipalities involved in the project thus far were also positive and decided to keep contributing content to central aggregated content hubs. They see practical value in the aggregation of the content and they liked the map-based approach to the citizen front end. A side effect of the content gathering process was the exchange of thematic content layers between governmental agencies who did not know what their neighbour had in stock. Further research with real life users outside the government should confirm the generally positive reaction to the ideas involved.



Fig. 4. Result set showing city centre purposes area in a neighbourhood in Dordrecht

7 Conclusions

That citizens, businesses and civil servants have to cope with vast amounts of often interfering regulations is a fact of life. The traditional approaches to provide access to these regulations are not satisfactory to these users. Normal questions like “where can I do this kind of activity” or “is this activity allowed here” are hard to answer in traditional web-based services environments. The Legal Atlas© approach offers a completely different approach, an approach that already has shown to be beneficiary to its users.

The Legal Atlas© approach combines jurisdiction-based features with geographical location and map-oriented (GIS-based) interfaces. Connecting the first two features is vital to the interoperability of the different governmental layers and therefore vital to the e-service levels of the government as a whole.

In the near future we hope to combine the semantic decomposition of the law texts with the codification that generates the legal map objects. The text governing the fact that a certain area has the legal function “city centre” and the different other legal sources containing regulations that put localized constraints could be made machine readable. This type of research is already conducted by De Maat and Van Engers (2003). The result would be that, once certain codes and processes were semantically mapped, a revision or a change of the original legal knowledge sources would *automatically* result in a different map for the user.

Once the processes and the semantically key concepts are mapped, we could also make maps that represent different legal sources even if they are written in different languages. Combining Dutch legal texts with German ones could for example form the basis for a map that covers the border region and could help businesses to decide where to start a new business.

Our future research will elaborate upon the current experiences with map-based access to legal sources and the E-Power production chain that helps to generate knowledge-based components from legal sources. We hope to merge these two approaches into one and test it in real life situations. We conclude in arguing that research on knowledge representations and interface layers are essential to the e-government field. The Legal Atlas© approach explained in this paper is an example of a fruitful multidisciplinary research effort addressing these issues. This kind of cooperation and cross-border thinking are key elements to a successful e-Government.

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E-CRIME System: A Knowledge Management Application in Public Administration*

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Abstract. Legal security, which is an important factor of life quality, was the major subject of our research. We have concluded that legal security could be achieved by the perfection of jurisdiction, of which the three major elements are time, precision and efficiency [4]. The final goal of an appropriately working juridical system is to find equilibrium between time and precision and this way to reach maximum efficiency. This paper will discuss in details the problems of the Hungarian juridical system, particularly those, which can be solved or supported by IT tools. Our research project will be demonstrated, in which after the analysis of laws and legal studies the knowledge mapping of this domain has been realized. Based on this, an ontology has been made and an expert system has been developed. Our paper also describes how an advanced information system can improve the efficiency of the juridical processes.

1 Introduction

Legal systems have basically two types: the Anglo-Saxon (precedent or case-based) and the continental (Prussian or rule-based) model. The Hungarian juridical system is a rule-based one.

In Hungary the functional disturbances of courts are well-known: unacceptably long proceedings are frequent, the overwork of judges is high, there are many administrative errors and backlogs, and information is often not available. Besides, the low level of manpower and scant technological resources cause further problems. Official procedures are legally well regulated, the workflow on the other hand is fully manual, there is little possibility for avoiding human errors. The management of judgment making process is not resolved and the transparency of proceedings also should be improved. Keeping in line with the technological-organizational-social environment and EU-conformity require substantial reorganizations in the work of courts, which can only be reached with the help of advanced information systems.

The purpose of our R&D project is to support the modernization and development of juridical system by developing and testing new knowledge manage-

* The research was founded by the R&D Division of the Ministry of Education under the frame of ICT program #00136/2001.

ment tools and procedures. The fundamental objective of our research project is to develop a citizen-friendly and cost-effective solution.

2 Situation Analysis

2.1 Problems Due to the Lack of IT Support

In the next few paragraphs we summarize and analyze those problems of the Hungarian juridical system, for which we tried to find an appropriate solution. A feasibility study has been made, which showed in details the problems of the Hungarian juridical system.

A comprehensive workflow system can handle almost all of these problems. The goal of our R&D project was to analyze the feasibility of an expert system, which can effectively support the judgment making process, and if it is possible then develop a prototype system. All other parts of the workflow system are developed by other organizations independently. However we try to summarize the whole range of problems to make clear the position of our expert system in the workflow system.

In Hungary the lead-time of the juridical proceedings is very long. When someone commits some criminal action, the official process of investigation, prosecution by the Public Prosecutor's Office, appointment of date of trial, conduction of trial, appointment and conduction of subsequent trials, judgment making, filling of appropriate documents and execution can even take several years. Every step of this process can be and should be improved in favour of efficiency and effectiveness.

In every step of the above described process the recording of data and documentation is fully manual. All documents of a case are held in a single dossier, which can be processed by only one person at the same time. This way parallel work is impossible, which causes the slow-down of the whole process. Take judges as an example, since our research focuses on judgment making. There is a huge amount of cases, all documentation of which should be handled by the judges, and the result of this is a massive overwork. The most crucial consequence of overwork is the existence of great backlogs in the Hungarian courthouses. Another effect of the paper-based workflow is the large amount of human and administrative errors. These documents contain many identical information, for example the number of case, the name of defendant, etc., which has to be copied from one document to another and this increases the possibility of typos and other errors.

The most relevant problem, which can be solved by our expert system is the following: due to the rigid legal regulation even small formal errors, like the mistyping of a name or a number can lead to the voidability of proceedings. If the judgment is appealed with reference to formal errors then the proceeding of the first or second instance become totally useless since the case can be renewed on a higher level.

As a summary we can state that formal errors, overwork of judges and manual workflow influence adversely the quality of judgments, which is a relevant

benchmark of the work of courthouses. From the set of quality factors the consistency of judgments must be emphasized. Different judges differently interpret laws and regulations and this way it can occur that in very similar cases they may return very different verdicts.

Finally, there is a further effect of the manual workflow, which we also have to mention. Since documents are stored in dossiers and file departments and since the registry of these documents is modest, gathering and searching of information is difficult and often impossible, which cause information loss and serious cost overhead.

2.2 Other Problems

We also have to mention some other problems in connection with the Hungarian jurisdiction. First of all, there are organizational problems that also affect the current proceedings adversely.

The most exigent of them is the low level of manpower. In Hungary the juridical profession is prestigious, but not well paid. Besides, it takes a long time for someone to become a judge, because this profession is based on very conservative and rigid rules and conventions.

The scant technological resources also narrow the opportunities of judges. However there is a large development plan in this area, in which the courthouses can obtain a number of computers and local network infrastructure (communication infrastructure and server computers) can also be initiated with central and EU (Phare) support. A Phare program launched a development project, in which the overall development aims to significantly improve the ICT infrastructure, to develop a secure network and establish a secure PKI (Public Key Infrastructure) environment.

To achieve the goals of the above mentioned plan the judges have to be trained because their competence and IT skills are very low. As we previously mentioned the process to become a judge is long, and the current manpower of the courts is middle aged or senior. Due to the high workload and the lack of necessity of using IT tools they tailed off from the advance of IT. This lag also causes resistance to the installation and training of new IT systems. Of course there are also differences in regional sense, the eastern region of our country is less developed and even less motivated in the advance.

In the background there are also some management problems. The management—which also consists of judges—is not committed to IT, this way the priority of IT development is low. This seems to be changed by the current development plans, so a centrally controlled process has been started, but it will be difficult to handle the inflexibility of the regional management of courthouses.

The governance must also consider that the management of judgment making process is not resolved. It is a very complex proceeding, therefore not all judges can see through the whole process. This can also lead to further errors and omissions. For an outsider not working in the jurisdiction the proceedings are completely opaque. This also makes the control of the juridical work more difficult.

The legal rules and proceedings are not optimized for computer aided workflow. The proceedings are however well regulated, but they are complex and contain elements based on conventions. The greatest difficulty we encountered is the diversity of the logic of judges. They have a way of thinking heading from global to details. This is in contrast to our system development concept, which in order to formalize procedures takes smaller elements first to handle the complexity of cases. Even the judge who followed every step of the pilot system development and helped us in this work could hardly accept this logic.

As a result of the thorough analysis of problems we argue that the judicial work can be supported on three levels:

- Knowledge-based system (rule-based or precedent (case) -based)
- Process automation system (workflow systems)
- Document warehouse, document mining

From this set of supporting elements our task was to investigate the most knowledge-intensive area, which is the aiding of judges' work and judgment making with a knowledge-based system. A pilot expert system has been developed, in which certain rules of the Hungarian Criminal Code have been formalized. The system gathers all input information and many modifiers (for example aggravation, extenuation, scope) necessary for the judgment and guides the judge in the forming of judgment. The purpose of this process is to determine a verdict, which stands on the top of rule base organized according the concepts of backward chaining. Backward chaining ensures that a verdict always matches the regulations of the law, if all the necessary information is available [6].

3 System Development and Knowledge Structuring

As we already mentioned, the main purpose of the research was to develop a prototype of an intelligent system, namely an expert system, to considerably improve the efficiency and effectiveness of knowledge intensive tasks of the Hungarian tribunals. The process of creating—intelligent—computer programs has four major elements, which must be well distinguished [7]. The following list not only describes all the major parts of our prototype system, but it also indicates the steps, the process of the development of our system.

3.1 Domain Ontology

The first element, which has to be distinguished, is the domain ontology. To give a definite description for the concept of ontology is a real challenge. In Artificial Intelligence (AI) ontologies have two different interpretations. First, ontology can mean a representation vocabulary. More precisely it means the conceptualization that the terms in the vocabulary are intended to capture. In this case ontology provides a set of terms, which describes the facts in a certain domain.

In another sense the term of ontology refers to a body of knowledge describing a certain domain, usually a commonsense knowledge domain, using a representation vocabulary. Actually this body of knowledge is a collection of facts about a domain [1].

But not only the researchers of AI tried to give precise definitions for ontology. In the following some more interpretations of ontology will be demonstrated, especially those in which the term is related to specific knowledge bases and which are designed with the purpose of supporting knowledge sharing. According to Guarino's statement ontology is a logical theory, which gives an explicit, partial account of a conceptualization or ontology is a synonym of conceptualization [3]. Another way of defining the term is the following: "ontologies are content theories about the sort of objects, properties of objects, and the relations between objects that are possible in a specified domain of knowledge" [1]. Finally, Gruber gives the most general definition for ontologies: "an explicit specification of a conceptualization" [2].

According to AI approach we aimed at developing a representation vocabulary, which serves as the domain ontology of judgment making, rather than creating a body of knowledge, which is a general ontology with which not only this domain can be characterized. The domain ontology of our expert system includes all of those concepts, expressions and the relations between them, which can characterize the given application area (the area of judgment making). This way the communication environment is provided in which the relevant concepts of the application area can be disputed and analyzed.

One of the most important features of the ontological analysis is the ability of clarifying the knowledge structure of a given domain. The clarified terminology enables the ontology to work for coherent and cohesive reasoning purposes. Another relevant feature of ontologies is the ability to support knowledge sharing and reusability. They are content rich forms, the representations of the domain knowledge.

3.2 Knowledge Base

The knowledge base contains the logical knowledge of the given application area in the form of statements. All of these statements refer to the concepts of the domain ontology and only these concepts are used. The knowledge base of our prototype system includes rules and regulations determined in the Hungarian Criminal Code, and rules determined during system development.

3.3 Problem Solving Methods

The problem solving methods determine that control structure, which can provide the typical, domain independent problem solving strategies [6]. Our prototype system was developed with the AION development tool¹. This tool joins procedural programming methodology and declarative problem description. In

¹ The model is implemented in AION version 9.0

the same program we can create graphical user interface, use database connections and set up a rule base, which is executed by the embedded inference engine of AION [5] (Fig. 1).

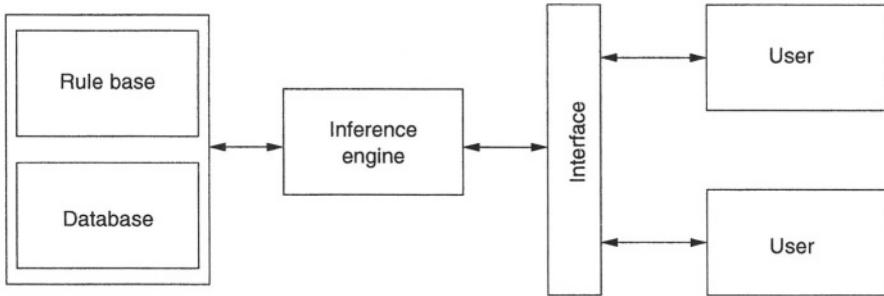


Fig. 1. Major parts of a rule-based expert system

3.4 Mapping

During mapping the concepts of the domain ontology and the knowledge base, which consists of statements, the structure of which is determined by the ontology, are matched by the input and output needs of the problem solving methods.

3.5 Ontology of “Judgment Making”

In Table 1 following we list those terms, which define the meta-ontology of the domain of judgment making. With defining relations between the main concepts we also determine the structure of knowledge of this specific area. This structuring also defines the progress of work (as Fig. 2 shows) and results correct inferences in our pilot expert system.

In Fig. 3 we demonstrate the concepts and the knowledge structure of a special case. It shows how a verdict can be returned in the case of stealing (together with all the specialties of the case).

3.6 Using the Pilot System

When the judge sits down in front of our pilot system, his/her first task is the selection of a case. Normally, the case data comes from the workflow system, and the phase of judgment making follows a number of document creation steps from the prosecution to the preparation of a trial. The judge selects a case and the system loads all the relevant data from the database and shows them on the screen.

The main window of the pilot system consists of two main parts. The primary place to show information is a large frame in the window, in which there is a

Table 1. Major concepts of the judgment making process

Defendant	The person who committed crime and the Public Prosecutor's Office lays him to charge.
Component parts of the prosecution	The statement, in which the Public Prosecutor's Office determines the type of criminal act, with which it lays the defendant to charge. When the defendant commits more than one criminal act, then the proceeding contains more than one component parts.
General part of the Hungarian Criminal Code	That part of the Hungarian Criminal Code that contains statements, concepts and several rules, which apply to all types of criminal acts.
Special part of the Hungarian Criminal Code	That part of the Hungarian Criminal Code that describes penalties regarding each criminal act.
Record of the defendant	Contains all the criminal acts he/she committed previously, from which only the last case has relevance in connection with the criminal procedure.
Recidivist	If the criminal act committed by the defendant is within three years regarding the expiration date of his/her last penalty, then the defendant is recidivist.
Frames of possible judgments	According to the component parts of the prosecution, the record of the defendant and rules defined in the Hungarian Criminal Code the possible penalties of the given criminal act can be determined, which we call Frames of possible judgments.
Judge	That official person who returns a verdict in the name of the Hungarian State.
Judgment	The law ensures the possibility for the judge to deliberate the factors of the given case and to choose that penalty from the frames of possible judgments, which is the most appropriate according to his/her opinion.

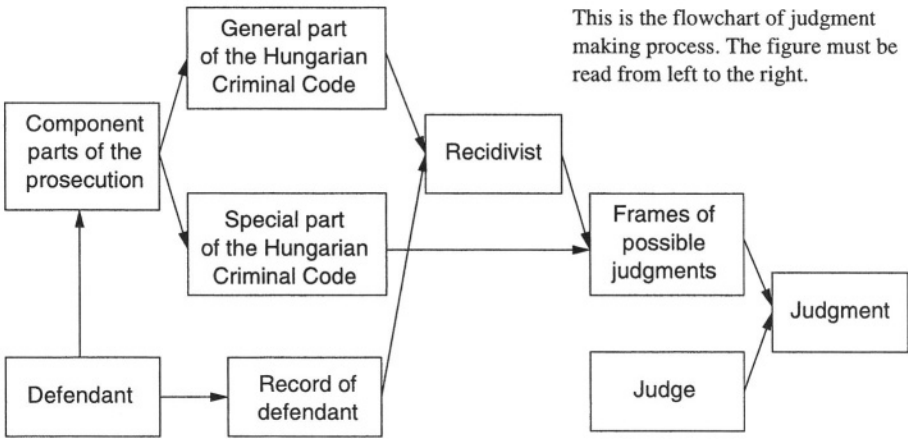


Fig. 2. Relations of main terms of the judgment making domain

tree structure representing the case. The root of this tree contains some identifier and description, such as the number of the case, date and a short description. On the first level of the tree there are the names of defendants, all of which containing more details. Expanding a defendant’s subtree, the judge can find the record of the defendant and the component parts of the prosecution. There can be more than one component parts of the prosecution. The pilot system may contain more than one defendant, too. The subtree called component parts of the prosecution contains items, which are named according to the rules of law and the practice of judges, the so-called BK1² descriptions. They are generated with the help of a number of rigid rules and they express the concrete criminal act in one long sentence, containing all the details. This naming convention is common in the practice of judges, it is tightly embedded in their way of thinking, so it is necessary to build up this phrase and show it among the case data, in spite of being a bit confusing for someone not in this profession.

The judge has the right ensured by the law to freely deliberate the information, facts and conditions of the case. This way the system has to handle these decisions and alterations in the case dossier. During trials the judge can alter some details of the case according to his/her decisions. For these amendments there is a special category in the subtree of the defendant: the so-called accepted parts of the prosecution. Compared to the ‘normal’ parts of the prosecution subtree it shows the differences between the prosecution and the result of trials including the opinions of the judge. This accepted category is the base of rest of the judgment making process.

The judge starts the decision-making by clicking a button and assures the acceptance of case data in a confirmation dialog. This process starts with the execution of those rules, which represent the Hungarian Criminal Code. As we

² BK1 description: standard description of a criminal act, including the categorization and the qualification of the act.

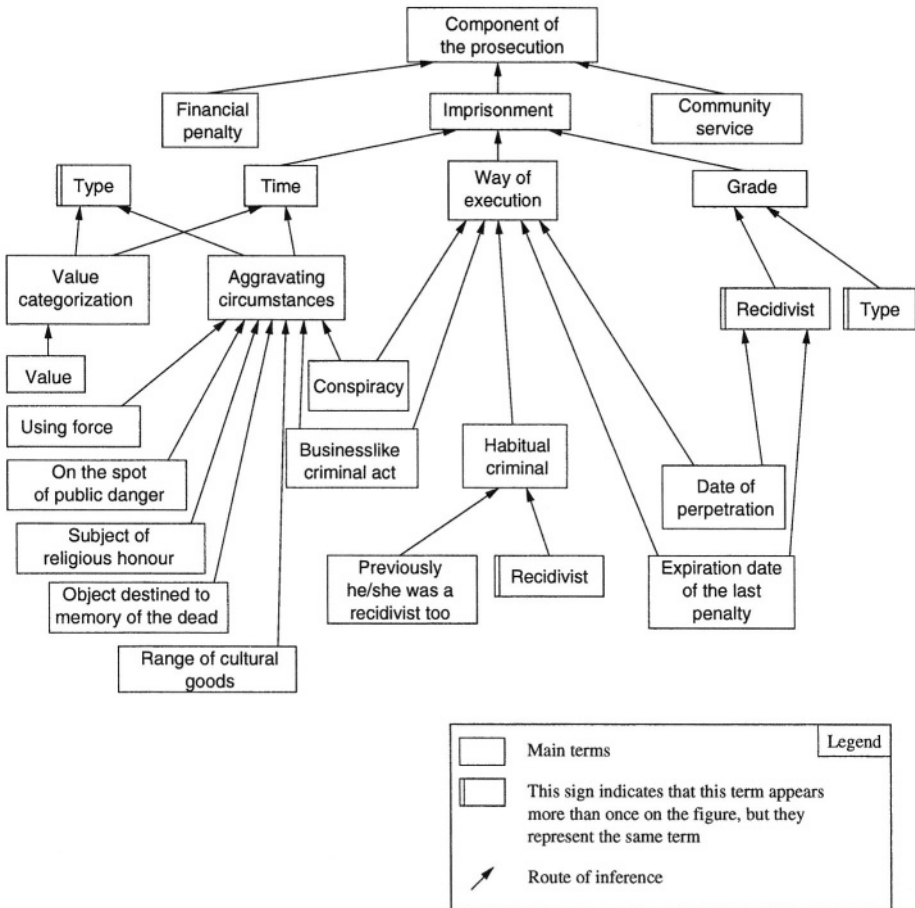


Fig. 3. Relations of the main terms in the case of stealing

mentioned before, the Hungarian legal system is rule-based, which means that only those criminal acts can be punished, which are named by the Hungarian Criminal Code. Moreover the Criminal Code always defines the type of punishment with its possible minimum and maximum degree. The judge has to make the final decision within this interval deliberating other circumstances of the case. The system controls this decision and ensures that it remains among the frames of law. In our prototype system all decisions affecting the judgment are controlled and the result of the process is an automatically generated judgment, which contains only a few parts, which have to be formulated by the judge. This way the majority of formal errors are taken out. This sentence is not “camera-ready”, it contains only the necessary parts and formulas described in the law. This is where our system is connected again to the above mentioned workflow system in a way that it puts back the judgment into the process of the workflow

system. This can be done by a common communication platform, for which we have chosen XML. The system puts all data issued in the expert system into an XML form. This way any other system, which implements the XML schema of our pilot system, can use the results of the judgment making process. Since our system covers only the judgment making process from the set of administrative processes of the whole juridical workflow, it shows the result of its process on the screen in two forms: as a human readable text, which follows the formal requirements of the Hungarian judgments, and as a XML form.

4 Results and Solutions

In our research project we have tried to find solutions for the previously fully analyzed problems. As we mentioned, there are difficulties in this area, which can be solved by IT tools. In the following we will discuss in details those problems, for which we have found solutions. The efficiency of juridical work can be greatly improved by a workflow system. When the whole proceeding is supported by a workflow system, the lags of the paper-based system will disappear. The document-flow does not require any time and the whole document base is searchable. We have to emphasize again that development of this workflow system was not the task of our R&D project, but we have simulated a similar environment until the real workflow system will be ready. This is important from the viewpoint of our expert system, because the user's working process begins with the selection of the current case. When the data of the case is recorded into database, they become ready for judgment making. The judge only has to find the appropriate electronic dossier and the expert system is ready to make the verdict. In the pilot system the registration of the relevant case data passes off inside the expert system, and these data can be saved and loaded later. The judgment making work begins with loading the appropriate case data from the case dossier. The Hungarian law ensures deliberation right for judges, so as we mentioned before the law defines only the frames of the possible punishment and it is the judge's task to make an appropriate decision considering facts of the case. The main task of our pilot expert system is to guide the judge through this process and to ensure that the sentence remains within the frames defined by the law.

This kind of workflow system makes possible that judges or clerks work parallel on the same case. The importance of this advantage is not so high for the expert system, but it can increase speed of the whole proceeding, so the arrangement of a case can be done in an even shorter period of time. In our point of view it is even more important that the work and control of judges can be faster. The expert system makes the processing of case data easier, the judge can see through them easily, and ensures the control of the judgment, because it assures that the judge's decision remains within the frames of possible judgments. Some parts of the judgment—which result from the decision of judge and from the case data—are automatically generated, there is only a few part, which the judge have to fill in, in which the justifications will be given concerning the

decision of the judge. The simplicity of this process can make the work of judges easier and since it is much faster, it can reduce the overwork, too.

Using the expert system can reduce the nowadays so frequent formal errors. This can be done by a simple concept: record data only once in the system. When the Public Prosecutor's Office enters for example the name of the defendant at the beginning of a case, it remains the same through the whole proceeding, there is no need to enter it again. So it will remain correct on all of the descendant papers. Our system ensures that the generated parts of the judgment are also correct. This way the majority of errors are eliminated.

The above described tools make the work of the judges more reliable. With the controlled judgment making and the automatically generated parts of judgment the quality of the judgments can be greatly improved. They cannot be appealed so easily, this way the high workload of the second instance court-houses can be moderated. Guiding and controlling the judgment making process improves the precision of the judgments too, because this process does not allow any failures and deviation from the rules of law. Using the expert system the consistency of judgments is also assured, because the system uses a rule base derived from the law, this way similar cases result similar judgments. Of course, the system only ensures the consistency from the viewpoint of law, because the judge can use his/her free deliberation right. This way it is possible to make very different judgments in similar cases, but it is assured that both are conformed to the law.

The expert system uses the 'electronic dossier' of the workflow system. The input data of judgment making is taken from it and all work made in the system is recorded into that and the result of judge's work is also put into that system. This integration increases the availability of information and assures the consistency of a case dossier. There is a common place of information, which is also searchable and this way reusable. Gathering of information is also easier with an 'electronic dossier', because if a judge wants to deal with a case, gathering of information is reduced to only the selection of a dossier and all the necessary information is available. Our expert system takes part in the whole proceeding from the selection of a case to the automated judgment generation.

5 Conclusions

However, there are some areas, which require more attention and analysis and therefore they show the directions of further development. The graphical user interface is a little bit modest because of the limitations of AION. A more user-friendly interface would be able to help the acceptance and the easier spread of the system in the future. The system could be complete if it would connect to a well-implemented and practically used workflow system. Since our system is only a pilot system yet, it contains only a small portion of the Special part of the Hungarian Criminal Code, so it would be complete only if whole Criminal Code would be processed. Moreover it would be useful to expand the operation of the system to other territories of law, for example to the area of civil law.

Even more experiences could be gained if the system would be compared to other legal expert systems in a similar working environment. The LEFIS Leonardo project³ will give ample opportunities to do this. The positive consequences could be well used in further development of our system.

The research shows a wider spectrum of possible improvements when the legislation process is analyzed. With an ontology worked out for the legislation process and with better management of it can greatly advance the quality of Hungarian laws. During this process it should be taken into consideration how laws will be appropriate for supporting the use of expert systems.

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³ For more details see <http://www.lefis.org>

Designing Participatory Processes

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Abstract. Cooperation emerges in various forms in the context of eGovernment. Cooperation is practised between the members of a municipal department, between two or more departments, between the municipal representatives and other stakeholders. Sometimes the cooperation involves public participation. In each cooperation mode, expert knowledge and experience has to be collected, shared and processed, and leads eventually to the desired outcome of the cooperation – the solution of the task. The cooperating planners, decision makers and stakeholders accomplish a number of procedures everyday, for example various recurring city planning tasks, visionary participatory planning processes, decisions on how to distribute funds, site selection, voting tasks, and many more. All of those procedures can benefit from IT-support. However, it is crucial to follow certain steps in the preparation of the respective process to heighten the chance of success. There is a long way from the problem at hand to a high-quality solution, from the outline of the process plan that includes the definition of the task, naming the involved parties, determining the amount of time and resources, via the decision on the process structure and the composition of steps and methods, to the core of the communication – its ontology – and then up to the transformation of the plan into a real-world setting, the combination of media and tools, the structuring of the underlying software systems and online and onsite meetings, not to forget the importance of the moderation and the objective evaluation. The paper gives an overview on how to realize web-based participatory processes. It shows how to draw a process plan from the beginning to the end. The presented knowledge was achieved by evaluation of various experimental and real-world processes. It consists of best practice experiences and cross-disciplinary research results.

1 Motivation and Methodical Background

For several years our group ‘Knowledge and Communication’¹, has accomplished and analyzed a range of participatory planning and decision processes. All discourses, as we call these goal-oriented communication processes, are moderated and supported by internet-based collaboration and communication software. During our experimental and real-world applications we gain experience in the development of process plans.

¹ The *Knowledge and Communication* team was formerly known as the *Mediation Systems* team of the Fraunhofer-Institute for Autonomous Intelligent Systems (AIS). Website: www.ais.fraunhofer.de/MS

On the one hand we investigate participatory processes in a laboratory environment through experiments on specific tasks, similar to real-world tasks. The goal of the experiments is to help guide the development of IT-support for cooperation through a process-oriented, evolutionary, iterative and participative process (Floyd & Züllighoven, 1997). This approach is facilitated by the construction of future usage scenarios (Carrol, 1995), (Anker, 2002). Scenario design incorporates procedural change in the former unsupported procedural routine. The experimental setting is chosen to guarantee control over the variable factors of (computer) mediated participation processes and to maximize the learning effect from the experiments through detailed documentation. The experiments are set up as role playing exercises in a laboratory environment. They are described in some of our publications (Voss *et al.*, 2003a), (Roeder & Voss, 2002; Voss *et al.*, 2003b), (Roeder & Jankowski, 2003), (Voss *et al.*, 2002).

On the other hand we support real-world processes in cooperation with municipalities. Several pilot projects had shown the need for moderated online discourse in the area of participatory decision making including citizens into the municipal decision making process. We accompany the process from the outline of the plan to the final evaluation, and broaden our experience in dealing with diverse problem classes and task types. We accompanied for example visioning processes, spatial development and planning processes as well as public budget participation processes. Some of our recent publications describe the processes (Märker *et al.*, 2002a), (Märker *et al.*, 2002b), (Märker *et al.*, 2003).

In the early stages of our research, we focused on process plans and models and outlined process phases according to the standard phases of decision making and mediation. Later, we went into the details of the phases and focused on organizing the discourse process between the concerned stakeholders. We deciphered several levels to a process - process, phase and step. Participatory discourse processes show certain schemes. They are usually divisible into several phases, depending on the task, each showing several steps of action. In supporting participatory decision making processes it is hardly possible to stick exactly with a plan in light of dynamically changing influence between task, software and process. Thus, the flexibility of the software is an important aspect, as well as the fact that a moderator (a neutral third party) is needed to restructure the process and configure the system dynamically, and take much of the burden of meta-discussion about the process from the participants.

Albeit difficult because of the interacting factors, it is possible and necessary to plan the process in advance. A long history in the field of group facilitation provided us with on-site process knowledge on group communication situations. This knowledge can be used for planning the overall structure of the process.

In the following, best practices are listed, which we use as a guideline to plan IT-supported participative processes. The paper may serve as a checklist for process designers.

2 Process Preparation

Task types: First of all, the type of the task has to be identified. Several types of tasks may be solved in a participatory way. For example site-selection or the selection of site combinations, as well as the distribution of facilities or of monetary resources are topics to be solved by a group of concerned parties. The insight about the true char-

acter of a process is valuable, but often difficult to gain in the beginning. Each type of task requires its own plan.

Degree of cooperation: The task may be to cooperatively solve the problem at hand. Also, it could be possible that only parts of the task need input of the stakeholders or that the process should be participatory only in a consultative or informative way. A project (or a phase in a project) may roughly be qualified as being closed, informative, consultative or cooperative. Different groups of participants may be involved in different ways. The grade of participation is chosen on the level of the phases.

Stakeholders: Stakeholders are for example representatives of municipal departments, citizens, enterprises, etc. The respective process designers, mostly the moderators but also representatives of enterprises, municipal departments, stakeholder groups or consultants are responsible for planning the participatory process and for inviting all stakeholders. If it occurs during the process, that another party is identified as a concerned stakeholder, the moderator is responsible for including them as well.

Resources: The time frame and monetary resources are general conditions with impact on the process structure. Mostly, they are given and can not be negotiated. They have to be considered as hard constraints during the planning and design of the process.

3 Process Design

There are several levels to a process - process, phase and step. Participatory discourse processes show certain schemes. They are usually divisible into several phases, depending on the task, each showing several steps of action. Recurring discourse schemes, which can be found in different processes, can be called 'discourse patterns'. Discourse patterns are more or less abstract pieces of a discourse plan. They can be found at all levels, the process, phase and step levels. The patterns can be called accordingly macro (process), meso (phases) and micro (steps) patterns (Voss *et al.*, 2003c).

The phases: The phases are influenced from criteria of both, the results of the process preparation phase and the steps of which the phases consist. While intent and goal as well as selection of participants of a phase may be derived from the process preparation phase, its time and resources are also influenced by the steps that make up the phase. A phase is defined through the intent or the task to be accomplished, the number and background of the participants, the time frame and the monetary resources. A phase may or may not have guidance through a moderator, and it may have break-off criteria.

The steps: After the phases and their goals are decided on, the smallest units of the process define which methods and which tools are needed. Steps, the elementary units of a process, may be composed sequentially, in parallel or otherwise interleaved. The composition of these small units has to be planned very carefully to reach the intent of the phase efficiently. The goal of the phases can be accomplished via different steps, out of which the most appropriate has to be chosen (the time frame of the steps is the most varying attribute). A step is defined through its own time frame, its goal, the participants, the moderation method, the tools, the place (e.g. 'distributed') and the collaboration modus (actions can be progressed synchronous and asynchronous).

The steps define how the communicative exchange takes place. They contain the core of the textual discussion. It is crucial to allow the participants enough freedom and flexibility to express their thoughts, but also to provide them with enough guidance through method, media and tool to stick to the task, that is, to reach the intended goal of the step and its phase. Still, more innovative software supported moderation methods are required for cooperative and participative decision processes. Process designers need suitable methods and feasible systems.

Media and tools: Although face-to-face sessions may not fully be replaced by electronic media, IT could support defined parts of processes. In order to help decision makers, a selection of techniques for data analysis, simulation, visualization and modeling has become available, together with software tools such as decision support systems (DSS), mediation and group decision support systems, expert systems, databases and data ware-houses (Lavrac *et al.*, 2001).

They support – depending on the system - several work modes (private, small groups, altogether, anonymous) and several work settings (same place - synchronous, same place – asynchronous, different places – synchronous, different places – asynchronous). A famous groupware classification scheme regarding this context is the time/space matrix (see figure 1).

	same place	different places
same time	face-to-face interaction	synchronous distributed interaction
different times	asynchronous interaction	asynchronous distributed interaction

Fig. 1. Time/space matrix

Online/Onsite: According to the appropriate method for a step, online or onsite realization will be decided.

The appropriate choice of mode as well as media and tools to support the actions electronically is the vital challenge during the preparation of the process. Besides the decision or group support systems this might be email, asynchronous discussion forums, chat, polling, group editors, shared whiteboards, application sharing, audio- or video-conferencing and even phone, fax or SMS. Each step in a plan has to designate an electronic place where the documentation will be stored, optionally applicable to discourse ontology.

Media breaks: As soon as different media and tools are selected, the problem of media breaks arises. How can data and information be transferred from one medium to another, in particular from non-electronic to electronic media, but also from one software tool to another? A solution might be, to use an integrated platform that supports all required features.

Ontology: Also on the step level, the method defines the ontology of the communication. The classification of contribution types (e.g. question/answer, idea/comment) helps to structure a discussion according to a predefined ontology. Discussions can become more precise, comparable and repeatable.

4 Process Realisation

The realization phase is characterized by adapting the process plan to the real world setting. Unforeseen events might come up, that require adaptation of the outlined structure. This is another reason, why it is necessary to support the process by independent moderation. The moderator acts on the content level as well as on the meta level of the process and is also a key figure for the evaluation of the process.

Moderation: In most processes, the moderator is also the process planner. Moderation is an important success factor for online cooperation processes. The moderation accompanies the process; the moderator is coordinator, facilitator and mediator. A question specific to the process and its task is, if the moderator also needs to be an expert regarding the content.

Contrary to onsite moderation, online moderation allows the use of synchronous and asynchronous moderation methods. This is a new area to gain experience in, especially against the background of the number of software tools and media. Onsite moderation methods should not simply be mirrored online, but checked, if there could be adaptations, that lead to resource savings, i.e. if a shortening of the time frame could be reached.

On the technical side there need to be software-features especially for the process moderators. Moderators of electronic discussions should be able to design a cooperative step in detail (participants, roles, beginning and end time, review and publication periods, obligations and rules, etc.). They must be able to monitor and control the discussion process, and to change the setting in a transparent way. Moderators and participants should be aware of the social context: individual contributions of a person, active, passive and absent participants, coalitions and opponents. There should be help to interpret the discussion and identify progress: controversies arising and being settled, chances for compromises, changes of opinions, opening and closing threads, etc. Switching between methods should be easy, so that moderators can initiate a survey, a review, or a private discussion with selected persons rather spontaneously. Writing summaries, restructuring or editing argumentation structures should be easy.

Evaluation: During and after the process, the contracting partner needs summaries and reports. The final report has to document the results of the process.

Beside means to “affect” an e-discourse, e-moderators need “sensors” and “meters” to support their perception in order to intervene intelligently. They need to understand the progress of the discourse, recognize peaks of activity or inaction, potentials of conflict or consensus, passive participants or trouble-makers. And not only the moderator is interested in the progress of the cooperation, the participants also might like to know whether there are many participants online or what tendencies the contributions have (e.g. if there are many pro or contra contributions). Awareness features can help to determine those aspects, and are needed for a comprehensive evaluation of the online parts of the process (Wolff, 2003). For evaluation purposes, online-polls and questionnaires are also features that help keeping the discussion goal-oriented (Salz & Voss, 2003).

Once a successful process is completed, it should be possible to store, maybe generalize, adapt and re-use it. Ultimately there should be guidance for picking good candidates from a library of successful e-discourse plans. We use the term ‘discourse management’ for all ways of re-using past e-discourses as plans or as templates.

5 Knowledge Aspects

From the rather practical viewpoint of the moderation there are mainly three facets regarding the knowledge aspects of the process: the combination of distributed knowledge, the creation of new knowledge and how to embed the resulting knowledge into the framing administrative or political procedures.

Combination of distributed knowledge: Cooperative processes intend to capture and combine distributed knowledge. The knowledge is distributed among the stakeholders. Text based discussion methods are beneficial in phases of knowledge sharing and knowledge exploration, since the publication of knowledge in a forum is a way to document the knowledge comprehensibly structured from the viewpoint of the participants of the text based discussion.

Mostly, the knowledge among the stakeholders regarding the task is sufficient, as they should represent all concerned parties. For highly complex problems, it could be necessary to install a library about the subject, where the stakeholders submit their expertise in terms of short texts, diagrams, etc. If additional knowledge is needed, the moderator should invite the respecting experts to the discussion, or obtain the requested information from suitable sources.

Some doubts exist regarding the citizen's expertise. In processes, in which the citizens are concerned (for example urban development decisions), they take the place of a stakeholder group. Public participation raises the suspicion, that decisions are based on laities preferences instead of expert's knowledge, and also that legal power structures are going to be undermined by favouritism. Often the municipalities fear, that citizens only contribute irrational requests that are either too expensive or too absurd to be considered at all. These doubts on the citizen's expertise may in some cases be justifiable, but experiences have shown, that comprehensive information, serious moderation and the participation of decision makers and key persons in the discussions with the citizens are factors that enable a fruitful discussion with the so called laities. Furthermore, often the citizens are most qualified in assessing possible outcomes of decisions. They are able to anticipate the results of a solution, since they mostly live in the concerned areas for a long time.

Creation of new knowledge: Good moderation can be a catalyser in the process of knowledge creation. Using a few techniques during the discussion process, the moderator motivates the group to explore new ideas and to build new knowledge.

One of the techniques is called 'weaving'. It describes the process of pulling discussions or contributions together like weaving a cloth. Some of the contributor's statements are collected and related to the focus on the consultation, thus they are mirrored back to the consultants in a new interrelation. The moderator might add a new dimension by himself, or end a 'weaving' contribution with an open question (Salmon, 2000).

Another technique concerns knowledge that may not be original, but new to the participants. The participants need to be acknowledged in order to be heard. The on-line moderator avoids the temptation to discount the experience in any way to counter it and enter into argument. The contribution is available for others to read and so it becomes a form of inventory. This promotes the creation of the inventory so that it can be used by others. The moderator may comment on whether the information and opinions being presented are complete and on the quality of argument supporting them (if no other participant does this). This method ensures that the experiences of

participants, whilst valued, are not necessarily considered complete in themselves. The moderator models ways of exploring and developing arguments (Salmon, 2000).

Many other knowledge related moderation techniques can be found in the context of e-learning.

Process embedding: Participative processes are embedded into a framing context. The framing context provides the task that is to be processed in a participative mode by a group of people. The central precondition for embedding the process is the precise description of the process task and the type of the aimed result - e.g. a decision of some sort, a list of guidelines, a vision, etc. The task to solve and the requested outcome type are delivered to the process designers by the institution or group that acts as the contracting authority or in a similar functionality. The degree of cooperation should be addressed – if the process will be of a cooperative, consultative or informative nature. The participants need to know what the contractors expect, and they also need to know what they intend to do with the expected result. Afterwards the process should maintain a certain transparency, so that the participants will be aware of the impact that their work has on the framing context.

For example showed an experience from a case study, that external relevance (process embedding) is the main factor limiting knowledge management in the sense of Horst Rittel: Citizens' participation needs the willingness to listen and to learn and, with regard to the political actors, the ability and courage to put back power claims, or, at least, if politicians do not want to participate, the promise that results will be taken into consideration (Marker *et al.*, 2002b).

6 Discussion

After discussions with municipalities, we are under the impression that the term “e-government” has lost some of its initial power. This could partly be a result of the technique-centred discourse that accompanied its first applications. The need for less technocratic discussions became obvious. We try to focus on participative aspects of e-government as an application field with immediate benefits for citizens and municipality. In this context, we see e-participation as a motor for e-government.

During several events and presentations in municipal contexts, the municipalities expressed their need for very small steps towards e-government and e-participation. Small projects, like the participative design of the homepage of the town, could be first steps towards a culture of e-participation in a city. The successful implementation of small projects should ideally lead to trust regarding the new methods, and further to acceptance and applications of e-participation in bigger project contexts.

Next steps would be to identify small projects that occur in most cities, and to design a standard process plan for each. This way, e-participation can be brought into the cities incrementally, without too much financial charge.

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Developing a Collaborative Learning Support System for a Natural Protected Area

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Abstract. The proposed contribution presents the results of an on going research work aiming at the implementation of a knowledge based system devoted to supporting the local government and the citizenship during the setting up process of a Natural Protected Area in Southern Italy. The system architecture integrates Group Decision Support Technology already available on the enterprise software market with tools enabling a dynamic representation of organizational memory. Organizational memory, structured within information systems supporting decision-making and action in organizational environments, can be a useful mean for developing multilevel (individual, of group, organizational) collaborative learning. Starting from the case study -the process for setting up the Gravina Natural Protected Area-, the paper describes the system's architecture and discusses some problematic issues related to: expert and non-expert knowledge acquisition and representation; possible dynamic representation of organizational memory, creation, use and storage of decision/learning histories, and dimension and relevance of memory.

1 Introduction

The present contribution refers to an on going research work funded by the Italian National Research Council in order to develop GraviCS, an argumentative information system oriented towards cognitive management of the decision making process [6] and developed to support decision making and future scenario building in the setting up process for a Regional Natural Park. Such a process appears very interesting in terms of learning opportunity since it induces relevant modifications in the relation between the environment and its settled communities.

When managing decision making processes in environmental planning, that is, when dealing with the relevant role of knowledge and the related knowledge actors, problematic issues are related to: the models and methodologies for building decision options, the exploitation of involved interests and values, and the exploration of elements which are fundamental for decision making. These themes represent focus points when designing and implementing DSSs' architectures. With regards to problem-oriented DSSs, most applications in environmental planning refer to environmental resource monitoring and management. Process-oriented DSSs, when developed in environmental planning domains, aim at supporting interaction between decision makers and facilitating the management of conflicts which often emerge within

the involved decision making structures. These latter are, moreover, fluid, interpretative, scarcely limited by formal organizational boundaries and are destined to self-define their structure during the evolution of the action process.

In designing the GraviCS system, we try to integrate the two approaches described both designing and implementing a DSS whose main purpose is to organize a dynamic representation of the organizational memory considered means not only of accumulating and exchanging knowledge but also to explore the operability of *transient-scenario*. A *transient-scenario* represents one of the temporary images of the *process-scenario* that is a scenario (in our case an environmental one) which evolves together with its related decision making system and with the community action itself.

Starting from a description of the organizational context of the Gravina (the naturalistic resource being the emergence of the protected area), the paper: i) discusses some problematic issues related to the possible dynamic representation of organizational memory, to the creation, use and storage of decision/learning histories, and to the dimension and relevance of memory; ii) introduces the concept of process-scenarios; iii) describes the decision support system's architecture developed in order to support learning mechanisms in a complex organizational environment in which local government and the citizenship work together.

2 From the Operational Context to the System

The research work started after the publication of the "preliminary studies" for the Natural Protected Area of the Gravina: "preliminary studies", as they are called in the Apulia Regional Law (n.19, 1997), represent a preliminary in-depth analysis of the territory devoted to the implementation of a Natural Protected Area. The Regional Law also defines the formal procedure for the park setting up: after the publication of the "preliminary studies", the regional law imposes the organization of the so called "preconferenze", a sort of public meetings which are not only devoted to a consultancy process but also are searching for political agreement among stakeholders. During such "preconferenze", a preliminary agreement on the park boundaries is ratified but cautionary norms (to be respected until the plan is approved) are not discussed. These are based on a standard grid, very little scarcely context-oriented and highly disruptive in terms of effects on the community due to the fact they cannot have short-term effects. During "preconferenze" period, a great role is given to negotiation processes but no space is left to mutual learning: in this phase even information exchange is inhibited.

While preparing "preconferenze", relevant roles are played by soft forms of local intermediation (based on intervention models characterized by high informality), influence by media, on-going planning processes, politicians' interventions. Elements affecting the parks setting up processes are: the strong political will (sometime the momentary composition of different groups with different behavioural logics), the administrative fragmentation, strong or spread interests.

The roles the local government can play in the process may be different with regards to different action strategies and political goals: 1) the regional authority may start the park setting up process leaving the local municipality and community consultancy no opportunity for consolidating their own knowledge or their own opinion on the park issues (this procedure is coherent with the current normative framework); 2) the local

government and the community interact, discussing the way the Gravina territory can be environmentally protected, and eventually propose to the regional authority to start the park setting up process; 3) the local government and the community interact, discussing the way the Gravina territory can be environmentally protected, and decide to wait for the regional authority to start the park setting up process.

In the end, the local government can play the role of park setting up proponent or be a passive actor of the process.

After long interactions with the Regional Natural Park Office and with the local government, in agreement with the latter, an interactive process coherent with perspective 2) was started. Supported by the local government 24 actors were selected who are concerned with the environmental and territorial themes chosen. Each of the actors was interviewed singularly in order to build individual text profiles describing the role he/she may have in the interaction in terms of cognitive contribution, experiences, and potential links with a wider portion of the community. At present we have planned the first two preliminary *vis-à-vis* meetings: the first will be oriented to a presentation of the initiative and participants; during the second meeting, the interaction support system GraviCS will be presented and a work agenda will be developed collaboratively.

3 Planning the Initiative

3.1 The Organizational Field and Its *Loose Coupling*

The GraviCS research work is carried out within the political and procedural framework described above and tries to give a formal value to the interactive phase preceding the “preconferenze” with a triple goal: i) to enrich the cognitive dimension of this phase; ii) to enable a rapid process of plan design in case of a positive outcome of the interactive process, thus reducing the duration of the cautionary norms; iii) to enhance an active role of the local community (citizens but also local government) rather than a reactive one.

Because the organizational field of the Gravina, as many others complex field, does not coincide with the existing strategic and conflict arena [10] but it includes, far as possible, actors who can potentially play a relevant role in the collective management of the natural protected area, a preliminary analysis was needed in order to define its boundaries and the structure.

In order to define the potential boundaries of the organizational field, it was useful to recognize some of its principal actors, they being also potential users of GraviCS; the structure of the organizational field suggested interesting elements for some GraviCS tasks.

In particular, individual interviews were useful in order to gain information on the field structure defined as interaction degree and nature of the inter-organizational structure [12]. The interviews, in effect, not only supplied the profiles of the field actors and described their potential roles (in terms of cognitive and experiential contribution inside and outside the field) in the interaction process, but also gathered useful information on institutions, sets of practices and other relational contexts.

Looking at the interviews, the organizational field of the Gravina territory shows the existence of a loose coupling among actors and among development policies adopted over the last decades. The loose coupling is a characteristic of all the organizations and, in fact, of all open systems [14], [24], [19]; in the case of the organizational field related to management of the Gravina territory, this loose coupling assumes a special meaning.

According to a thesis proposed and examined by Di Maggio, in effect, the greater the concentration of resources on which organizations are based, the more structured their organizational fields are. In the case of the Gravina Natural Protected Area, the great resources concentration characterizing the field shows a strong potential structuring which is now a non-collaborative structuring. The coupling characterizing the examined organizational field are evidently ambiguous and show the overlapping of environmental planning and management interventions which are fragmented and uncoordinated.

Referring to some of Weick's observations on loosely coupled systems [24] we can recognize in the existing organizational field:

- several situations in which many and different means are used to produce the same output (ex. improvement of the environmental quality is the goal of programs for the Gravina world life protection, for fauna and flora conservation, for historical area rehabilitation, but also of initiatives and policies, oriented to the economic and tourist development, which aim at making the area attractive for potential users);
- the lack of coordination, which is mainly evident in the overlapping of plans, programs and policies sharing the same goals and aiming at the management of the same resources (the archaeological area, the urban area, the Gravina natural area and the areas for the famous wine production are all in the same geographical location but submitted to different norms and constraints);
- the lack of regional norms (the only regional plan, regulating spatial planning in the Puglia region, does not recognize the Gravina area as a relevant environmental location);
- the presence of some action networks which are highly connected but hardly interested in feedback.

The observed organizational field is characterized by a multilevel decision environment where the stakeholders interact and work together, though evidently independent of each other. In this way: i) there is a huge consumption of time and energy because of the disagreements on use of resources; ii) each single stakeholder selects and improves personal practices which aim at shared general objectives but produce overlapping outputs; iii) each single stakeholder organizes communication practices independent of the others; iv) there is an evident decentralization of practical norms.

The process supporting the setting up of the Natural Protected Area has to deal with an organizational field whose loose coupling limit and inhibit both the reactions to external inputs [25] and the diffusion/transmission of information and knowledge, and thus eventual collaborative learning processes. "By definition, a loosely coupled system is... harder to administer" [26].

Although the conditions described above may seem negative, they are exactly the conditions which enable an organization field: to resist sudden environmental changes; to develop a deeper sensitivity to the external environment; to adapt to local

conditions; to tolerate “breaking points” of parts of the system without damaging the whole organization.

In the end, all the issues related to organizational fields which are loose coupled systems represent a set of relevant questions on the theme of transferring and generating knowledge within organizations. These questions become more and more relevant when the organizations are supported by information and technology tools which enhance the generative dimension (both structuring and un-structuring) of the field languages.

In collaboration with the Gravina local government and abandoning the idea to intervene into the park setting up process with a pre-defined organizational model, our research work aimed at supporting the organizational field to start an evolving process which depends on the history of its internal relations and is characterized by collaborative learning. In order to support such a process, we are also implementing a knowledge-based system that integrates information tools supporting group decision making with tools oriented to the dynamic representation of the organizational memory.

3.2 The Organizational Memory

Generally speaking, organizational memory means the set of information stored by an organization during its activities and necessary to make better informed decisions [23]. This information is obtained as result of decisions already implemented and/or explored and are enriched by both individual knowledge and collective interpretations taken from argumentative dialogues.

When structured within information systems supporting the coordination of decisions and actions in organizational environments, organization memory can reveal to be a useful means to develop multilevel collaborative learning (individual, group, organizational), and therefore to support cooperation in multi-task and multi-users environments. Organizational memory, in effect, can facilitate the integration of organization actors, reduce transaction costs and adapt itself to external/internal changes [23]. Organizational learning is easier when individuals and groups, as the agents for knowledge transfer, somehow share cognitive systems and memories.

In information systems, organizational memory is based on systematic monitoring and storing of information streams; therefore, it represents one of the basic tasks of the system supporting the structural analysis of information exchange processes. Since organizations are able to extract meta-information from stored information, organizational memory can help to select actions towards learning but also identify reasons and mechanisms inhibiting it. Finally we can try to improve the learning process: by removing mechanisms recognized as negative and also by recalling those actions considered effective and productive.

In order to improve learning, organizational memory needs to be supported by an effective system. Weick suggests that if an organization has to learn something, the distribution and the accuracy of its memory become crucial characteristics [25]. In other words, an ideal organizational memory system has to be consistent and retentive, and to reach a good distributive capacity. Moreover it should not be an obstacle to creative and innovative activities.

Since the organizational field operating on the Gravina, is a loose coupled field, it presents an organizational memory similar to that of oral cultures: it is an easy modifiable memory, organized by spread knowledge and information sources (sometimes

they are also independent), is scarcely retentive, and is able to store only what it needs for its balance—such balance often coincides with the organizational status-quo.

These characteristics are also characteristics which make the organization creative since they allow the actors of the organizational field to reinterpret the past in a retrospective way (the existence of loose coupling, in effect, can facilitate the combination and the recombination of knowledge-based resources in a way which is flexible and creative).

The “store” metaphor, as representation of memory is no longer adequate to such an organizational field: it needs to be supported in a way which is able to evolve together with the on-going process.

Information technology, for such cases, presents some advantages: it makes the memory contents explicit, modifiable and sharable when needed. By the use of information technology, information propagation within organizational fields with loose coupling can become possible.

3.3 Dynamic Representation of Knowledge: The Use of Transient Constructs in Organizations

In GraviCS the role of the organizational memory is to enable the exploration of the operability of *transient-scenario* (elements of such scenarios are: the park boundaries proposal, the proposal for implementation norms, the action agenda) in a space which is constrained by the existing organizational field and also by other forces governing spatial transformation but external to the field itself.

It is a space constrained by: norms and rules, institutional organizational structures, relationships among stakeholders (institutional and not), rooted practices which are now routines, and practices foreseen as desirable within the preliminary studies to protect natural and anthropic environments.

Organizational memory, therefore, is considered a combination of initial available knowledge of the organizational field (knowledge stored in documents, in practices, in procedures) and knowledge structured in the system itself and being able to describe how initial knowledge has been used by the users during the interactive process.

The system memory, therefore, should take into account both the initial knowledge (the base knowledge) and the process knowledge (which considers evolutions and changes occurring in procedural schemes of knowledge use. The process knowledge and that developed during interaction are evolving and need to be captured, formalized and diffused throughout the whole organizational field.

Concerning the above considerations, some of the cycles carried out in “virtual spaces” enable the users to be involved in a simulation experience; derived learning cycles are typically experiential since the actors are given the opportunities to reflect on the experience, to apply theories and concepts to their observations, and to identify new possible objectives and alternatives referring to the new knowledge continuously generated during interaction. Such mechanisms enable the transaction from one “*transient-scenario*” (and its supporting organizational structures) to the next one.

The series of organizational structures and *transient-scenarios* represent the set of *transient constructs* which are knowledge “containers” [17] facilitating experimentations and changes and whose tasks in the system are:

- to represent knowledge dynamically through its changing (or disappearing) with time;
- to take a picture of the “current” knowledge (in the form of *transient-scenario* – park boundary proposal, norms proposal, implementation agenda).

4 GraviCS Architecture

GraviCS aims at supporting collaborative learning to develop *process-scenario* for environmental planning in an argumentative, interactive environment. The system’s architecture has been designed in order to integrate, in a GIS environment, IT tools traditionally oriented to group decision support and currently largely used in the market of enterprise software [8], [2] with instruments oriented to the representation of organizational memory described in the preceding paragraph.

The GIS environment, although considered a starting reference for the system implementation, represents neither its structural nor its functional heart. Actually, the GIS environment represents a sort of landscape where the system is developed and, with regards to its fundamental functions, it is no more than a tool supporting: i) the visualization of cartographic information, ii) the geo-referring and exploration of hypertexts; iii) the geo-exploration of the data-base.

The GraviCS architecture has been designed in order to enable its users and the system manager to configure the system coherently with support needs, which are evolving together with the process [3], [7], [16]. The system, in fact, initially makes available only some basic functions; it is the user/s to explore, and eventually activate, new tools/functions that are always available but never imposed automatically by the system. This perspective has been considered relevant coherently with the need to develop a support system in a bottom-up approach [4] that is through a close collaboration with the organizational context that uses the system. This perspective has not been translated, within this work through a system converging toward a definitive architecture, but more referred to the idea of developing a system that can evolve together with the evolving interaction/decision process.

GraviCS is a web-based system and is substantially divided into two main modules (figure 1). The first module, with limited access (by the use of passwords) represents a sort of intranet where assistance is supplied to the interaction of a small group; in this module the eventual access of expert consultants is also managed (users can ask for the intervention of further participants whose cognitive contribution is consensually considered necessary for discussion on specific problems).

The second module represents the web interfaces of the system and currently its design still has to be started: we shall consider making such interface active only when, during the park setting up process, the interaction requires enlargement to a wider community whose interaction goals and roles are unknown (not necessarily declared, as it is the case with the small group accessing the system with a password).

4.1 Operational Tasks of the System

The system architecture has been designed considering the relevant goal to support organizational learning. With regards to this perspective the main challenges in de-

signing GraviCS were represented by the system's functions oriented to the creation and the management of the organizational memory due to the need to keep in the system and to make available to users information and knowledge considered relevant for the evolution of the decision making process.

Therefore, the design and implementation work, related to the first module, aimed at two main operational goals:

- transferability of information and knowledge
- accessibility to the interaction process

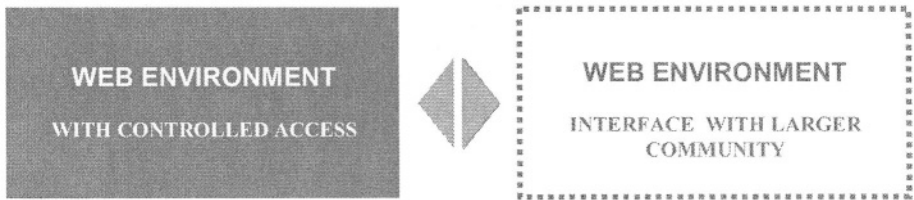


Fig. 1. Two macro-modules for GraviCS

The first goal not only poses the relevant problem of archivation of information and knowledge but mainly that of information and knowledge retrieving from the archive although this archive is rapidly growing in dimension and diversification [9]. The second goal, instead, poses the problem of a dynamic representation of the organizational memory, that is a problem of immediate or slow understanding of the advancement level of the interactive process with regards to its origin, its ultimate goals, the interaction contents, and the different cognitive position of the participants. With regards to the first goal, Conklin [9] evidenced that traditional tools for information/knowledge acquisition and archivation (like those available in enterprise management softwares: e.mail, Lotus Notes, ...) fail in the creation of an organizational memory because of inadequacy in indexing, that is inadequacy to organize the memory itself. In facing this problem, the system privileges an organization based on two main kinds of relations: semantic relations and geographic relations. Semantic relations are represented in the system through hyper textual links, geographic relations are introduced through a geographic indexing linking information and knowledge to maps. In some cases these different relations can contemporarily characterize a relation: two approaches in the archive navigation are possible and are always available to the user, but also parallel navigations in documents and maps are available [1].

The second goal takes into consideration the need to facilitate users' access into the interactive process, both when they are "ordinary" or "extraordinary" participants: the more rarely the user uses the interaction space, the more accessibility is reduced. For this second goal the *traceability* and the *transparency* of the process becomes relevant [18]. Process traceability is relevant in order to enable process access to extraordinary users, that is to newcomers (Marker and Pipek's perspective), and in our case it is a basic issue, with regards to the system goal to support learning mechanisms, in order to facilitate creation of feedback and reflection. In this sense two different synthetic representations of the process trace have been introduced in form of causal maps.

The first representation, of more general nature, is a sequential diagram of the formal process for park setting up: the system of sequential events, constraints, and actors of the setting up process. This first map (*1st level map*), a non-dynamic map, aims at making role and location of the current interactive phase explicit within the whole process as it is structured by the law: this is extremely useful at the start of the interactive process since it is not explicitly included into the formal process.

The second representation (*2nd level map*), unlike the first, has a dynamic framework, that is it changes together with the interaction process: *2nd level maps* visualize the sequences of *causal argumentations* [20] that explain the transaction within the process from one process condition to the next one which is more.

4.2 Tasks and Functions of the Implemented System

GraviCS architecture concerning the first macro-module, is shown in fig.2. It is substantially based on two modules: an archive, containing the normative data base, all the documents of the preliminary studies (expert studies), and the process memory; and a work space, the module supporting the argumentative dialogue[15].

A further module is a sort of container of useful instruments (tools box): it is accessible both by users and system managers and contains instruments which are eventually useful for interaction but are made available only if their use is expressly required by users or suggested by the system manager.

The implemented system supports the transition from one state of the interaction process to the next: the transition from one state to the other is represented by a transaction (positive, negative or partial) of a causal argumentation and is formalized by the system through the transition from one *transient-scenario* to the other. A sequence of *transient-scenarios* is considered to give shape to the *process-scenario*. Causal argumentations are produced and discussed in an asynchronic interaction environment, or in a synchronic environment (with forum and chat opportunities), or also in vis-à-vis interaction spaces.

The *Archive* represents the space where three functions are implemented: exploration, archiviatio, and visualization. All the three functions are supported by the hypertextual organization of the documents and by geographical indexing.

The process memory contains *1st* and *2nd* level causal maps. In particular, the *2nd* level maps are connected to the documentation of each *transient-scenario* to which they refer through the hypertexts and the geographical indexing. The process memory is updated every time a transaction of a causal argumentation is completed.

Very often, argumentative processes become dialogues between stakeholders [22]. The *workspace* aims at supporting these dialogues on the current *transient-scenario*. Argumentative dialogues represent a possible space where informal knowledge can be made explicit. Informal knowledge acquisition is somewhat problematic since the dialogues are informal themselves and are not recorded. The main task of this module is, therefore, to record structured dialogues through the creation of a framework of observations/argumentations and related comments. The former are producible in the individual environment (asynchronic space) and can have geographic indexing (if they are derived from a reflection on the park boundaries) or be mutually related through hypertext links (if they refer to norms or to the implementation agenda). To each observation/argumentation, users can attach a set of comments: observation/argumentation and related set of comments represent the starting point of fo-

rum/chat discussions; forum, that can be remote or vis-à-vis, can be accessed also by extraordinary users (invited experts, consultants, institutional representatives, ...), eventually required by the group. To the active *transient-scenario*, in the i^{th} current state, a set of causal argumentation (based on observations/argumentations and related comments) is associated; within the forum/chat environment the causal argumentation can activate the transition from the i^{th} state to the state $i+1$ when the transaction is completed.

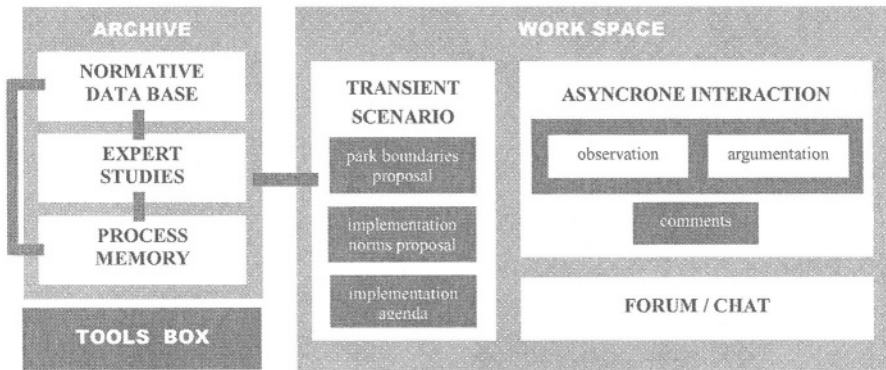


Fig. 2. GraviCS architecture

The *Tools Box* represents the space where many instruments supporting the interaction work and the system management are located. Basically, the box contains three categories of tools: interaction tools, representation tools and evaluation tools. Interaction tools are software able to create forum/chat environments, to supply remote support for mailing and interviewing. Representation is supported by software working in GIS environment and support map editing; representation tools are also instruments supporting causal maps production when they are developed both by users or automatically through text-analysis [5], [13]. The latter option is especially useful for the automatic up dating of 2nd level maps, starting from textual recording of argumentative dialogues. Finally, evaluation tools are software supporting multicriteria decision making in group environment (Expert Choice e Naiade).

5 Future Perspectives

GraviCS has been developed in order to support both mediated and vis-à-vis interaction and to leave to the users the opportunity to ask and plan for different interactive conditions. Moreover, this flexibility appears relevant also with regards to learning opportunities due to the need to record the processes of information and knowledge creation, exchange and selection in whatever interaction conditions they are needed to be carried out.

As already announced in the introduction, the research presented in this paper is still on going. We are now completing the implementation of GraviCS. In implementing GraviCS, we are trying to leave the implemented architecture as flexible as possible in order to have the possibility to fit the system to the planned agenda (the agenda will be discussed during the next meeting with the small group of stakeholders).

Many problems still feed wide areas of reflection and suggest possible directions for further research. The most relevant appears the problem of dynamically representing the organizational memory through both causal maps and transactions of causal argumentations. This approach needs to be tested with regards to the opportunity to evaluate the activation of learning mechanisms and their eventual progress.

The greatest challenge in this sense can be considered the dynamic approach in organizational memory management and in the representation of the decision making process. In order the system to be effective in this sense, it is necessary that system and users develop the same approach in building dynamic views of the process and of its evolution in the system representation: this asks for a deep flexibility of the system which, although many efforts, still does not really appear satisfactory in this sense.

Future changes in the system architecture and functions need to be planned coherently with the feedbacks deriving from the tests of the system in the users community and with the first attempts that will be done in order to recognize whether it is useful or not to support in some way learning process not limited to the individual level.

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Learning to Become an E-citizen: The European and Italian Policies

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Abstract. It is almost generally acknowledged that the application of ICTs may represent a strong vehicle for social innovation and progress in the hands of governments, of political representatives and of citizens. So, when the focus is on *e-Democracy*, which nowadays represents one major strategic approach of ICT applications, it must be interpreted and explored in connection with the more general, traditional and philosophical concept of *Democracy*. In the World Wide Web context the citizen becomes an *e-Citizen*: this means that citizens must learn how to turn real citizens of an electronic community and how to use the Internet possibilities in order to become aware of what *e-Citizenship* implies.

1 Democracy in Modern Societies

It is almost generally acknowledged that the application of ICTs may represent a strong vehicle for social innovation and progress in the hands of governments, of political representatives and of citizens. So, when the focus is on *e-Democracy*, which nowadays represents one major strategic approach of ICT applications, it must be interpreted and explored in connection with the more general, traditional and philosophical concept of *Democracy*.

The consideration whether or not *e-Democracy* shall be a natural extension of representative and liberal democracy, as practiced today in most western countries is not to be neglected. Before debating on the possibilities and prospects of *e-Democracy* implementation, it is necessary to understand the meaning of *Democracy* and what it nowadays implies.

Theories on democracy are numerous. Throughout the centuries, democracy has undergone many changes, as the size of the citizenry has evolved from a narrow, exclusively defined body that participated in a collective will within small city-state (*direct democracy*), to a universal suffrage system (*representative and liberal democracy*).

Conceptually democracy may be defined in relation with political participation, representation and the citizens' capacity to choose freely¹ [10].

According to James Fishkin [9], four conditions are necessary for citizens' political participation and engagement: political equality, deliberation, participation, and non-tyranny².

According to the philosopher Alain Touraine [13], representative democracy takes place when "there is a democratic will to enable those who are subordinate and dependent to act freely and to discuss rights and guarantees on equal terms with those who possess economic, political, and cultural resources."³ So, the concept of citizenship is based on a guarantee that all citizens of a country have the same legal and political rights, regardless of their social, religious, or ethnic background and implies that individuals are actively responsible⁴.

Since it is becoming apparent that the emergence of *e-Democracy* is starting to have some impact on both governments and society, a few questions need to be posed if we are moving to a new form of democratic participation. Does the evolution of *e-Democracy* practices enhance the democratic system currently present in societies or is this change able to bring to new forms of democracy?

2 E-citizenship in the Knowledge Society

A citizen is an active member of a community or society provided with rights and duties conferred by that community. In the Information Society and the World Wide Web context the citizen becomes an *e-Citizen*: this means that citizens must learn how to turn real citizens of an electronic community and how to use the Internet possibilities in order to become aware of what *e-Citizenship* implies. Generally speaking the concept is integrated with aspects specifying it significantly: they are *e-Democracy* and *e-Government*.

e-Democracy refers principally to the participation in a government or democratic activity online or to using the Internet to further a cause or express an opinion, that is online participation in an *e-Society* [4]. It is widely believed that the Internet enables people to connect from all over the world who share the same beliefs and principles through websites or e-mail discussion groups and this would result in the changing of government policies. In this way existing communities will be altered and new ones might emerge with new relationships and new citizenship scopes.

The notion of *e-Government* is very recent and covers the possibility of public administrations to offer services and information through new media or interactive tools, taking advantage from the innovative prerogatives brought about by ICT.

e-Democracy and *e-Government* issues are therefore key factors for the development of *e-Citizenship*.

¹ David Held, *Models of Democracy*, 2nd Ed., Stanford, CA: Stanford University Press, 1996: xi

² James Fishkin, *The Voice of the People*, New Haven and London: Yale University Press, 1995: 34-41

³ Alain Touraine, *What is Democracy?* Translated by David Macey, Boulder, Colorado: Westview Press, 1997, p. 11.

⁴ *Ibid*, 1997, p.19

In order to take advantage of new *e-Democracy* and *e-Government* resources, individuals need to attain an interdisciplinary basic education giving attention to those issues referring specifically to the implementation of *e-Government* policies and to the new citizens' possibilities arising from an *e-Democracy* prospect. This may include an understanding of how change can be brought about and what individuals can do in relation to these issues.

The creation of an *e-Democracy* system will allow citizens to participate more actively in politics, subsequently bringing greater clarity to the decision-making process of their elected political representatives and taking part to local government's activities through online tools, or using the Internet for expressing their opinion or suggesting new important initiatives. On the other side, citizens will have the opportunity to access any kind of information of interest for them at a convenient time and place through websites which are rich of updated and relevant information.

Within this general framework attention is to be focused on those features of *e-Government* and *e-Democracy* which are essential for developing and implementing *e-Citizenship*, starting from a consideration of European and Italian official documents where these approaches are identified as priorities for the realization of the Knowledge Society.

3 E-democracy Definition and Features

In recent years, when dealing with *Electronic Democracy* and the new communication space offered by telematics networks, reference is made to those aspects which identify computer-aided democracy with direct democracy, that is the access to politically relevant information (*teleconsulting*), the availability of pluralistic discussion places (*electronic conferences, newsgroups and e-forums*) and the possibility for all to intervene in decision-making (*e-voting, permanent polls, televoting*). Therefore, *e-Democracy* means that citizens will not only use technology to inform themselves about current events, but will also use it as a voting tool in both their national and local elections or administrations and as a means for active participation.

According to the OECD Public Administration Group (PUMA) that has been conducting extensive studies on *e-Government* and *e-Democracy*, three main components are required for implementing online interactions between governments and the citizens: information, active participation and consultation.

A Scottish organization, the International Teledemocracy Centre, aiming at strengthening democracy through the use of innovative ICTs stressed the attention on two relevant types of relationships between governments and citizens, the one where citizens are given the opportunity to give feedback on specific issues; and the other, based on partnership where citizens are actively engaged in the policy-making process.

According to the definition given by Steven Clift [2], an expert in this field, *e-Democracy* means the use of information and communications technologies and strategies by *democratic actors* within the political practices of national, regional and local communities: they can be identified as governments, elected officials, media and major online portals, political parties or interest groups, civil society organizations,

international governmental organizations or citizens/voters. However, nowadays only citizens can experience *e-Democracy* as a whole.

Other theoreticians such as Coleman & Gotze [3], Van Selm & Hollander, argue that *e-Democracy* implies the use of ICTs and of computer-mediated communication to favour active citizens' participation; it also supports a collaboration between the actors of policy decision-making without the limits of time and space whether acting as citizens, or as elected representatives, or on behalf of administrations, parliaments or associations within the political processes of all stages of governance.

According to Tsagariousianou, electronic democracy consists of three components: information provision, deliberation, and participation in decision-making.

In more digitally developed countries democracy is experimented as *e-Citizenship* at some level of governance and public life, while in the majority of the other countries the impact of *e-Democracy* reaches actually most of the public only through its influence on traditional media.

By giving emphasis to *e-Democracy* and *e-Citizenship*, some benefits are to be expected. When governments make information and policy available online, citizens may become more aware of public affairs and when participating in the decision-making process, better choices and decisions will be taken. When governments establish an online presence (*civic nets* or *portals*), they may take full advantage of ICTs enabling an open dialogue between policy-makers and civil society and receiving citizen comments and feedback. In addition, political groups can run online advocacy campaigns and political parties may promote their programs online.

Of course *e-Democracy* may increase its benefits, as technology enhancements and online trends from the Internet are continuously being adopted and adapted to political and governance purposes. As e-mail, wireless networking, weblogs and other tools move in from other online content and technology areas, innovation and change catch up.

Traditionally, citizens participate through voting and other means allowed by a State constitution such as the referendum. However, with *e-Democracy*, not only can citizens provide feedback, they can interact through discussions, negotiations, and other methods that would have normally required personal interaction. Online discussion groups or forums, which can increase citizen participation in policy and complement existing democratic structures, may become the premises for two new potential instances, such as *e-Voting* and *e-Participation*.

e-Participation focuses its attention on the implementation of digital tools for developing a new kind of relationship between the citizen and the public decision-maker, that is, a direct and immediate dialogue between them, while *e-Voting* means that the citizen's right to vote will be expressed utilizing new technologies.

However, both electronic voting and participation are more a theoretical approach than a practical reality, although technology has advanced to the point that systems can guarantee total security and reliability.

4 European Actions in E-democracy

e-Democracy implementation is being greatly stressed by the European Union, as it appears in recent political actions, two of which are to be mentioned as particularly significant [5].

On 6 December 2001 the Committee of Ministers of the Council of Europe adopted the Recommendation No. 19/2001 addressed to Member States on the participation of citizens in local public life. This document considers the participation of citizens as the core of the idea of democracy and their involvement in political activity and in decision-making as the lifeblood of any democratic system. Member States are to adopt some basic principles for improving local democratic participation within their national system, aiming at assuring the rights of citizens to have access to clear and comprehensive information about their local community and to have a say in political decisions affecting their community's future. They must also seek for new modalities to enhance civic consciousness and promote a culture of democratic participation shared by citizens and local authorities; they are to develop the awareness of belonging to a community, to encourage citizens to accept their responsibility and to contribute to their community life, to give major importance to communication between public authorities and citizens, so that local administrators pay attention to demands and expectations of the population.

Together with these principles some general steps and measures for encouraging and reinforcing citizens' participation in local public life are indicated.

One key measure is that which aims at "*improving citizenship education and incorporating into school curricula and training syllabuses the objective of promoting awareness of the responsibilities that are incumbent on each individual in a democratic society, in particular within the local community, whether as an elected representative, local administrator, public servant or ordinary citizen*". As regards young people in particular, the attention is given to the school system which is to be developed as a major common arena for promoting participation and democratic learning processes.

Another key measure refers to enhancing participation in local elections through more convenient voting procedures, such as the introduction of new voting options (*postal voting, post office voting, electronic voting, and so on*).

To favour the implementation of these actions, during the Greek European Presidency in 2003 the European Union undertook a very important initiative: *e-Vote: vote for the EU YOU want* [8].

The project aims at experimenting the use of the Internet and of new technologies for getting more people involved in the discussions and decision-making process of the EU government. It refers to the adoption by the European Union of some experimental *e-Democracy* tools. According to the project a website (<http://evote.EU2003.gr>) has been organized into different sections through which Europeans may have access to different relevant topics and can participate in decision-making. The section *Online Voting* refers to how well the EU is working today, to ideas for changes and future reforms in issues such as environment, immigration, economic growth, social exclusion and foreign affairs. The section entitled *Special Votes* relates to special meetings and events on key issues such as State enlargement, drug policy, peace and security. In the section named *Your Question*, the citizen can ask questions to politicians on important topical issues. *Your Voice* is an open-ended section where citizens can make their comments and offer their ideas and suggestions about anything is important to them, to Europe and to the collective future and *New Features* offers innovative and creative opportunities to use technology for active participation. At the moment this website has been accessed by more than 180.000 *e-Voters*.

5 Italian Political Policies in E-democracy

Following up the strategies set out by the European Union for the development of the Knowledge Society, in recent years also the Italian government has shown great attention to change and innovation not only in the digitalization of public administrations (*e-Government*), but also in the contemporary enlargement of citizen participation to political strategies in order to move the community towards a global *Governance*.

Therefore, any action towards these directions must be based on a coherent and organic set of initiatives involving not only infrastructures, service tools and distribution systems but also contents, that is the management of change and of consequent legal adjustment as well as the development of new cultural involvements [11].

The main steps of the Italian political strategy [6] are represented by the adoption of an *Action Plan for the Information Society* approved on 16 June 2000, integrated by a more specific *e-Government Action Plan*, approved on 22 June 2000, and by the approval on June 2002 of the *Government's Guidelines for the Development of the Information Society*. However, only most recently the Italian Minister for Innovation and Technologies has promoted specific actions for the development of *e-Democracy*. In fact, at the end of October 2003 the Government has effectively launched the second phase of *e-Government* implementation within regional and municipal authorities, consisting of various action lines, two of which specifically devoted to the introduction of digital citizenship (*e-Democracy*).

The *e-Democracy* action aims at promoting the use of ICTs as the main tool for developing citizens' participation to public administration life with the aim of improving the efficiency of political decisions and their sharing by all involved actors.

This action is strictly connected with the one promoting education and training as ways for enhancing innovation and *e-Government* implementation. The stress is on *virtual education*, based both on *e-learning* tools and on the creation of *specific masters on e-Government issues* to be organized in collaboration with university centres.

6 E-democracy Trials

A few limited cases of online public engagement in policy-making have already been experienced all over the world [12]. Where examples can be found, they are of an experimental nature as online public participation is still in its infancy. Almost all of the cases analyzed are characterized by two problems: too few people know about experimented trials; governments fail to integrate them into the policy decision-making process.

6.1 E-democracy Experiences in the World

Numerous studies are under way on how to implement electronic voting and participation and a certain number of highly circumscribed cases have already been experienced all over the world although they are mostly limited to *e-Voting*. The first example may be considered the distant *e-Voting* procedure experienced in Arizona in 2000

during the election of the representative of the Democratic Party to the US Presidency. The voters, besides the traditional method, were able to express their preferences by means of a special electronic voting card going into specially equipped polling stations spread all over the State or by simply utilizing their personal computer.

The last municipal elections that took place in Great Britain in 2002 are also an interesting example. The electronic vote was experimented in 29 districts together with the traditional paper method. The citizens by means of smart cards enabling them to exercise their electoral right could vote by simply touching the screen of *ad hoc* computers. Some of them could also use sms messages on cellular phones.

Since experiences from abroad have shown that the use of the Internet can increase voter participation, especially among young people and that this approach is cheaper and more efficient when the votes are to be counted, other countries are going to experiment *e-Voting* in the near future.

The Danes will experiment with *e-Vote* in the European Parliament election 2004. In fact, 15,000 Danish voters in the Council of Ishoj, near Copenhagen, are to participate in an experiment on Internet voting in the European Parliament elections of next June. The Ishoj Council joined up with the European Parliament office in Denmark in order to enable Internet voting on voluntary base.

The Estonian Government recently announced its plan to introduce on-line voting for general elections.

The canton of Geneva in Switzerland is planning to allow remote voting by the Internet for its local elections this year and, in Germany, cities such as Bremen and Cologne have announced that citizens will be able to vote online by 2006.

6.2 E-democracy Trials in Italy

Electronic voting and participation through the Internet have been experienced also in Italy [1], where it is possible to make polls, to vote and to take part to political decisions in those local governments where civic nets have been implemented. Italian civic nets, started in 1995 and presently almost completely spread throughout Italy, offer citizens the opportunity to contact local governments, although they have been created for giving access to public services.

There are only a few *e-Democracy* trials which can be identified in the Italian political framework, with *e-Voting* experiences being the majority with respect to *e-Participation* examples.

Recently some Italian municipalities have experimented *e-Voting* procedures, participating at a large European project called *e-Poll (Electronic Polling System for Remote Voting Operations)* [7] financed by the European Commission within the 5th Framework Programme. The *e-Poll* partners were six: the Italian Ministry of the Interior, Siemens Informatica, France Telecom, Ancitel, Aquitaine European Communication and Municipium.

The main goals introduced by *e-Poll* concern the organization of voting processes and the promotion of the *European Virtual Ballot Network* (EVBN) for supporting new voting procedures. This network will make it possible to use *e-Poll* kiosks anywhere, within a private, reliable and protected context wherever constituents may be

on the election day. The voter-recognition system is based on an innovative smart card with an embedded biometric fingerprint reader, which performs voter recognition with absolute security.

Besides reliability and security, this project aims at challenging the different countries involved on the following issues: need to adapt legislation, need for full confidence in the voting process on the part of voters and the administrative authorities, and the guarantee of preservation of current roles in the election process. Its final aim is to build up an *e-Voting* prototype to be implemented in each Member State of the European Union.

The first pilot phase was experimented in Italy between 2001 and 2002 by the municipalities of Avellino, Campobasso and Cremona.

During the constitutional referendum held in October 2001 Avellino was the first Italian municipality adopting the remote electronic vote. All citizens belonging to a specific polling section (section number 1) were requested to express their vote not only by the traditional paper card in the regular polling station but also by utilizing an electronic voting card in a polling station equipped with electronic devices. This special *e-Poll* card, commonly called *Polly*, identifies the citizen as it contains his/her personal data and his/her right hand forefinger print and replaces the traditional recognition of the citizen by the polling station president. These digital votes were crypted with no reference to the electors and directly received by the virtual ballot box of the Ministry of the Interior for the final counting.

One year later this experimentation was repeated during the administrative elections in Campobasso.

The municipality of Cremona tested the *e-Poll* system simulating an election on two specific items (pedestrianization and mobility) of interest to the local community. A sample of one thousand citizens was selected and invited to vote by means of an electronic voting card on a fixed election day in three specially provided kiosks.

After these experiments, other municipalities started their trials. The municipality of Milan, for instance, is developing the *TruEVote (A secure and TRUstable IntErnet VOTing systEm)*. The project aims at building up an electronic voting system based on the Internet and the digital signature, but also on the requisites directly proposed by the potential voters. Also the Italian government established in its *Guidelines for the Development of the Information Society* an extended trial during the 2004 elections for the European Parliament and for local administration governments (*election day*).

As for *e-Participation* trials, the *Iperbole* Project experimented by the Municipality of Bologna in 1999 is to be identified as the first significant case. The local government, before deciding on a certain matter, puts the draft of its decision online in an appropriate space of the civic net and leaves such a draft for 15 days, during which all citizens can express their opinion on the topic and in this way participate in public decision-making. Another example is that of the municipality of Jesi, which has recently activated an *e-Participation* section in its civic website, where citizens can make their comments and suggestions on the specific drafts on which the Administration seeks the citizen's opinion.

Other municipalities followed these examples, such as Rome, Milan, Turin and Venice. However, the evolution towards the implementation of *e-Democracy* models all over the country is speeding up day after day.

7 Promotion E-democracy through Learning

As already underlined, it is impossible to attain huge transformations within the public administration system without, at the same time, focusing attention on the human resources involved in the use of services (*citizens*) and in the realization of them (*public servants*).

It is well known that large sections of the population do not have the necessary knowledge required for using information technologies and, therefore, risk being excluded from the digital revolution unless massive policies favouring widespread computer literacy are to be promoted. Digital literacy initiatives are, therefore, to be considered the major tool for promoting innovation in the various fields of the community economic and social life and for moving towards the Knowledge Society. Moreover, schools and universities are recognized as the basic channels for digital literacy and, in order to offer global responses, proper training and updating courses are to be implemented and present curricula are to be adjusted in order to include attention to innovation problems.

The transformation of abilities of human resources (comprising citizens and public servants) can be managed by traditional means (*classroom teaching*), but especially through innovative approaches, such as, *e-Learning*, which in different official documents is acknowledged as the most suitable tool for attaining the expected results. The importance of *e-Learning* derives from the urgent need for providing a sort of ongoing retraining of skills which are becoming obsolete very quickly, while the traditional education model appears to be no longer sufficient.

As to the conceptual framework of this kind of education, attention should be paid to technical issues able to guarantee a basic technological background and to political and legal issues, essential for the promotion of the Knowledge Society, especially those referring to the cultural involvements of *e-Government* and *e-Democracy*. As already underlined, in fact, *e-Democracy* has no future without the realization of *e-Government* issues.

It is therefore useful to focus the attention on those educational initiatives that are being carried out in Italy for the training and updating of public servants and for the acquisition of basic digital literacy by general citizens.

From a brief survey on recent teaching experiences in the field it emerges that the attention is prevalently focused on university graduate or postgraduate courses for giving young people some professional expertise, as it appears from a few selected examples.

A Master's for lifelong learning was promoted this year in Rome by the European School of Economics, entitled *Internet Law*, dealing with the issues of Information Society and globalization (privacy protection, *e-Commerce*, digital signature, cyber-crimes, digital intellectual property, *e-Government*) and some *e-Learning* seminars on PA innovations and on *e-Procurement* and *e-Commerce* for lawyers were also held.

Other Masters' were organized by the University of Camerino (*Law, Economics and New Technologies*), Bologna (*Information Technology Law and Legal Informatics*), Pavia (*New Technologies for the Public Administration and E-Government*) and Rome (*Ma.Go.L. -Local Government Management and Institutional Communication and Organisation through Advanced Technologies*).

The Master's held in Camerino is a post-graduate course, aiming at training qualified experts in the use of new technologies and at making them aware of the legal aspects involved. Teaching is partly traditional and partly online. The course consists of 10 modules, dealing with computer science aspects, digital literacy, legal informatics, *e-Commerce* from the economical and legal point of view; digital documents, domain names, computer crimes, telecommunications law; a module is devoted to *e-Government* issues, treating specifically the relations between technology and PA, the right of access, legal documents drafting and *e-Procurement*.

The Master's held in Bologna was promoted by CIRSIFID and focuses especially on the main domains of information technology law (*e-Commerce*, intellectual property, privacy protection, security, digital signature, informatics applied to the Public Administration).

The Master's held in Pavia aimed at training on technological and legal responsibilities strictly connected with *e-Government* and *e-Democracy* issues.

One Master's which is held between February and July 2004 will be devoted to the *New Communication Technologies Law*, with special reference to Internet Law. The course is organized by the Catholic University in collaboration with the Ragusa Municipality and the electronic journal "Diritto&Diritti" and aims at preparing new professional figures particularly skilled in the application of technological tools and legal issues arising from the development of the Information Society. It is a course based on the so-called *blended learning* approach, that is some distant online lessons are held in addition to traditional classes. Teaching materials are available online in the www.diritto.it website.

The course deals with a general legal framework of Information and Communication Law, with Private Computer Law (*e-Commerce*, electronic contracts, digital signature in the European and in the Italian context, domain names, Software Protection) and with Electronic Administrative Law (subjects and activities of new technologies management, digitalisation of Public Administration, *e-Government*, *e-Democracy* and *e-Procurement*).

Another Master's to be mentioned is the one organized by the University of Rome (Roma Tre) on the *European Citizenship and Public Administrations*. The attention is on the European legal context, that is the historical background, the institutional framework of UE and the European fundamental rights Charter, the instances of the European citizenship with special reference to *e-Government* and *e-Governance* issues.

None of the courses are expressly devoted to enhance the citizens' awareness towards participation to the governance of public administration, while the realization of *e-Citizenship* has already shown, at least at theoretical level, the sprouting of new citizens' fundamental rights, skills and prerogatives which are to be considered in the new objectives of education and lifelong learning.

8 Conclusions

The engagement of citizens in policy-making does not mean diminishing, but on the contrary strengthening the representative relationship. ICTs provide new opportunities to connect citizens to their representatives, resulting in a less remote system of democratic governance. Providing them with appropriate information about policy issues

and utilising public experience and expertise in the policy formation process, requires anyhow the development of a critical and deliberative political culture.

Therefore, to make full use of *e-Democracy* and *e-Government* resources, individuals need to have a basic level of technological, legal and political literacy. Thanks to *technological literacy*, in particular, they would be able to access to the Net for analysing all information sources contained in the telematics networks, while through *legal literacy* they could become aware of their rights and duties with respect to the Knowledge Society and, finally, through *political literacy*, they will become able to interact and debate with their local institutions and administrators.

The right to digital literacy as a lifelong education becomes fundamental for the development of the Knowledge Society and moreover represents an evolution of the fundamental right to education.

Anyhow, if we consider the present panorama outlined above, we can observe that we are still far away from the realization and globalization of a *lifelong education right* as a fundamental right for each citizen. The way is still long. Courses oriented to offer basic digital literacy to ordinary citizens are very rare. Only some post-graduate (Masters') were promoted in some main university centres, but they are usually attended by graduate students wishing to locate themselves within the evolution process of the Information Society.

At the moment it seems very worthwhile - also the recent Italian official document sets forth - to create *ad hoc* university *curricula* and *Masters* specifically oriented to *e-Government* and *e-Democracy* issues. These should be inserted within the law school system or applied in post graduate courses, in order to create new skilled professionals able to better implement *e-Government* actions and to support citizens in becoming more aware and informed of their rights and of the services available to them.

Anyhow, it is to be pointed out that even if priority is to be given to the training of public servants, who are the first actors involved in the development of the Knowledge Society and, therefore, the right people for promoting change and innovation in the citizens' behaviours, it would be also necessary to organize specific courses on *e-Democracy* culture and tools for offering the general public the opportunity to become aware of their new rights and possibilities.

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Organizational Factors Affecting Knowledge Sharing Capabilities in E-government: An Empirical Study

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1 Introduction

E-government, a concept that emerged in the late 1990s, is facing challenging opportunities for improving public service delivery to individual citizens. The Internet, the World Wide Web, and other digital tools are transforming the ways in which business, the public, and government communicate, and altering citizen demand for government service delivery [6, 32]. Public expectations for fast and convenient service delivery and institutional needs for efficiency are motivating agencies to experiment with e-government ventures[4]. Modesitt[27] and Greeves[18] are among a growing number of researchers taking note of government use of the Internet, Geographic Information Systems (GIS), and Web technologies to establish external collaboration, civic engagement, networking, and customer service. E-government services are clearly expanding and will continue to do so; the speed at which the expansion occurs will be limited only by the speed at which technical and financial capacities evolve and organizational/managerial philosophies emerge.

There is an increasing emphasis on the importance of knowledge management beyond information system management in both the private and public sectors [8, 10, 16, 31, 30, 35]. Specifically, the application of advanced information technology to public service has brought new attention to the ability of government agencies to coordinate and enable the creation, integration, management, sharing, and transfer of information within agencies and in governmental networks. The importance of knowledge sharing in e-government has been emphasized in public administration along with the emerging discourse of network governance and network management. However, despite considerable research emphasis on information management and e-government, there has been little research pertaining to a systematic analysis of the organizational factors affecting knowledge sharing capabilities in the public sector.

The purpose of this paper is to analyze how organizational structure, culture, and information technology influence knowledge sharing capabilities in public organizations. To enhance our understanding of the organizational factors affecting knowledge management in public organizations, survey questionnaires were sent to employees in five national government agencies in South Korea to elicit their opinions on how organizational structure, culture, and information technology influence knowledge sharing capabilities. The five government agencies selected for this exploratory study have established knowledge management information systems as well

as information technology infrastructures for e-government services. According to a United Nation (UN) survey of e-government projects in 2001, South Korea ranked 15th among 98 nations working to expand their e-government capacities [36]. This is an important trend in that country, since the percentage of South Korean citizens with Internet access has expanded from 6.8 in 1998 to 51.5 in 2001 [15]. Since 1987, the Korean government has established an information technology infrastructure that includes 3 national, 16 metropolitan and provincial, and 232 city, county, and district government networks. Following the development of this IT infrastructure, the South Korean legislature passed a 2001 law promoting the establishment of e-government services.

The results from a multiple regression analysis of the collected data will be presented, followed by a discussion of the major findings and their implications for knowledge sharing capabilities in government. The paper concludes with several suggestions for improving knowledge management in e-government and future research.

2 Literature Review and Research Model

2.1 Knowledge Sharing Capabilities and Organizational Factors

Davenport and Prusak [10] define knowledge as a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. They note that in organization, knowledge often becomes embedded not only in documents but also in organizational routines, processes, practices, and norms. As knowledge is a central resource of government service, effective knowledge sharing in the public sector is a significant public management challenge for providing excellence in public service. Particularly, knowledge-sharing capabilities are considered key to the success of e-government to meet the needs and demands of constituencies in all levels of government. The creation of knowledge sharing capabilities in public organizations requires dissemination of individual employees' work-related experiences and collaboration between individuals and between subsystems of the organization. In addition, collaboration with other agencies and stakeholders is the basis for improving knowledge sharing capabilities [14, 20], in the public sector. Several researchers [11, 17] suggest that combining or integrating knowledge in different parts of the organization reduces redundancy, enhances consistent representation, and improves efficiency by eliminating excess volume.

This paper explores how three organizational dimensions as independent variables influence knowledge shaping capabilities in public organizations (see Figure 1). These three dimensions are organizational culture (visions and goals, trust, and social networks), organizational structure (centralization, formalization, and performance-based reward systems), and information technology (IT application, and end-user focus).

Organizational Culture: Scholars indicate that organizational culture is central to an organization's ability to manage its knowledge more effectively [11, 8, 12]. Three components of organizational culture receiving consistent attention related to

effective knowledge management include clear organizational vision and goals [24, 21], trust [37, 29, 21] and social network [25, 29]. As noted by Leonard [24], an important component of culture is organizational vision. Several scholars also note that the overall vision generates a clear organizational purpose so that it can achieve its desired future goals [21]. Clear organizational vision and goals are also important to engender a sense of involvement and contribution among employees [9, 29]. Along with clear organizational vision and goals, Von Krogh [37] suggests that trust and openness in organizational culture promote employees' active knowledge management behaviors. Scholars and practitioners also indicate that communications, dialogue, and interaction between individuals or groups are important to support and to encourage employees' knowledge-related activities[25, 29] . Especially, formal and informal relationships and contacts are important for sharing different perspectives and knowledge in organizations [29]. In this study we explored how organizational culture, including visions and goals, trust, and social network affect employee's knowledge sharing capabilities.

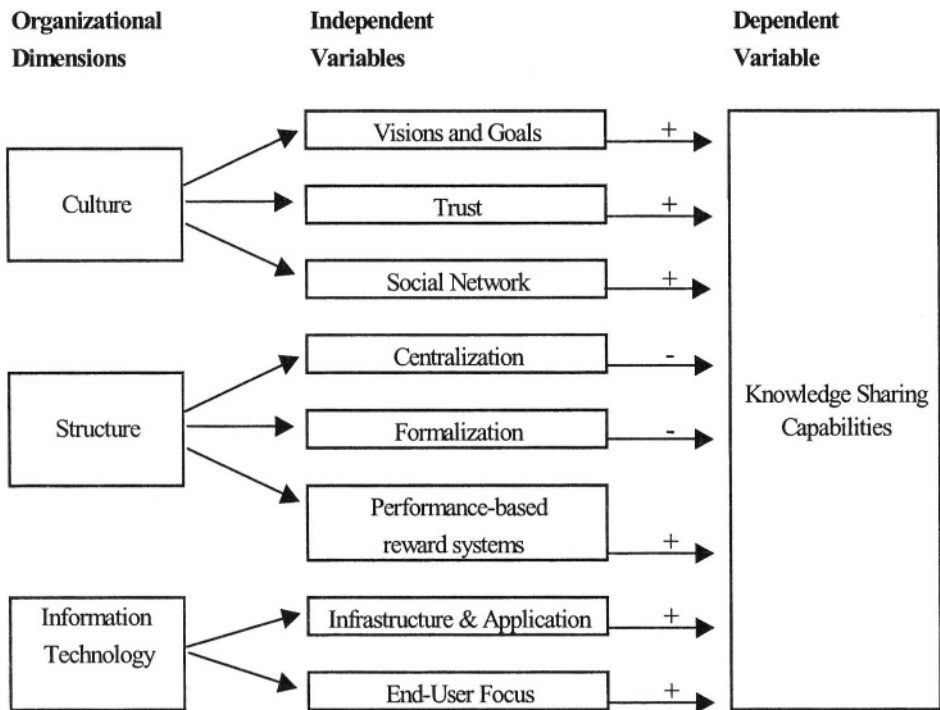


Fig. 1. Research Model

Organizational Structure: The present study includes three variables of organizational structure dimension, including centralization, formalization, and performance based reward systems. Organizational structure has often had the unintended consequence of inhibiting collaboration and sharing of knowledge across internal organizational boundaries [29]. Creed and Miles [7] also note that a hierarchical structure in government limits active knowledge sharing activities and communication between employees or between employees and supervisors. O'Dell and Grayson [29] agree that organizational structures should be designed for flexibility (as opposed to rigidity) to encourage sharing and collaboration across boundaries within the organization and across the supply chain. However, this effect can also be achieved by maintaining the formal hierarchical structure while adding the dimension of flexibility [28]. Nonaka and Takeuchi [28] indicate that a combination of a formal organizational structure and a non-hierarchical, self-organizing organizational structure would improve knowledge creation and sharing capabilities. Another important variable related to organizational structure dimension in which this study is interested is a performance-based reward system. Leonard [24] argues that organizational reward systems can determine how knowledge is accessed and how it flows in organizations. Several scholars note that incentive systems should be in place to promote employees' motivation for taking the time to generate new knowledge (i.e., learn), share their knowledge, and help others outside their own divisions or functions [1, 29].

Information Technology: Scholars also emphasize information technology infrastructure as an element crucial to the linkage of information and knowledge integration in organizations [2, 13, 33]. In order to build knowledge sharing capabilities, the organization must develop a comprehensive infrastructure that facilitates the various types of knowledge and communication. Several dimensions of the technology infrastructure analyzed by Grant [17] and Leonard [24] include business intelligence, collaboration, distributed learning, knowledge discovery, knowledge mapping, opportunity generation, and security. Specifically, Leonard [24] notes that knowledge mapping technologies allow an organization to track its sources of internal and external knowledge so that individuals in need of a specific type of knowledge know where it resides. As the five government agencies selected for this exploratory study have established knowledge management information systems and information technology infrastructures for e-government services, the present study analyzed how employees' use and application of information systems affect their knowledge-sharing capabilities. Another important component of information technology related to knowledge sharing is the level of end-user focus of information system development. In order to improve knowledge management capabilities in organizations, information systems and software should be developed to promote easy use and application by end-users [23, 3].

3 Research Method

3.1 Sample Selection and Survey Administration

The study incorporated data from a 2003 survey of public employees working in five national government agencies in South Korea: Ministry of Government Affairs and

Administration, Ministry of Information and Telecommunication, Ministry of Justice, Ministry of Science and Technology, and Ministry of Culture and Tourism. A reason for the selection of these five agencies was that these government agencies have adopted knowledge management information systems and information technology infrastructures for e-government services. All of the survey respondents indicated that their agency has established Internet based e-government services, Intranet, electronic data management systems, and knowledge management information systems. The survey sample was constructed from individual employee directories. Copies of the survey were distributed to 200 selected department employees (40 survey copies for each agency). One follow-up survey was also sent. From the total adjusted sample of 200 survey questionnaires, 165 were returned; 3 of these were considered invalid because they were incomplete. Hence, the final number of usable questionnaires was 162—a response rate of 81 percent.

3.2 Survey Measures and Items

The self-administered survey instrument was designed to elicit information on employee perceptions of organizational culture, structure, information technology, and knowledge sharing capabilities, as well as demographic information. In order to measure knowledge sharing capabilities, three sub-dimensions of knowledge sharing were developed [31, 16] : 1) knowledge sharing between employees; 2) employees' easy access to other divisions' documents, information and knowledge; and 3) knowledge sharing between teams and groups. To assess the validity of our research model, measures of the three sub-dimensions of organizational structure (centralization, formalization, and reward systems), three sub-dimensions of culture (visions and goals, trust, and social network), and two sub-dimensions of information technology (infrastructure and application, and end-user focus) were developed (see Appendix). Multiple-item measures were used for all of the variables to improve the reliability and validity of the measures. These measures are largely derived from the literature on knowledge management. In addition, responses were recorded using a seven-point Likert scale (ranging from 1 = strongly disagree to 7 = strongly agree).

Coefficient alpha reliability estimates for all of the variables were arranged from .75 (formalization) to .93 (visions and objectives). All of the coefficient alpha reliability estimates are included in Table 1 below. A factor analysis indicated that the items designed to measure the three organization dimensions and knowledge sharing capabilities loaded on four separate factors: organizational culture, structure, information technology, and knowledge sharing capabilities. The factor loadings of all of these items support the use of these items as indicators of the underlying constructs they were designed to measure. The three demographic information questions included in the survey were years of work, position, and education.

4 Findings

The majority of respondents (68.5 %) worked in administration positions. There were 32 employees (19.8%) reporting themselves as information technology professionals. Only 22 respondents (13.6%) were female. In terms of age, the sample

ranged from the twenties to over fifty, but more than thirty percent of respondents were over forty years old (33.3%). The distribution for work experience in the current department was: less than 5 year: 15.5 %; 5-10 years: 22.3 %; 11-15 years: 32 %; 16-20 years: 16 %; and 21 years or more: 14.2 %. The majority of respondents reported having a college degree, with 18.5 percent holding graduate or professional degrees. Position levels ranged as follows: lower level (Grade 9-8): 13.5 %; middle level (Grade 7-6): 51.8 %; and higher level (Grade 5-4): 34.6 %.

Table 1. Descriptive Statistics, Reliabilities, and Correlations

	Mean (s.d)	1	2	3	4	5	6	7	8	9	10
1. Visions & goals	4.50 (1.20)	1.0	(.93)								
2. Trust	4.95 (1.0)	.48**	1.0	(.81)							
3. Social network	3.93 (1.11)	.46**	.46**	1.0	(.85)						
4. Centralization	3.93 (1.21)	-.41**	-.32**	-.28**	1.0	(.85)					
5. Formalization	4.51 (0.94)	-.03	-.04	.09	.45**	1.0	(.75)				
6. Performance based reward systems	3.30 (0.87)	.52**	.26**	.50**	-.30**	-.05	1.0	(.83)			
7. IT Infrastructure application	4.98 (1.49)	.18*	.28**	.21**	-.15	.04	.04	1.0	(.86)		
8. End-user focus	4.53 (1.11)	.37**	.47**	.45**	-.25**	.14	.34**	.36**	1.0	(.82)	
9. Knowledge sharing capabilities	3.82 (1.20)	.32**	.24**	.45**	-.30**	-.06	.43**	.38**	.40**	1.0	(.89)

N=162; * $p < .05$, ** $p < .001$

Descriptive statistics and correlation coefficients indicate that the majority of the zero-order correlations were statistically significant at $p < 0.01$. All of the measures appeared to be relatively distinct; the largest correlation (between organizational visions, objectives, and performance-based reward systems) was .52. Mean scores for visions and objectives (4.50), trust (4.95), formality (4.51), technology infrastructure and application (4.98), and end-user focus (4.53) were relatively high, but scores for social networks (3.93), centralization (3.93), and performance based reward systems (3.30), and knowledge sharing capabilities (3.82) were relatively low.

4.1 Multivariate Analysis

Results from an ordinary-least square (OLS) multiple regression analysis appears in Table 2. The equation achieved statistical significance at the .001 level. Among the variables of organizational culture, the variable of social network was positively associated with high levels of knowledge sharing capabilities: the results showed that

employees who perceived high degrees of social networks reported higher levels of knowledge sharing capabilities than employees who did not ($p < .01$). Statistical support was also found for organizational structure dimension. Government employees who perceive a high level of performance-based reward systems are more likely to express higher levels of knowledge sharing capabilities ($p < .01$). Moreover, the regression analysis results showed that employees who perceive a high level of information technology application are more likely to express their capabilities of knowledge sharing at a statistically significant level ($p < .001$). However, end-user focus was not significantly associated with employees' knowledge sharing capabilities when three control variables were included in the regression model (Table 2).

The report provided no statistical support for some other variables. Clear visions, goals, and trust were not significantly associated with employees' knowledge sharing capabilities in this study. Nor were centralization and formalization significantly associated with knowledge sharing capabilities. Among the control variables, the data showed that the surveyed employees who had been working in their present departments for longer periods of time were more likely to express high levels of knowledge sharing capabilities (see Table 2).

5 Implications and Future Research

The results of this study evince that social networks, performance-based reward systems, and information technology application are all significant variables affecting knowledge sharing capabilities in e-government. The data strongly suggest that executive leaders, public managers, and managers of e-government need to acknowledge these factors when addressing the issues of effective knowledge management and capabilities of knowledge sharing for government service.

The findings also suggest several strategies for consideration by government agencies interested in enhancing employees' capabilities for knowledge sharing. The first consists of conducting employee assessments regarding internal and external social networks. The employee assessments should focus on communications, contacts, and interactions between employees and between work divisions and agencies. Performing such assessments can be a first step in giving employees the perception that their departments are interested in their network environment, informal networks, communication flow among teams, and access to information among divisions, all of which are significantly associated with knowledge sharing capabilities. Managers and supervisors can also develop a plan of action to improve knowledge sharing capabilities. For example, executive leaders and managers can develop incentive and reward systems for recognizing excellent knowledge sharing abilities of employees. Fair and objective performance-based reward systems may promote employees' motivation for taking the time to generate new knowledge, share their knowledge, and help others outside their own divisions or functions [1, 29].

The study results show that organizational investment on information technology infrastructure and knowledge management information systems is an important factor affecting knowledge sharing capabilities through employees' usage and application of these information systems. Accordingly, executive leaders and managers need to

create workforce technology environments in which individual employees perceive a supportive interest in their knowledge sharing capabilities.

All of these suggestions for improving the knowledge sharing capabilities of employees in e-government require organization leaders to commit to promoting informal and formal networks and knowledge-oriented management practices. Especially considering the emergent emphasis on homeland security and e-government, agency leaders, IT managers, and human resource managers must collaboratively respond to fundamental environmental changes in order to encourage employees' commitment to knowledge sharing capabilities and organizational performance.

Table 2. Results of Regression Analysis

Organizational Dimensions	Variables	Regression Coefficient (β)	Standard error	<i>t</i>
Culture	Visions & goals	-.02	.08	-.30
	Trust	-.08	.09	-1.08
Structure	Social network	.23**	.08	2.80
	Centralization	-.07	.08	-.85
	Formalization	-.08	.10	-1.08
	Performance based reward systems	.25**	.11	3.11
Information Technology	Infrastructure & application	.27***	.05	3.96
	End-user focus	.12	.08	1.51
Demographic information	Years of work	.17*	.05	2.57
	Position	-.04	.07	-.63
	Education	.01	.24	.01
<i>R</i> ²		.471		
<i>Adjusted R</i> ²		.374		
F		9.745***		

N= 162; * $p < .05$; ** $p < .01$; *** $p < .001$

An important implication of this study for future research is that researchers may wish to examine the variance of knowledge sharing capabilities in e-government in terms of social networks and performance-based reward systems. The findings of this study indicate that social networks and performance-based reward systems can be significant organizational factors affecting employees' knowledge sharing capacities. If some public organizations have established knowledge management information systems as well as information technology infrastructures and applications for e-government services, researchers can focus on two independent variables of social networks and performance-based reward systems for explaining the variances of knowledge sharing capabilities among agencies. For example, a typology construction and analysis can be applicable to understand knowledge sharing capabilities in e-government (see Table 3).

Table 3. Knowledge Sharing Capabilities in Public Organizations
(*Social Networks and Reward Systems*)

A <i>High: social networks</i> <i>Low: reward systems</i>	B <i>High: social networks</i> <i>High: reward systems</i> High: KSC
C <i>Low: social networks</i> <i>Low: reward systems</i> Low: KSC	D <i>High: reward systems</i> <i>Low: social networks</i>

Table 3 summarizes the intersection of two variables for understanding different levels of knowledge sharing capabilities (KSC) in organizations: the degree of social networks and the level of performance-based reward systems. In this typology, all organizations in four cells are supposed to have established IT infrastructures and IT applications. Organizations in cell B of the table have a high degree of social networks among employees and a high level of performance-based reward systems; those in cell C are low on both. Those in cells A and D would be high on one and low on the other. Based on the finding of this study, organizations in cell B would have a higher degree of knowledge sharing capabilities than the other cells. Those in cell C have would have a lower degree of knowledge sharing capabilities than the other cells. Although those in cell C have established IT infrastructures and IT application, the low degree of social networks and the low level of performance-based reward systems negatively affect employees’ knowledge sharing capabilities. Further empirical analysis of this typology may provide an appropriate device for understanding how organizational culture and organizational structure affect the level of knowledge sharing capabilities in e-government.

6 Conclusion

The associations among organizational culture, structure, information technology and public employees’ knowledge sharing capabilities explored in this study can also be the subjects of research with other nations’ public employees. An assessment of the validity of the findings presented in this paper would be especially valuable. Future projects should also focus on: a) associations among the level of e-government development, knowledge acquisition, knowledge preservation, and knowledge application

beyond knowledge sharing capabilities; and b) comparative studies of private and public sector knowledge sharing capabilities.

Several limitations to this research should be noted. First, the measures used here were perceptual rather than objective; a more complete analysis would require additional data from interviews of employees and longitudinal studies of the dynamics and patterns of knowledge sharing capabilities through e-government transformation. Second, while the response rate for the survey was high, the sample size was small. In conclusion, the results suggest that organizational culture, structure, and information technology all exert significant forces on knowledge sharing capabilities among South Korean government employees. The findings imply a need for intensified organizational and managerial commitment to knowledge sharing capabilities through promoting informal and formal networks, reward systems for knowledge sharing abilities, and enhancing information technology as well as end-user support for government employees.

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Appendix: Survey Items

*Items were measured on a seven-point frequency of usage, with 1 for “almost never use” and 7 for “almost always use,” all other items were measured on a seven-point Likert-type scale, with 1 for “strongly disagree” and 7 for “strongly agree”

Organizational culture

Visions and Goals

1. My organization has future oriented organizational visions.
2. Top management leaders present clear organizational vision and communicate it with employees.
3. Overall, organizational vision and goals are clearly stated in this agency.
4. Employees in this agency understand organizational vision and goals.
5. Every employee in this agency can explain organizational vision and goals to others.

Trust

1. Employees have full confidence in the skills of their co-workers.
2. Employees trust expertise of their co-workers.
3. If employees got into difficulties at work, they know their co-workers would try and help them out.
4. Employees do not try to deceive their co-workers for their own profits.

Social networks

1. Employees communicate with each other through informal meetings within the organization.
2. Employees interact and communicate with other people or groups outside the organization.
3. Employees actively participate in communities of practice, which are voluntary forums of employees around a topic of interest.

Organizational structure

Centralization

1. Employees participate in the decision on the adoption of new policies or programs.
2. There can be little action taken here until a supervisor approves a decision.
3. A person who wants to make his or her own decision without consulting his or her supervisors would be quickly discouraged here.
4. Even small matters have to be referred to someone higher up for a final answer.

5. Any decision I make has to have my boss's approval.
6. Formalization
7. Each unit of this agency has well-established formal rules, task guidelines, and operational procedures.
8. There are many rules on the job.
9. Employees are constantly being checked on for rule violation.
10. Employees always carry out their tasks by rules and formal documents in organization.
11. Employees feel as though they are constantly being watched to see that they obey all the rules.

Performance-based reward systems

1. Individual or team-based performance is measured with fair.
2. This organization provides me with a fair opportunity for advancement or promotion.
3. Employees believe that they are promoted to a higher grade not by years of work but by their competencies and performance.
4. Pay increase or bonus is the most important factor affecting job commitment.
5. I am satisfied with the amount of pay and reward I receive.
6. Reward system affects employees' knowledge transferring, sharing and utilizing.

Information technology application

Application*

1. Employees' utilization of Internet, e-mail, electronic bulletin boards.
2. Employees' utilization of Intranet
3. Employees' utilization of DB (database), EDMS (electronic data management system)
4. Employees' utilization of KMS(Knowledge Management System)

End-User Focus

1. Information systems and software in this agency are designed to be user friendly.
2. It is easy for me to use information systems without extra training.

Knowledge Sharing Activities

1. Employees voluntarily share individual know-how, effective information and knowledge with each other.
2. Employees can freely access to the majority of document, information and knowledge within organization.
3. Employees cooperate or communicate with each other teams or groups for sharing information and knowledge.

Knowledge Sharing and Creation: The Bricks and Mortar of Intra-organisational Co-operation within a Scottish Local Authority

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Abstract. Plans to modernize government processes and practices are leading to a reconsideration of how to manage the vast range of knowledge resources that are found within the public sector. The theory and practice of Knowledge Management (KM) are found to be increasingly applied. This paper aims to explore the problems surrounding KM in one department of a large local authority in Scotland, namely the Building Services Department within Glasgow City Council. The discussion recognizes the importance of information age governance and that successful KM involves more than just the implementation of systems. These initial findings relate to research undertaken in late 2002 before a major reorganization of Building Services.

1 Introduction

Plans to modernise government processes and practices are leading to a reconsideration of how to manage the vast range of knowledge resources that are found within the public sector. Much of the work in the public sector revolves around the use and interpretation of information and knowledge. With the quantity and multiplicity of types of information being held and used within the public sector, not to mention the numbers of people employed, managing knowledge is a difficult task. One consequence of this is that concepts of Knowledge Management (KM) are increasingly being applied.

KM, although a concept which has many differing views and interpretations, is generally understood to be an organised and systematic attempt by organisations to transform the acquisition, preservation and sharing of knowledge to improve their performance. KM attempts to address the problems of the distribution of knowledge across organisations. However, some see KM as the 'next stage' in ICT development, designing software solutions to managing knowledge. Others see it as people management, with an emphasis on the development of social relations to enhance knowledge sharing and create 'communities of practice'.

Managing information and knowledge is critical and central to the way in which the public sector functions, and is also important in helping to achieve some of the

reforms that are currently being put forward within the public sector. For example, knowledge sharing and KM strategies can help to promote trust and increase the transparency of decision-making situations. The internal processes of government are increasingly relying on technology to communicate and so it is essential that different departments and groups learn to impart information and knowledge to each other and to, also, establish trust and accountability.

This paper aims to explore the problems surrounding KM in one department of a large local authority in Scotland, namely the Building Services Department within Glasgow City Council. Taking a knowledge focus can improve the processes of government but can an ICT enabled system alone improve the decision-making and control within such a department? Or does it take more than a piece of software to implement a KM project? This particular group is one that has undergone many organisational changes in the recent past and although could be described as a community of practice, in that there is much knowledge and expertise within the team which could improve work practices, there appears to be little evidence of knowledge sharing.

The discussion will consider KM as an important feature of information age governance and address some of the difficulties that need to be overcome if KM is to be successfully implemented. The paper will, firstly, briefly outline the evolution of KM before exploring the application of KM within the public sector in particular. It then moves on to discuss KM within Building Services and whether they can creatively use ICTs to underpin a KM strategy, to serve the needs of both internal and external stakeholders. The paper addresses KM at the micro level of a department in local government but some of the issues may well also be relevant to the macro level of national government.

These initial findings relate to research undertaken in late 2002, prior to the transfer of all Glasgow's housing stock to the newly created Glasgow Housing Association Ltd (GHA) and the consequent changes to structure and working practices within Building Services.

2 Knowledge Management Developments

Many of the first wave of KM initiatives focused on interventions which attempted to convert tacit knowledge (that is, information that is not written down but kept 'in peoples' heads') to explicit knowledge (that is, information that can be coded and is objective and can be recorded in documents or in databases). For example, Nonaka and Takeuchi's four-stage model of knowledge conversion, the knowledge spiral, which was designed to explain how tacit knowledge and explicit knowledge interact to create knowledge and the framework for a learning organisation. Explicit knowledge, it is believed, can be embodied through the use of documents, diagrams and computer systems. ICTs can then be used to store and disseminate this knowledge. The problem of how to encode this tacit knowledge is seen as a key issue. Thus, ICTs in themselves can enhance and deliver radical opportunities to improve knowledge-sharing processes.

However, many of these technology-focussed KM projects failed, primarily due to a lack of understanding of the difference between 'information' and 'knowledge' [1], [2], [3]. Organisations that relied on ICTs for managing knowledge, in fact, managed

their intangible assets much like they had always managed their tangible assets. Many organisations who implemented so-called 'knowledge management solutions' found they failed to live up to their promise, since they focussed almost entirely on the technological aspects and ignored the human and organisational aspects. The use of corporate intranets, databases and datamining techniques are, indeed, useful tools for capturing explicit knowledge and routine work procedures but knowledge is dynamic, subjective and interpretive in nature (Malhotra 1997, cited in [4])

Technology cannot, in itself, make organisations more 'knowledgeable' [5]. Knowledge *like* information has *meaning*, however, knowledge *unlike* information relates to *beliefs* and *commitment* and knowledge *unlike* information relates to *action* [6]. Thus knowledge is contextual and dependent on a combination of elements.

Later developments in 'strategic' KM techniques have focussed on building an effective knowledge-sharing environment and on creating an infrastructure to "foster the exchange of knowledge in a community-oriented environment" (Ellis & Tissen 1999 cited [4]). The emphasis in 'strategic' KM is on corporate culture and on social communities of employees. Thus we see an importance being placed on 'communities of practice' for sharing knowledge which

"reflect the way in which people actually work as opposed to the formal job descriptions or task-related procedures that are specified by the organization" [6:23].

In addition, 'communities of interaction' may need to be encouraged which span departmental and organisational boundaries to further promote knowledge sharing. Collaboration, knowledge sharing and self-organising teams are seen as key strategic goals at all levels of the organisation.

Other more 'organic' approaches to KM offer a typology and linguistic framework to observe and document how things are actually done and how knowledge is actually exchanged in practice. A more recent wave of KM theorists [7], [8] have, indeed, questioned the principles upon which much of the earlier KM literature had been based. Drawing on complexity theory, they point out the contradictions in attempting to manage and control knowledge that is so inextricably linked to the 'knowers', their minds, identities and beliefs. Indeed, Stacey (2001) goes on to question the ethics of attempting to do so, as:

"To talk of a corporation owning knowledge, managing knowledge, controlling knowledge, is to talk of corporations controlling the very identities of human persons" [7: 3].

Managers need to realize that unlike information, knowledge is embedded in people and knowledge creation occurs in the process of social interaction [9]. Indeed, many writers have emphasised that only human beings can take the central role in knowledge creation and argue that computers are merely tools, however great their information processing capabilities may be. Knowledge is socially constructed and is subjective. People form the 'communities of practice' which preserve and create knowledge as well as creating a set of values and assumptions that form the basis of their working lives. Thus knowledge becomes culturally embedded and knowledge creation occurs as a process of social interaction. Technology can, indeed, help and support the dissemination of this knowledge but is not, in itself, a knowledge creator. A 'KM' solution is not, therefore, a matter of simply implementing a new ICT sys-

tem, a “mission impossible” [10], but involves changing organisational structures and communication habits.

An over emphasis on the power of ICTs to capture and communicate knowledge ignores the social processes through which knowledge is validated. Indeed, it has been stated that “Knowledge Management is mostly Culture and People, with Technology thrown in” [11]. The human employee element and the way in which they use and interact with information are important [12]. Nevertheless, it is impossible to discount technology as a necessary underpinning of KM and some would argue [13], [14], [15] that developments in technology, the speed and connectivity this provides and the subsequent rise of the networked organisation, provided the catalyst for current KM strategies and applications. Successful KM strategies rely on the appropriate combination of people, processes and technology with an emphasis on environment, culture and self-organising communities of practice, organically sharing and creating knowledge. ICTs play their part in KM by providing an infrastructure to support and encourage knowledge sharing within a supportive organisational culture.

3 KM as a Tool of E-government

As with other management theories, fashions and methods designed and developed in the commercial sector, so KM is now beginning to make inroads into the public sector. However, as Milner [12] reminds us, quite often these models, theories and practices are implemented and applied without much thought being given to adapting them to the working patterns and practices of governments. One concern is that public sector organisations are rushing into large-scale investments in IT, making the same mistakes that characterised early KM projects in the private sector.

Public sector organisations on the whole are complex, hierarchical organisations. They are involved in a wide number of different relationships between, for example, policy makers, service providers, politicians and the general public. Moreover, increasingly, new relationships with outsourced functions and private-public partnerships are creating new ways of working and organising work. Thus there is wide scope for knowledge management applications and theory to be applied and tested. How do these various stakeholders share their knowledge and experience with the others?

The success or failure of KM projects in general rests on a number of different factors. These include a flexible organisational structure, a knowledge-friendly culture, motivated staff, multiple channels of knowledge transfer and senior management support as well as a technical infrastructure that can support successful knowledge sharing. They also need to be in line with the individual organisation and their culture and goals. KM projects are often focussed on providing the physical infrastructure to facilitate knowledge sharing and storage but what is of paramount importance is to encourage a ‘climate of sharing’.

Experience from early adopter public sector organisations suggests that the success or failure of ICT supported KM projects rests on a number of different factors. Firstly, where knowledge can be explicitly stated and coded, ICT based KM systems are more likely to succeed, although, they still need to be supported by other factors. Secondly, there needs to be some sort of common understanding or amount of common knowledge between the groups participating in the project. Moreover, the indi-

viduals must be willing to share their knowledge, to trust the other parties involved and the organisational culture must support and encourage knowledge sharing and knowledge creation.

In the public sector, the traditional hierarchical structure often exhibited is not conducive to, and may potentially hinder, successful KM implementation. Moreover, there appears to be an embedded culture of *not* sharing information and knowledge between departments in governments which in turn may lead to a difficulty in both the creation and maintenance of horizontal networks across organisations [16]. Indeed, the culture and operations within the public sector have been shown to hinder the development of inter-departmental relationships [17] and the potential to develop 'communities of interaction'. Additionally, achieving integrated public services may well be hindered by overt and covert issues of territory and power [18]. For KM to work, a focus needs to be placed upon the employee, for public servants to be treated as assets rather than tools of public service delivery [12] and a reconceptualisation of the public sector to a service oriented organisation. The dynamics for change towards a KM enabled public sector exhibit tensions between creating a commitment to an operating culture, where information sharing is the norm, and formal structures with little or no flows of information, characterised by 'turf wars' [18].

The most difficult barriers to overcome in implementing KM projects in the public sector concern the "cultures and contracts which serve to impede rather than support the collaborative and improvement focussed culture" (Milner 2000:76). Moreover, commitment to such projects from staff, as well as good local leadership and support, is needed if they are to succeed. Skills in change management are, therefore, required. In addition, the introduction of new ICT systems, designed to enhance knowledge sharing, needs to be implemented with thought, planning and the appropriate training and development of staff.

For the development of a new model of public service administration and service delivery, the creation of a successful information and knowledge-focussed organisational culture is necessary, indeed, some might say essential. The concepts of KM can be used as a strategy for change and innovation in the public sector and can be aligned with the goal of improving services and internal administrative processes, leading to more responsive and flexible organisations. KM has the potential to join-up organisations by promoting data sharing, avoiding duplication of effort and improving access to information and the way it is presented. However, the removal of traditional barriers and the promotion of knowledge sharing are necessary if a more knowledge driven organisational culture is to be created. Increased expectations and demands of citizens and those employed within the public sector in terms of easier and greater access to information are proving to be key drivers of KM development.

Within the UK, following the publication of the Modernising Government agenda, a programme of change and reform has begun to improve the efficiency and effectiveness of public services. A number of government policies aimed at 'information age' government have been put forward, for example, Modernising Government (1999) committed to modernising public services and having all public services delivered electronically by 2005 (which has subsequently been extended to 2008). Local authorities are expected to offer at least 25% of their services on-line by 2005. Following this, various government initiatives have been implemented, such as the UKOnline portal to services, launched in September 1999. A key strategic goal is that government services will become more 'joined-up' around the needs of 'the customer'. This drive towards e-government and a more citizen-focussed approach to the delivery

of services is causing a rethinking of the processes of government. It also involves significant changes to the knowledge resources within governments. To facilitate such programmes as the on-line delivery of services, adequate access to information and knowledge resources are needed [19], [20].

In a further drive to modernise the internal processes of government, the Knowledge Network was established in October 2000 to support government departments in sharing knowledge and working on-line with others across government. The Knowledge Enhanced Government (KEG) programme was designed to examine key KM areas, such as knowledge capture, knowledge transfer, knowledge retention and enabling knowledge based community working between and across departments. A Knowledge Management National Project has recently been established in England to develop a consistent KM system to be used over all local authorities. However, it appears that the 'KM as technology' philosophy is being followed.

4 Knowledge Sharing in Building Services?

A study was undertaken to examine KM within Glasgow City Council's Building Services department – specifically the 'Design Team' of the department's Design, Build & Project Management Division. Up until March 2003, the Design Team employed 102 staff, comprising Architects, Quantity Surveyors, Engineers, Clerks of Work and Administrative staff, who were responsible for the design, procurement and contractual issues associated with all council-owned major building maintenance projects and new build construction. The Design Team were specifically selected for this research because they are effectively consultants who sell their '*knowledge*' to other client departments, in the shape of new building designs, specifications and technical drawings. This Design Team could be said to be a 'community of practice' sharing common understandings and knowledge within a particular environment. In addition, Building Services introduced a divisional approach to service delivery by creating six service departments. This structure was chosen to allow services to be more clearly defined for customer access¹. Therefore, there were several divisions who needed to communicate information and ideas within the organisation.

The initial empirical research comprised a questionnaire distributed to 90 of the 102 staff employed in the Design Team division. The response rate was 43%. The objectives of the questionnaire were to attempt to evaluate the culture of the division vis-a-vis knowledge sharing; to assess the role that management played in encouraging knowledge sharing and creation and to explore the impact of existing technology. This was supplemented by interviews with six questionnaire respondents who had indicated a willingness to take part in follow-up interviews.

The results of the survey showed a high number (44%) of the staff claiming an understanding of KM and its meaning, and nearly all (85%) believed that knowledge sharing could benefit an organisation. In exploring the impact of organisational culture with regard to knowledge sharing, the majority of the respondents, 44%, perceived that management did not encourage knowledge sharing. With regard to man-

¹ These were: Repairs & Maintenance (DLO); Design, Build & Project Management; Integrated Manufacturing; Training Services; Transport Services and Customer Services.

agement’s role in knowledge creation, the perceptions were almost identical. Once again, 44% of respondents considered that management did not promote knowledge creation within the department. Only 8% of respondents thought management actually encouraged knowledge creation. A key factor in KM project success is management support, which it appears, was not perceived as being in evidence to the staff within the division

Almost two-thirds of the respondents agreed that ‘organizational culture’ is the greatest inhibitor to knowledge sharing and a vast majority (87%) that the ‘knowledge is power’ syndrome existed within the department. Exploring this question in greater detail through the follow-up interviews, it was discovered that a feeling of a ‘blame culture’ existed within Building Services. One interviewee even suggested that the fear of reprimand resulted in staff ‘keeping their heads down’. Another interviewee highlighted the presence of a number of sub-cultures that he believed to exist within the Design Team, which created barriers to knowledge sharing. All interviewees agreed that the current situation required senior management intervention to reassure staff and promote openness and trust. These findings resonate with previous studies which have found this ‘natural’ inclination to hoard knowledge at every level of practically every organization (see for example a study by Martin (2000 & 2003) on KM in local government in Australia [21] [22]). Moving to a KM culture means a profound shift from these ways of thinking [23], which it appeared at the time of this survey, was not present within this group.

The questionnaire also aimed to unpick some of the ideas around ICTs and KM. The vast majority (85%) felt that the most important enabler of knowledge sharing was ‘people’. However, the vast majority (82%) thought that ICTs could assist knowledge sharing within the department. Thus we see from this sample, that technology as an aid to KM, rather than the means to KM, appears to be the case. Recent research has indeed shown that significant failure rates have been found with regard to KM technology projects where little attention is paid to the ‘human element’ and the relation between technology, knowledge processes and overall organisational performance [24].

The next stage was to investigate what software the staff had access to that might enable knowledge sharing. These are shown in the table below.

Table 1. Software availability

SOFTWARE	%
Email	100%
Microsoft Office	90%
Intranet	87%
Internet	72%
CAD	69%

However, the findings highlighted that around half the respondents with access to the Internet and Intranet either rarely used it (approximately once a week) or never (or

only very occasionally) used it. This raises serious questions over staff utilisation of both applications which might have been used to promote knowledge sharing.

Exploring this theme in more detail, respondents were asked to give examples of how ICTs could assist knowledge sharing within their particular department. The respondents' examples are listed below in order of popularity of choice:

Table 2. Use of ICT supported knowledge tools

ICT SUPPORTED KNOWLEDGE TOOL	%
Staff briefings delivered through e-mail	19%
Fully utilise Computer-Aided Design (CAD) system through sharing designs, details and storage of drawings	15%
Improve storage and access to knowledge by use of shared databases	15%
Full utilisation of the Intranet by the department. FAQ pages	10%
Internet access for all staff	7%
IT software training	7%
Database with project review on feedback of successes and failures	7%
Improve communications generally	7%
Shared information distributed through the use of e-mail	5%

It would appear, from the examples offered, that the existing technology is not fully utilized, in line with the previous table. Although it is informally recognised that individual and specialist knowledge exists within the team, this has not been explicitly captured or utilized and the full knowledge sharing capabilities of the CAD system, which was thought of as being a KM tool, are being ignored. 'Word of mouth' was more regarded as a more important way of sharing information and knowledge.

In summary, the research findings appear to indicate that the current levels of knowledge sharing and creation within the group are hampered by a number of factors. Firstly the organizational culture, in particular knowledge hoarding. Secondly, that management do not encourage the sharing or creation of knowledge. Thirdly, that there is a lack of trust and openness and the perception of a 'blame culture' which is not conducive to successful KM implementation. Finally, although staff do have good access to ICTs, which could allow them to share expertise, they are not using the technology to support and encourage knowledge sharing and creation. The investigation found that the Department have invested large amounts of money in technology but this investment is only giving marginal returns in terms of enhancing the knowledge base of the organisation. Whilst the technology is in place, the current culture is inhibiting knowledge sharing and there are few, if any, processes available to promote knowledge creation. Moreover, management need to take a more proactive role in promoting a knowledge focused organizational culture, without which, any KM initiative becomes a 'mission impossible'.

It has been stated that organisations should “hire smart people and let them talk to each other”. Building Services employs and develops ‘smart’ people but the culture and processes need to be in place to encourage and enable them to talk to each other and share their expertise and knowledge.

5 Conclusions and Further Research

At this preliminary stage of reporting, the main ideas and themes in the literature are supported by the findings of this survey. There is an indication that taking a knowledge focus can improve the internal processes of local government and deliver a more efficient and ‘joined up’ service to citizens. However, in the rush to embrace KM, also comes the danger of rushing into introducing new technology without giving due consideration to the processes and, critically, the appropriate culture, to enable knowledge sharing, within and between departments and organisations. Without this knowledge sharing and creation, local authorities will be unable to achieve the desired levels of efficiency and effectiveness. A KM focus is even more critical for Building Services as they prepare for the massive changes and uncertainty brought about by the transfer of Glasgow’s entire housing stock to the newly created GHA, in March 2003. Building Services are currently restructuring to meet the needs of the GHA and to face the future, more competitive, market place, where Building Services will have to tender, along with private contractors, for building and maintenance contracts.

We believe that what these preliminary findings have shown is that, although ICT enabled KM tools can be implemented, unless the users of the system have faith in it and are willing to use it to its full extent, the software itself cannot produce ‘knowledge sharing’. What is needed is a corporate culture that encourages knowledge sharing and that sees KM as a way to enhance processes, improve communication flows and so build an atmosphere of trust, transparency and openness in decision-making. As a step towards achieving this, senior management are urged to provide richer communication regarding the strategic objectives and values of the organization in a way that is accessible to all employees. ICTs can indeed help in this and make the process easier but the ‘human element’ remains of prime importance.

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PETALE: Case Study of a Knowledge Reengineering Project

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Abstract. In 2003 the author followed a knowledge reengineering project and workflow project in an administrative unit of the Canton of Vaud in Switzerland. The goal of this paper is to briefly present the case and to show what lessons were learned. We will show how this organization went from a mainly paper-based mode of operation to an integrated electronic workflow system and how we built a domain model using a combination of UML diagrams and RDF schemas.

1 Introduction

Between January 2003 and September 2003 we followed the development of an information system in the Service of Economy and Tourism (SET) of the Canton of Vaud in Switzerland. We focused on the knowledge engineering aspects of the project and the goal of this paper is to present the case study and to show what lessons were learned. We believe it is of interest because the SET is a typically knowledge-based administrative office with very few structured processes. Furthermore this organization went successfully from a paper-based mode of operation (although they used office suites) to an integrated electronic workflow system in less than a year. This integration was not only realized internally, but also with different external users.

The SET was created in 1998, out of a large-scale reorganization project, largely based on New Public Management ideas. It is a relatively small unit, employing 26 persons that belong to five main organizational sectors (Tourism Promotion, Local and Regional Development, Trade Police, Economic Promotion, New Technologies). Each of these sectors relies on designated legal texts to accomplish its tasks, for a total of more than twenty laws and decrees, both at the Federal and Cantonal levels. To give a brief overview of the variety of the SET's tasks, let us mention that in 2001 this service treated about 200 enterprises files in the domain of economic promotion and that it delivered more than 12'000 authorizations and business licenses for restaurants, shops, movie theatres, hawking, lotteries, concerts, ski teachers, etc. In simple cases, the SET can take decisions without any form of notice from other public administrations or administrative units, but in more complex ones it might have to consult up to ten of them, at the communal, regional, cantonal and federal levels. For

example, the SET has to check whether a company respects environmental and labor laws before considering tax exoneration. It also has to verify whether a building is compliant in terms of safety, hygiene and insurances before it delivers an authorization to operate a restaurants or a bars. All these decision processes are at the best semi-structured, although most of them are rather unique negotiation-based cases. For a detailed typology of different types of administrative services such as routine processes or individual case solving, see [1].

Before the introduction of the new system, SET employees processed all the incoming files “by hand”: they had to check whether a file was complete and valid before they could register it. After a decision was taken, they also had to track the file and the following procedures: inspections, payment, renewal, etc. Finally they had to provide statistical data to the relevant administrative department. In order to accomplish these tasks the only software tools they had were a Lotus Notes contact base, three disconnected Access databases and several consolidated Excel sheets. In some extreme cases, software tools and paper-based files were overlapping five times without any type of “communication” between them, meaning that data had to be updated manually. Furthermore, the tracking index of each file consisted of a separate Word document, with the consequence that there was no automated way to see all files related to a designated company.

2 PETALE Project

The SET has five main strategic missions to fulfill and the PETALE system was designed to support most of the tasks realized within these five domains. However it is out of the scope of this paper to go into the details of these tasks. To illustrate the knowledge reengineering that the SET went through and the daily operations of this administrative service, we will concentrate on one example: delivering authorizations to operate a restaurant or a bar. Furthermore we decided to study only one area of knowledge analysis that the CommonKADS approach proposes [2]. This knowledge-modeling suite is based on three groups of models that answer three essential questions:

- *Why* is a knowledge system a potential solution? Which costs, benefits and organizational impacts does it have?
- *What* is the nature and structure of the knowledge involved?
- *How* must the knowledge be implemented in as system? What software architecture is suitable?

The SET developed a complete IT strategic plan before starting the PETALE project and we consider that it answers the first question quite thoroughly. Indeed this strategy provided amongst other things an inventory of existing procedures and a new organizational architecture. Furthermore this IT strategy pointed out that a new legal basis was needed in order to share data amongst the administrative services using the PETALE system. A private IT development company was hired to implement the system and did a “state-of-the-art” job, with several mock-ups of the system and corresponding validation rounds with users representatives, hence we believe that the last question was cared for. Thus we focused on the nature and the structure of knowledge and in the following section we will show what was done during the project and we

will propose a few additions in terms of knowledge models. The main processes of the SET were described in the IT strategy. However these descriptions were text-based and we wanted to somewhat formalize them. We followed the approach described in [3], based on use cases and scenarios, with addition of business rules. For more on use cases requirements we suggest [4] and for a complete presentation of business rules we recommend [5]. We will not explain that work here, as it is not directly related to the knowledge reengineering case we want to present.

However we will show one example of a UML collaboration diagram (Fig. 1): obtaining an authorization for restaurants, bars, nightclubs, sport clubs, street vendors or for special events such as parties. To get the full picture on this graphical notation language, we advise reading a reference book written by the creators of UML [6].

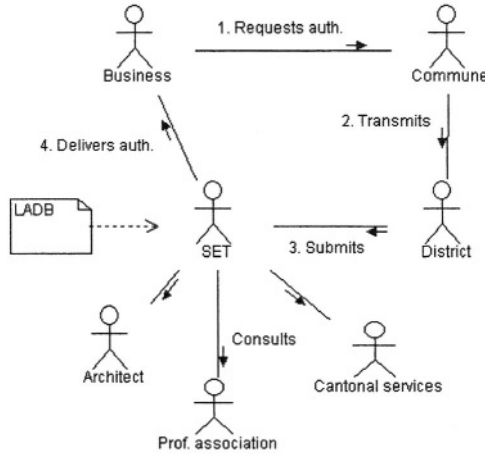


Fig. 1. A business requests a license from the commune where it is located. The commune then has to transmit this authorization request to the cantonal level through the prefecture (public administration at the district level), this procedure being the official channel of communication between a commune and the Canton. At the cantonal level, the SET relies on the “Loi sur les Auberges et Débits de Boissons”, which is the legal basis treating all the cases related to selling drinks. In complex cases, the SET has to consult other cantonal services, professionals or business associations in order to deliver an authorization.

Most of this information can be found with full details in the IT strategy of SET [7] and in the PETALE users manual [8]. In the following section, we will present the domain model that we developed as a side-project: they were not used by the SET in order to develop the system.

3 Domain Models for PETALE

We were able to attend project meetings where software engineers, managers and user representatives gathered in order to define the scope and the requirements of PETALE. Furthermore lawyers were there in order to verify that the system respected the new regulation on data sharing and data privacy. Although terms such as “knowl-

edge components” or “ontology” were never outspoken, the meetings were often revolving around these concepts. Before the PETALE project and in a paper-based mode of operation, these knowledge components were not explicitly identified: the SET employees simply knew that a “contact” could be a person, a business or a commune, that a “file” contained all similar authorizations related to one contact, that they had to look up by hand the different files with different authorizations related to a single contact, that a bar can have three “owners” (one for the building, one for the goodwill and one for the mandatory professional license “attached” to the bar), etc. These are just a few cases amongst many ambiguities that an experienced worker can handle but that need to be modeled in order for a computer system to work properly. Indeed, many hours of discussions were necessary in order to define concepts that were satisfactory to all the attendees. For example the concept of “signboard” was introduced at the request of the communes, because that is how a bar or a restaurant is identified at their administrative level: a signboard is linked to a physical address and a goodwill, moreover with the address one can find the owner of a building from land registers.

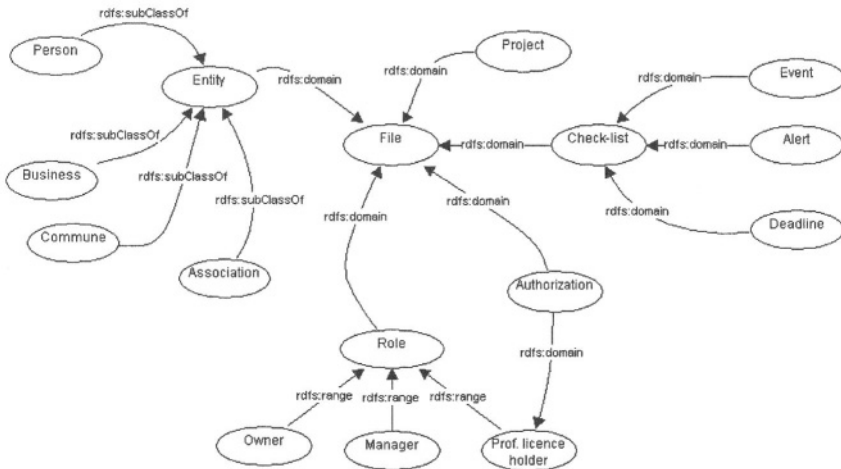


Fig. 2. A file is made of one or several authorizations concerning one entity and is completed by a check-list of temporal milestones containing data about special events that might take place at a site selling drinks (e.g. authorization to open later than usual for a particular occasion), deadline (e.g. annual renewal of the authorization) and the alerts that are sent to the PETALE user in charge of that file (e.g. check payment for renewal of authorization). The concept of project allows different files to be grouped thematically. An entity can be either a person, a business, a commune or an association (non-profit organization). Although this is not shown on the graph for readability reasons, owner, manager and professional license holder are all sub-classes of entity. They are linked to a file through a concept of “role”. These three roles can be endorsed by a single person or by any combination of persons and companies. The only constraint is that the professional license holder must be an individual and the authorization is legally bound to the license holder.

The software engineers developed a large and complex database architecture based on entity-relationship diagrams. A computer (or a skilled database developer) understands these models, but it is difficult for the average user to use them. In order to

obtain a more explicit domain model, we created simple models based on Resource Description Framework (RDF) schemas. This W3C recommendation is an emerging standard that enables the definition of metadata for encoding machine-readable semantics [9]. They are shown here under a basic form of labeled directed graph, but let us quickly mention that they can be developed into full-scale knowledge models. With the use of tools such as Protégé2000, it is possible to generate the corresponding XML code or RDF statements under the form of triples that can be used in relational database [9]. Examples of the mathematical equivalence of these RDF statements (graphs, XML and triples) as well as further references are given in [10]. We believe that these RDF schemas provide the link between domain models that are understandable by human beings and domain models that are machine-readable.

The framework we propose is rather simple but we think it can be used efficiently for acquiring, representing and sharing domain knowledge, with both dynamic and static representation and a strong focus on the nature and the structure of knowledge, as we mentioned in the introduction.

4 Conclusions

The first authorization was printed on October 1st 2003, the same day the system became operational. The PETALE project was thus successful, for several general reasons: thorough reorganization prior to the project, sound IT strategy, strong support from the head of the SET service, high technical skills of the IT company, etc. We also believe that knowledge engineering was a key factor:

- The organizational aspects of the project were taken into account very carefully and detailed task analysis was made.
- All the actors concerned by PETALE were involved in the identification and refinement of knowledge components during the full cycle of the development, from the first draft of the graphical interface to the different mock-up versions of the system.
- A functional prototype of the system was validated by a sample of users within the SET, in other public units of the Canton of Vaud and from four “test” communes.

As we already said in the text, most of the participants of the PETALE project probably would not speak of knowledge engineering or ontology development, although we judge that it is exactly what they did. However we feel that the use of a formal methodology such as CommonKADS would have made their job easier, or at least the use of a graphical notation language such as UML for the description of information and control flows.

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The *U.S. vs. Fiber Materials, Inc.*: A Case Study in Knowledge Failure

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Abstract. Through close examination of the *U.S. vs. Fiber Materials, Inc.*, this paper examines the documentation responsible for the overturning of a guilty verdict in one of the most highly acclaimed export control enforcement cases of the last decade. The jury's verdict in the case was derived from the organizational memory of the regulating agency. Ultimately, historical records were unearthed which proved the agency's memory to be egregiously inaccurate, and the defendants, after nearly twenty million dollars in legal fees and eight years in legal limbo, were subsequently acquitted of all charges. This case study highlights the disconnect between traditional record keeping practices and digital information systems. It identifies a knowledge-to-task gap in the policy area of export controls. It suggests a need for further refinement of the contextual qualities and attributes necessary for policy knowledge and reuse.

1 Knowledge Continuum

Multilateral implementation of policy is an exercise in coordination and collaboration. It is an information rich endeavor, requiring reciprocal information sharing between countries, government agencies, and individuals. Recent scholarship has suggested that one cause for poor policy coordination is due to poor information sharing. [1] In addition, emerging research in public administration suggests that interorganizational coordination and collaboration of public agencies requires a common knowledge base which must reside within a "sociotechnical system." [2] Information and knowledge are not mutually exclusive categories however. The specific environment in which workers produce information imposes meaning on information, thus increasing its knowledge value. Information has a trajectory, which is derived from the manner in which it is used and the specific context within which it is generated. This information-to-task alignment is imperative for knowledgeable decision-making. On the continuum to knowledge, information moves further along as more and more situational context is impressed upon it.

But what salient attributes or qualities of a given context facilitate the metamorphosis of information into knowledge? What attributes are necessary in the context of multilateral policy efforts? Might these attributes change over time or remain static? These questions add insight into the development of robust knowledge systems, knowledge systems that may facilitate future policy efforts.

2 Knowledge Context

The court case *U.S. vs. Fiber Materials, Inc.* centered on the interpretation of two words, two words that appeared in hundreds of government regulations, “specially designed.” The term was intended to mark the strategic threshold of many items in government regulations, dividing those items that required government licensing from those that did not. Unbeknownst to FMI executives or government officials, the terms had been defined some thirty years prior to FMI’s export. The definition had been published in a government manual by the very government agency that brought the charges against FMI.

In 1987 FMI sold three pieces of equipment to the Indian government. The company later learned that the Defense Research and Development Laboratory in Hyderabad, connected a control panel from one piece of equipment to a larger, more strategic piece. And that, according to U.S. Government officials, is when FMI, its executives, and its subsidiary corporation Materials International, violated U.S. export laws. The U.S. Government’s concern stemmed from the dual-use nature of the equipment. Carbon reinforced composite materials are exotic materials which may be used in the manufacture of commercial items, such as aircraft brake pads. Alternatively, carbon-carbon is used for making nosetips for strategic, ballistic missiles – those capable of carrying nuclear weapons. FMI was a preeminent supplier of this material, and the company had supplied all three missile-equipped branches of the U.S. military with product: Army, Navy, and Air Force.

3 The Method of Memory

The Judge presiding over the FMI case determined that the definition of “specially designed” was to derive from the testimony of government officials under whose regulatory jurisdiction the exports fell. According to a U.S. Department of Commerce export-licensing officer, the export violated U.S. export laws, because the control panel was “specially designed” to work with a highly sensitive, strategic piece of equipment. One National Security Council member and former Commerce Department employee testified in the FMI trial that, “India now has the ability to extend the geographic range for delivering a nuclear weapon, extending its delivery range beyond Pakistan and into China. India has moved from the short range of its Agni missile to an intermediate range missile – the Pithvi. India has that capability today because of FMI and its illegal export.”

The official maintained that “specially designed” had been defined in the international regime in which export controls were negotiated: NATO’s Coordinating Committee on Multilateral Export Controls. “Specially Designed,” multiple witnesses testified, had always been understood to mean “capable of.” He had “familiarized” himself with these administrative rules by word of mouth only. He stated that when questions arose, speaking with other engineers and inquiring as to what predecessors had done was the primary vector for communicating this regulatory knowledge, “so there would be a certain consistency to our judgment”.^[3]

Though subsequent arms control regimes adopted use of the term and defined it, the use of the term within CoCom prevailed in determining its meaning in the FMI case. The item was restricted for its dual-use nature and therefore CoCom precedent prevailed. The Missile Technology Control Regime, for example, defined the term to mean “exclusive use.” This fact was irrelevant. Consistent interpretation and usage of the term given the history of usage in CoCom prevailed.

A second witness had led the Capital Goods Technology Center in Commerce, an office devoted to the analysis of export licenses of capital goods equipment such as machine tools. Whether an item was “specially designed” was subject to the interpretation of the licensing official. The leader of Capital Goods testified that “the ‘capable of’ interpretation was used consistently within the Department of Commerce” [3]. Both witnesses testified that they had grown familiar with the term relative to the licensing of control panels for other pieces of capital goods equipment. Both officials maintained intimate familiarity with regulations of Capital Goods items such as those covered under regulations ECCN 1091 and ECCN 1312, the latter the regulation at issue in the case. Though not written down, he explained that “the meaning of specially designed was in my head and the heads of others.” [3] With only the evidence of human memory, the jury returned with a guilty verdict in June 1995.

4 Organizational Structure and Memory

At the time of the FMI export, The US Department of Commerce was a decentralized body consisting of several offices, technology sections, and divisions. The Bureau of Export Administration—the office responsible for licensing dual-use exports—was divided into several smaller divisions. Each was further sub-divided to cover specific areas of technology: computer equipment, metalworking machinery, chemical, biological, nuclear, and missile technology, each with specific offices devoted to licensing operations.

Multiple organizations were involved in the classification process of strategic and benign commodities. Many of these organizations produced many documents and manuals that circulated throughout the U.S. government and non-proliferation community. Pervasive throughout these documents were the terms “specially designed.” Despite the widespread presence of the term, its meaning existed solely in the memory of policy officials.

5 The Form of Policy Memory: Records and the History of Specially

Government records provide one mechanism through which one can gain access to the history and administrative structure behind policy knowledge. Public records such as regulations, manuals, forms, congressional hearings, oversight reports, legislation, acts, and amendments, as well as declassified government

documents were all crucial in ascertaining the administrative history of the interpretation of “specially designed.” These records depict a pattern of interpretation and usage that extended throughout the U.S. government, through NATO’s CoCom, and across the globe.

Lawyers emphasized the right to a fair trial under the due process clause of the 14th Amendment of the U.S. Constitution, under which the criminal charges were unconstitutional. The defendants could not be charged with violating a regulation the government itself could not define.

The prosecution countered that the language of the regulation and the use of “specially designed” was quite regular. Over the fifty years of its use; however, the numbering system of the regulations, as well as the faceted technology categories to which these numbering systems were paired, changed considerably. The export control commodity number, the alphanumeric number used to identify specific, individual regulations, underwent a series of changes over the five decades. Those changes reflected shifts in bureaucratic structure and changes in decision making authority among, across, and between government agencies and international organizations.

Prior to 1965, the United States relied on the classification and indexing scheme produced within the Census Bureau for identifying and statistically collocating exports into group. In 1965, the United States switched to the classification and indexing scheme used within NATO’s CoCom in order to standardize internationally the categories, documentation, and description of export regulations. This change in authority, administrative function, and of documentation had inter/intra national ramifications on export enforcement. Enforcement personnel, government agencies, nor exporters had any way of ascertaining the meanings between these terms when the switch between indexing and classification systems was made. No public concordance was ever published, nor is there any evidence to suggest that one was used within government. The intellectual linkage and continuity underpinning the area of export controls been severed, and, along with it, so too was the meaning of “specially designed.”

Without analyzing the indexing and classification schemes within the export regulations themselves, it would be impossible to ascertain the differences between the regulations over time, such as the pre-1965-post switch in terms, as well as any semantic differences between regulatory language. This switch is critically important. Time series analysis of the content of export regulations chronologically revealed that “specially designed” appeared more frequently after 1965. Prior to that time, the term “specially fabricated” was used. A review of the various Schedule B classification manuals revealed that “specially fabricated” was defined in a 1952 Schedule B Manual. The definition of which differed dramatically from that of “specially designed” offered via the testimony of government witnesses in the FMI trial.

The domestic indexing scheme of Schedule B, when compared to the international scheme of CoCom, constituted only a linguistic difference. No clear evidence suggested a semantic difference between the two terms. Put simply, did “specially fabricated” mean the same thing as “specially designed?” Multi-

ple documents proved critical for determining the semantic similarities between these two terms. Many depicted a pattern of synonymous use of the two words in the capital goods item of vacuum pumps.

For example, The strategic characteristics of vacuum pumps were discussed as early as 1958 in CoCom.[4] Negotiations on the definition of vacuum pumps were widely circulated internationally and within several agencies of the U.S. Government including, Departments of State, Commerce, and Defense. [5] “Specially fabricated” was included in the definition of these items in 1959. [6] A recommendation was added that the term be added to CoCom’s International or “Dual Use” list that same year.[7] The term was purposefully used to delineate the strategic threshold of an item. Moreover, documents went so far as to state that “special machines” were those only applied to the use for which they were designed.[]

CoCom’s documents were corroborated via numerous records obtained from several U.S. Presidential Libraries. A report from Secretary Luther Hodges papers from the Bureau of International Commerce, U.S. Department of Commerce dated July 30, 1963 examined special aspects of export controls for technical data, prototypes, components, parts, and materials. The report defined “specially designed” to mean any item that was intentionally designed to meet or achieve the desired outcome of the export. More importantly the report discussed the general policy shift from quantitative control of manufactured goods or those “fabricated” to control of intellectual design know-how inherent in the “design” of items.

Of all of the records associated with the trial, the Department of Commerce’s own administrative records were the most damaging to the prosecution. A 1952 report from the U.S. Department of Commerce’s Operations Division explained how licensing officers should interpret export regulations, particularly when dealing with parts and components for machinery. [9] “Specially fabricated” the report argued was to be interpreted to mean “exclusive use.” “Specially fabricated” and “specially designed,” the report stated were to have identical meanings.

6 Knowledge Failure

Multiple documents vigorously impeached the testimony of the prosecution’s witnesses, proving no semantic difference between “specially fabricated” and “specially designed.” On August 14, 2003, the Judge granted a longstanding Motion to Dismiss. The court’s guilty verdict was overturned. Eight years after the guilty verdict in the case and after millions of dollars in legal fees Fiber Materials, Inc. and its executives were acquitted of all charges.

7 Knowledge Attributes

Government records were at the heart if this case study, and at the center of a pathological deficiency in knowledge building and retrieval. Despite lengthy

discussions of organizational memory and knowledge management in the research literature, little exists to describe the attributes of contextual knowledge. Moreover, the problem of semantic differences and its effects on regulatory interpretation is rampant with the domain of export controls, arms control, and nonproliferation more generally.

Form

Public organizations reside and operate within policy domains. These domains may cross national, jurisdictional, semantic, and organizational boundaries. What is important in the preservation of this contextual knowledge is a heightened awareness to the wide array of information inputs and the multiple forms they might take. Considerations of information form will enable more thorough consideration of a wider collection of information inputs come time for decision making, systems development, and resource sharing.

Evidence

Access to information is said to open government and hold public officials accountable. Government rule by law should limit that of men. Evidence of government action not only provides an accountability mechanism, but also allows for decision-makers to ascertain an order to decisions within and across organizations. Records are valuable evidence. However, evidence derives its value from its authenticity or provenance. Preserving the original order of records and the diligence of the record keeper will fortify this evidential quality.

Taxonomy

Record keeping systems and the languages and manner in which they describe objects provide interorganizational links within policy domains. Common terms or “controlled vocabularies” enable access to common areas shared between and across organizations. These taxonomies structure knowledge for future use and reuse.

Versatility

Information must be versatile. Systems must enable users to go beyond the limits of the information’s original form. The records of the FMI case formed a noncomputerized database. Government decision-makers were limited in their ability to pull knowledge from the information due to technical limitations of the form of policy knowledge.

Endurance

Systems must maintain knowledge structures of time. Simply providing access to knowledge is not enough. These structures must endure organizational, jurisdictional, and functional changes. The FMI case depicts continuous changes in function across organizations. What provided access to this knowledge was the endurance of the knowledge in records.

8 In Sum

Records professionals, librarians, and information professionals have long wrestled with the attributes of information that facilitate the development of knowledge. However, the division of professions frequently separates and divides the

principles necessary for the generation of knowledge systems in public policy. Information sharing is critical for coordination and collaboration. Both are key aspects of the effective enactment and enforcement of international agreements. When placed in the broader context of the policy area of arms control and nonproliferation, the degree of effort needed to join these disparate principles within the information professions for the generation of knowledge systems are minuscule when compared to the price of information failures in export controls.

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E-government: A Catalyst to Good Governance in China

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Abstract. The paper first analyses the characteristics of governance in the information age, illustrates the advantages of E-government services; Second, deals with the implications and key elements for good E-governance; finally points out the urgent tasks for good E-governance in China, emphasizing governmental responsibility on primary education, human resource cultivation, sustainable social and economic development, etc.

1 Introduction

Since the mid -1990s, Chinese government, together with other governments around the world, has been launching its ambitious National E-government project, so as to embracing the brand new era of information technology, building China into a modern democratic and knowledge-oriented society.

E-government, by definition, refers to the use of information and communication technology (ICT) to promote more efficient and cost-effective government, facilitate more convenient government services, allow greater public access to information, and make government more accountable to their citizens. It is not merely a technology term or event, but rather a profound revolution. Just as the point of view of the United Nations that E-government is a government that applies ICT to transform its internal and external relationship,¹ hereby I argue strongly that the E-government project, if properly carried through, may work as some kind of catalyst to promote good governance in China, just as in other countries of the world. The project is not only our ideal vision in the future, but also a strong belief that our country, our people and our society will benefit a great deal from the E-government Strategy as well as from the program in its every aspect.

2 Governance in the Information Age

In recent years, the concept of *Good governance* has gained more and more recognition throughout the world, a number of governance indicators, testing data and links between good governance and economic outcomes, have been designed and widely used in the field of academic research. These Indicators measure different aspects of

¹ Department of economic and Social Affairs, United nations, 2003 World public sector report 2003 E-government at the crossroads, pp.2. New York.

the quality of governance, such as the severity of corruption, the extent of civil liberties, the bureaucratic efficiency, the rule of law, the predictability of policymaking, etc. Citizens of both developing and developed countries are increasingly aware of the costs of poor governance, and they are demanding better performance on the part of their governments, they believe that good governance is a necessary condition for long-term economic growth and people's welfare.

Apparently, governance needs technology basis; and good governance needs more advanced technology background or atmospheres. The advent of Information age makes it possible for governments to pursue managerial or governing excellence. E-government initiatives around the world certainly have playing an important role to redefine the fundamental elements of government, improve government performance, as well as to change the traditional governance institutions and regimes globally.

In the Information Age, the traditional governance paradigm has transferred into a new pattern characterized by the overwhelmingly use of digital technology, which may be called Electronic Governance, and from that, the governments, operating in the world for century's long, have begun their new existences, the unprecedented E-government now come into being. If some one ask what is the advantage of E-government? It will not be a short list, we can promptly illustrates a categories of advantages of E-government, among them including:

1. *Improving services to citizens.* E-government can offer numerous possibilities for improving a nation's public sector responds to the basic needs of its citizens. People always want information or services delivered quickly and easily. E-government means people's needs can be met in a more timely, tailored, and convenient ways, while maintaining their privacy and the security of their personal information, that is really great.
2. *Improving the productivity and efficiency of government agencies.* Today, the governmental agencies are wanted to deliver "outcomes" and outputs, achieve better results for serving people' various needs. This will involve agencies working more effectively across their traditional boundaries and collaborating with one another. E-government will satisfy this need by sharing information between departments (G2G), with businesses (G2B) and with citizens (G2C). Which will strengthen the integration of structures and processes of governmental bureaucracy, and make government agencies operate more efficiently.
3. *Strengthening the legal system and law enforcement.* Governments are the largest purchasers in all economies, and for both moral and political reasons they should buy goods and services in the best way possible. One dollar paid in excess of the best possible price is a dollar less to provide health care, social security or public housing. By fostering transparency, and empowering people to participate in the political processes, e-government will strengthen the legal system and law enforcement; make policy processes more open and consultative.
4. *Promoting the development of priority economic sectors and regions.* Under e-government project, government must observe market principles, behave in a pro-market way, consequently government will minimize its intervention to business on the one hand; and promote the development of priority economic sectors and regions on the other hand, for example, to promote the growth of the software industry and train qualified experts in IT field, take the advantage of economic of scale, set up Industrial clusters, and boost remote and rural area's development.

5. *Improving the quality of life for vulnerable people and disadvantaged communities*
E-government is an aspect of the whole issue of governance, the whole issue of economic and social development concerning the question of poverty reduction, empower the poor and vulnerable people in a society, it means sharing the opportunity for development. Responsible E-government project cannot simply ignore the fact that technology has the prospect of giving a huge advantage to some parts of the country, whereas leaving behind many other parts of the country with an even greater gap to catch up. Sharing benefits without frontier is the soul of technology revolution.
6. *Advancing public management performance and promoting good governance.* E-government will eventually transform the processes and structures of government to create a public administration regime with less hierarchical red tapes, it will be citizen-centered, not bureaucracy-centered; results-oriented, other than inputs-oriented, it will working in further more effective and efficient ways. The market-based behavior of E-government will actively promote entrepreneurship and innovation process. Governmental agencies will empower civil servants to serve citizens better and to be more responsive to their needs, so that the dream of reinventing government devised by David Osborne and Ted Gaebler will become reality.

In the information age, governance needs a fundamental revolution. With the technologies to implement electronic governance already available and its importance understood by the leaders of our country, managerial issues are of key importance, Change in the mindset of the people particularly at the top levels in the bureaucracy is critical because it is the elite group who provide the leadership. Now E-Government in China is in the initial stage, we should follow the logic of its development, and build successful E-Government project with Chinese characteristics.

3 Good Governance under E-government Project

China is a big country with a large population and extensive territory .the implement of E-Government project is naturally important, even critical to China's social and economic development. It reported that from 1994, the Internet has developed quickly in every aspects of the nation, the most famous E-Government project in China is so-called" Golden Projects", which started from 1993, aimed at developing an information economy and strengthening administrative capabilities.

The Golden Projects initially comprised three elements known as Golden Bridge, Golden Card and Golden Customs. Golden Bridge is the infrastructure for 'informatizing' the national economy, its mission is to build the infrastructure backbone over which other information services will run; Golden Card project, initiated in 1995, aimed at creating a unified payment system to allow the widespread use of credit and debit cards across China; the Golden Customs project was intended to create an integrated data communications system connecting foreign trade companies, banks, and the customs and tax authorities, so as to lay a foundation for E-business in China.

The success of the three pilot projects paved the way for a range of other Golden Projects, including Golden Sea project, building a data network directly to top CCP and government leaders; the Golden Tax project, aimed at modernizing the work of

tax collection in the country, The whole Golden Projects, its purpose and participants, is illustrated below in the table 1:

According to Chinese ancient tradition, golden color is so noble, so auspicious that the use of the color was restricted to some kind of special occasions. Giving the name of “Golden projects” to E- government and other E-projects, indicating Chinese government has attached great importance to the projects and taken strong commitment to carry them through. Beside the “government online project”, China has also launched “corporation online project” and “family online project”. Nowadays, Internet is becoming the indispensable thing in daily life of ordinary Chinese people, we have all the provinces and all the state bureaus online, and a number of E-Government services are available on the Internet. Chinese Citizens are encouraged to access E-Government services as their convenience.

Table 1. The Golden Projects in China

NAME	MAIN PARTICIPANTS	PURPOSE
Golden Bridge (JinQiao)	MII; MEI; State Information Center; JiTong	To build a public network backbone and international Net work interface capable of transmitting data, voice, image and multi-media information.
Golden Card (Jin Ka)	PBoC; MII; Ministry of Internal Trade; Great Wall Computer Co	To establish an electronic-based financial transaction system and information service; to have 200 million credit cards in use across 400 cities by 2000-2003.
Golden Customs (Jin Guan)	MOFTEC; Customs Dept; JiTong	To establish networks capable of handling foreign -trade taxes, foreign currency settlements, domestic returns, quota management systems, an electronic data interchange (EDI) and an import-export statistical database.
Golden Sea (Jin Hai)	State Statistical Bureau; PBoC; State Information Center	To build a data network linking top government leaders with other institutions, organizations and offices under the direct jurisdiction of the communist Party Central committee.
Golden Macro (JinHong)	China Im-Ex Bank; Ministry of Finance; State Information Center	To develop a state economic and policy support system by setting up databases unifying industrials, taxation, prices, investments, resources, capital energy, transportation and information exchange.
Golden Tax (Jin Shui)	Ministry of Finance; MII; State Taxation Bureau; Great Wall Computer Co	To make use of computerized work unit tax receipts and direct bank connections to aid the flow and use of funds across China.
Golden Intelligence (Jin Zhi)	State Education Commission	To enable teachers and research professionals to have timely and precise information and to enable international and local communication and cooperation.

Golden Enterprise (Jin Qi)	State Economic and Trade Commission	To design and build an integrated enterprise target (quota) and distribution system; to build a countrywide enterprise and product database.
Olden Agriculture (Jin Nong)	Ministry of Agriculture	To develop and monitor agricultural supervisory committees, and the calculation and forecasting system.
Golden Health (Jin Wei)	Ministry of Health	To develop and apply computer technology, communications technology and scientific information distribution to the medical sector.
Golden Information (Jin Xin)	State Statistical Bureau	To develop real-time information flows.
Golden Housing (Jin Jia)		To create a property information network.
Golden Switch (Jin Kai)	Ministry of Information Industry	To build China's domestic digital switch manufacturing industry.
Golden Cellular (Jin Feng)	Ministry of Information Industry	To provide the basis for a coordinated mobile communications strategy, and to develop national roaming standards and systems.

Source: Peter Lovelock and John Ure. *E-Government In China*. , www.trp.hku.hk.

However, we cannot stop here, E-Government is a long march, we still have a long way to go to reach its destination. E-government does not function well just because government buys more computers and puts up more websites on intent. It does not function even governmental online service delivery is more efficient and less costly than other channels. The goal of E-Government is not so simple; it cannot be reached automatically without down to earth hard working. What we have done is only the tangible infrastructures for E-government. It is the intangible infrastructures that are the most important elements for good government performance and good governance. In perspective of ICT development, China is surely one of the most expanding and growing countries, what more interesting, however, is what approaches it should adopt, especially for a country with a long tradition of strong state administration, to realize democratic and civic participate goal. We know, of course, the feasible path may be different from those of developed democratic countries; we should blaze a way in democratic governance via E-governance. Dr. James D. Wolfensohn, President of The World Bank, once argued: "Civil society is probably the largest single factor in development..."² thereby only if civil society could operated well upon E-government infrastructures, could that of good governance goal be eventually

² James Wolfensohn, Speech at the World Bank/Development Gateway Conference:E-government in Developing Countries. Washington, D.C.June 11, 2001.

reached. The infrastructures supporting civil society movement is mainly intangible, such as social, cultural, and institutional elements, which are also the pillars of national Integrity. B. Shadrach, an expert from Transparency International explained that there are eight concrete factors embedded in the mainstay of national Integrity, i.e., 1 Public Awareness; 2 Public anti-corruption strategies; 3 Public participation; 4 Watch-dog agencies; 5 The Judiciary; 6 The Media; 7 The private sector; 8 International co-operation. These factors are interdependent, identifying opportunities for reinforcing the fight against corruption.³

Economic theory expounds on the importance of information on economic outcomes either through its direct effect on prices and quantities or through its effect on other factors such as institutions and the quality of governance. It is well known transparency being a key point of good governance, countries with better information flows also govern better, therefore the most important role that E-government program bore is to promote government transparency and thus reduce the opportunities of corruption, good governance is among other things, particularly transparent and accountable, it is also effective and equitable. We should kept a vigilant guard over the E-corruption that might be produced by corruption-prone public organizations, and explore the possibility of developing integrity pacts (TIIP) for E-government services.

4 Knowledge Management via E-government Project

Now let us take a different look at E-government project in China, we need to have an awareness of, first and foremost, the challenges and difficulties that facing by Chinese government, realizing it will be difficult for China, with so large a population and enormous regional disparity, to realize the E-Government mission, it will be an arduous process obviously, requiring good plan, strong political commitment, sustained dedication, and sufficient public investment. Therefore, we should also bear in mind the E-government project is simultaneously a process of knowledge creation, management and dissemination through governmental efforts in pushing information and communications technology in our country, for example, government sponsored web-school system that can reach remote rural areas, disseminating knowledge to those local poor children and dwellers who do not have the opportunities of getting in touch with outside world, it is E-government project and its ancillary program that bring necessary knowledge and technical help to them, that can enlighten and empower them ,and absolutely change their fate in the future.

Building E-government architecture is a progressive process, however, different countries should have different strategies, *the United Nations Division for Public Economics and Public Administration* outlined five general stages to successful E-government, 1 Emerging stage: A government web presence is established through a few independent official sites, but Information is limited, basic and static; 2 Enhanced stage: Content and information is updated with greater regularity, 3 Interactive stage: Users can download forms, contact officials, and make appointments and requesths; 4

³ B. Shadrach. eGovernment for Transparency. International conference on eGovernment for Development Palermo, Italy, 10-11 April 2002

Transactional stage: Users can actually pay for services or conduct financial transactions online; 5 Seamless stage: Total integration of e-functions and services across administrative and departmental boundaries. But according to *the E-government handbook for developing countries*, which is the research result of the Project of the Information for Development by The Center for Democracy & Technology, the evolution of E-government can be simplified into three phases, 1 Publish stage :Using ICT to expand access to government; 2 Interact stage: broadening civic participation in government; 3 Transact stage: Making government services available on line.

It seems that China's E-government build is not arranged strictly in consecutive order, but starting from several stages at the same time, yet every stage has not been developed to its perfect pattern until now. The challenges we are facing today is two-side, one is keeping up with the rapid development of information technology, putting a curb on the problem of brain- drain, and increasing national R&D investment on high tech, etc, the other, however, is waging a struggle to wipe out poverty in some remote and rural regions of the country, where people's living conditions are so rough that they don not have enough food or drinking water, they suffer from disease, plague, drought or flood, kids do not have enough opportunity of primary education, let alone talking with them the high technology or digital revolution. The most urgent task for China to pursue good governance is not just reducing the phenomenon of poverty, but eradicating the rootstock of poverty, i.e. the institutional basis upon which the poverty phenomenon being duplicated, passed down and accelerated one generation to another. Knowledge is the most important factor, more than land, tools and labors, to determine the fortunes of the poor. Our vision for China is a civilized and learning society not only built on the high tech but also on honest, discipline and other moral purpose. Our ancestor once created a splendid treasure of civilization; Chinese architecture, literature, calligraphy, porcelain, medicine, acupuncture and even our martial arts are famous all over the world. Keep on our tradition, the present government of China certainly should assume the responsibility of educate its people from now on, build solid infrastructures for E-government regimes technologically and morally.

Citing the data from *The 2003 e-readiness rankings — A white paper from the Economist Intelligence Unit* published by *The Economist Intelligence Unit*, among 60 countries, China's E-readiness have taken the 50th in 2003, only improved the ranking score of last year by one precedence. The white paper pointed out Hong Kong (10th), Singapore (12th), South Korea, 16th, Chile, 28th, Mexico, 31st, Argentina, 35th, Brazil, 36th and other developing countries and regions have had made significant advances in recent years. Comparing with our scores, we hardly keep much satisfaction; we have to keep up with the more advanced countries. Since many of the E-government works were carried out multi-accessed in China, so that we should continue going forward along this multi-dimensional approach, In order to build tangible architectures for E-government we shall boost high technology industries, at the same time, promote social and human society sustainable development so as to enforcing intangible architectures for E-government. Above all, the paper emphasizes the fundamental tasks for Chinese government on primary education, human resource development, equity of regional development, and poverty alleviation, points out that social and human development is the pedestal of information technology.

5 Conclusion

E-government is about transformation that helps citizens and businesses find new opportunities in world market. Among other many promises, E-Government holds great potential to reform governmental bureaucracy, provide greater access to government information, offer developing opportunities to the poor on equal terms and empower them consequently, E-government will particularly benefit rural and traditionally underserved population and communities. In short, E-Government can act as a catalyst to strengthen democracy, accelerate social and economic development, and improve good governance in the country. Chinese government should take pains to reach the E-government goal, turning the country into an advanced democratic, modern information society.

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Priming E-governance for Quality of Growth

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1 Introduction

e-Governance woven around development missions and goals can open up potential business opportunities that complement and compete in enabling those in the business of Governance help deliver quality of life to the masses. The role of *Knowledge Management (KM)* in these endeavors is both strategic and value enhancing. With the declining role of Governments, e-Governance can attract private entrepreneurship, eg, KM-embedded business models can be developed as *Governance Technology Ventures*. This Paper seeks to identify some approaches to structuring knowledge-based e-Governance tools, keeping in view a variety of governance processes required for achieving *quality of life (hence growth) outcomes* in developing countries.

Strategic e-Governance: Strategic e-Governance is different from the run-of-the-mill, routinized, low-end e-governance. The traditional view that Governance is a confluence of processes targeted to achieve desired ends, however, continues to hold sway among development economists. There is a realization, however, that development interventions, framed in ivory towers and cast in a one-size-fits-for-all mold are far removed from ground realities. Implemented top down, they just do not work. The World Bank's Comprehensive Development Framework (CDF) underlines these insights, and recommends grass-roots approaches.

KM in Governance: The public sector, having realized the strategic importance of tools and concepts for managing their knowledge resources, is particularly poised for a take-off in practising KM. In the private sector, KM has been discussed for nearly a decade. Advanced concepts and systems supporting KM are being developed by companies who perceive and appreciate the added value of KM as a strategic instrument. Interactive, KM-based research and development (R&D) in Governance Technology has a key role to play in futuristic Governance ventures

If we consider how a development plan (be it drafting a vision statement or a charting growth path) is to be introduced as a planned public policy intervention (PPI), how it is implemented, -- and try to gauge at what level of disaggregation (viz., the remit of Governance Structures/ Administrations) would such a PI be right --, it entails a thorough knowledge of the development issues at hand and of technology, i.e, how Governments must deal with them. In such contexts, "KM-based e-gov tools" can offer an assortment of solutions. However, neither development nor KM is instant coffee. The mix of ingredients in planned interventions need to be balanced using an array of endowment and environmental (market) factors, and applied at the right time, in right dosages, and in properly diagnosed/ pre- identified catchment areas. In knowledge societies, such "catchments" do not necessarily be geographically con

tiguous, posing problems of dealing with complexity. KM thus has a pre-eminent role to play in the variegated strategic e-governance contexts cited above.

R & D in Governance Technology: Integrated Systems and Web-enabled KM approaches capable of dealing with the macro-to-micro complexity of policy-making and implementation can enable spread effects to trickle faster. They can help usher in an era of sustainable *Quality of Growth (QOG)* for developing countries, an area lately under microscope with World Bank research <1> KM in e-Gov can work wonders to eradicate poverty, co-terminus with a QOG and development ethos. Inevitably, e-Governance will in future evolve more as a “knowledge management service”, and become adaptive, personalized, proactive and accessible from a broader variety of devices. Communication services, as a consequence, need to evolve into collaborative services providing better support for argumentation (policy debates), negotiation (bottom-up planning), deliberation and other goal-directed forms of structured discourse (inclusiveness eg., gender, empowerment, grass-roots participation etc.)

Exploring the scope for e-Governance models based on Monitoring and Evaluation (M&E) approaches to gauge development effectiveness represents an important task in QOG targeting. Seen from a KM lens, the kind of M&E efforts entailing from KM in an assortment of multi-dimensional development contexts demand a balanced calibrated approach. Sensitizing politicians to the economic consequences of policy quick fixes, and more so in the management and governance of emerging technology driven sectors for securing poverty eradication and QOG outcomes is of paramount importance in this context. This Paper attempts to articulate these issues, with a view to prompting policy makers to create enabling environments that help permeate “*QOG consciousness*”. In the authors’ view, this is tantamount to “commuting the growth process”, a chance to leapfrog into an era of quality of life at least for some poor, bypassing an unending saga of travails and tribulations that has been the plight of the third world poor, especially those from South Asia

2 Priming E-governance for Quality of Growth

At the dawn of the 21st century, we are beginning to grapple with the reality of what until recently have been mere concepts – the Information Age, Knowledge Society, Knowledge Management (KM) etc. These concepts and phraseologies are still evolving, and need to be refined. Perhaps, some abstraction and confusion owing to lack of conceptual clarity is inevitable at the present juncture. The following definitions excerpted from OECD (<2-13>) web pages would suffice for the time being.

Knowledge Management: KM practices have always existed in organizations to make decisions and to produce goods and services. What has changed is the weight of knowledge as a source of wealth-creation compared to other factors of production; knowledge has become a critical determinant of competitiveness for both private and public sectors. The knowledge-intensive economy implies a need for faster adaptation to accelerated change in the environment of public policies and service delivery. Governments will have to be more reactive, and deliver services closer to the customer. Thus, knowledge management represents a management modernization challenge for the public sector, which involves adapting classic management tools in a way that systematically promotes knowledge sharing.

This includes, inter alia:

- Improving human capital (flattening rigid pyramidal hierarchies, linking performance pay and promotion to knowledge sharing)
- Consolidating social capital: Fostering local community-based initiatives for poverty eradication (through Self Help Groups), creating a socio-political climate conducive to social capital formation by resolving gender issues and encouraging grass-roots political participation
- Adapting organizational capital (intranets, computerized databases)
- Networking to strengthen connections with private firms, research institutes, universities (promoting public-private partnerships)

KM-centric e-governance initiatives are being propelled by the availability of ICT tools that allow new ways for institutions to work. Such initiatives are capable of reaching out to realms beyond the confines of simple e-governance. Indeed, KM uses not only ICTs but also low-tech; communications tools, with its scope extending beyond internal decision making and delivery of services, to roles that encompass creation and availability of strategic knowledge. By the same token, e-governance extends beyond KM as it can increase a government's legitimacy, the quality of public decisions and service delivery, and promote citizen's contribution to public policy issues and decision-making.

KM and Public Policy Interventions: Effectively supporting the above governance work with KM concepts and tools requires a comprehensive re-think on management of *know-how, domain expertise, information resources and knowledge bases*. At the same time, the specific problems of public administration and governance (e.g. data protection, security, trustworthiness etc) need to be taken into account. Transition to e-Democracy and e-Government entails modernization and re-organization of governance work, its legacy systems and responsibilities. This has a significant impact on the distribution and shape of knowledge in the respective domains. Besides, when introducing new IT into a specific administration, past knowledge, -- based on which decisions would have been made, why they have been made and how have problems been solved --, represents a "*valuable knowledge resource*" for future changes. Support for collection, elaboration and accessibility of such domain and project knowledge (or, to be precise we may call it "*Public Policy Intervention (PPI)-knowledge*" needs to be designed properly. This entails monitoring and evaluation of effectiveness (success/ or lack of it) for each PPI, both at micro and macro levels across a span of time, termed "*PPI-history*", in juxtaposition with specific "*Development Contexts*".

2.1 Governance Technology (Knowledge) Portals

Overall, Governments are trying to take advantage of the latest technologies for value-added transaction driven portals and achieve cost savings. Typically, and naturally, they are not only addressing processes/ routines that are repetitive, drudgerous and those involving communication, but also decision entailing multi-department process flow paths, whereby their transfer to the web can make a noticeable difference without big changes in the existing work practices or IT infrastructure. The traditional techniques of organization, work and process flow methods/ studies are find-

ing a niche in this category of Portals. These Portals mostly fall into one of three categories:

- Intranet Applications that allow data to be gathered, processed and shared in new and more efficient ways
- Extranets that link Government to Business Partners (citizens, customers, suppliers, stakeholders etc) bringing discipline and cost-savings to procurement; and
- Public websites that give Citizens a self-service channel for their dealings with Government

The Micro-Angle: Let us for instance, take the case of India. Considering the sub-continental size and diversity of a vast country like India, QOG concepts and awareness will need to be tested from a micro-angle among the poor in select test centers in the metropolitan, urban and rural India, with a select cross-section of Politicians, Judicial and Legal luminaries, Captains of Industry, Beauracrats, Civil society and the NGOs, as also of Opinion Builders, Advertising and Media Personalities, Civil Society and the NGOs as to their expectations of QOG for India. An appropriately designed questionnaire and sampling methodology can be used to ascertain popular expectations on QOG and QOL (Life), and how people are expecting the Government to respond to their needs on particular issues.

E-Gov Portals: As system architectures currently in vogue demonstrate, e-Gov portals represent global entry points to many different local services from distinct public service providers. Customers as well as public authorities can access these offers via the Internet or even while on the move via devices such as mobile phones, handhelds etc. This forms the external, or customer-focused view of public services. From a government-specific perspective (the internal view), the services are considered as the sequence of process steps that must be performed by the overall system in order to fulfill customer requirements. Bringing together these two points of view is currently an important issue in the modeling of public services delivered through a global single-point access orientation. Several key aspects have to be addressed in order to meet this requirement:

- Applying a holistic concept to modeling public services
- Finding an appropriate mapping terminology
- Developing integrated service models that cover both the front-office (portal) and back-offices
- Adequate merging of service models with the technical components of the platform (e.g., interoperability)
- Applying a user-centric and service-centric development approach.

Virtually all e-Governance technologies are already working for e-commerce. For example, Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) and Supply Chain Management (SCM), Data Warehousing and Mining (DWM), Business Intelligence, Internet Procurement and Payment Systems --, all are available now, and need little adaptation for e-Governance purposes. Likewise, security protocols, multi-layered firewalls and public key infrastructures needed for authentication and protection of data are already available off the shelf. Even the vendors, always keen to offer their own patent solutions agree that technology is not a barrier to introduction of e-Governance. So long as the e-Gov Technology Portals

operate as humble learning organizations, one might rest assured that the cause of QOG is well served.

Learning with a TQM Approach: e-Governance is a learning process, whereby Quality Assurance (QA) procedures and methodologies could be devised and implemented appropriately using *Total Quality Management (TQM)*, *Competency Maturity Model (CMM)* approaches. There is scope for TQM/ CMM processes in the following Governance areas which generally tend to evince some system/ process quality deficits:

Citizen vs Customer: In the competitive, liberal global scenario of goods and services, Governments must desist from indulging in monopolistic practices, relegating citizens' (cosumers/ customers) interest to the back burner. Availability of a speedy, decentralized legal system to protect consumer interest is critical.

Participative Processes and Transparency: Most developing countries are fraught with Governance related systemic and/ or process problems because of which only a fraction of benefits meant for customers (citizens) trickle down as intended. People are part of these processes and it is the quality of human resources that make a difference in delivering QOG and other overall development outcomes. TQM requires that such processes be analyzed with a quality slant in mind, improved constantly by introducing checks and balances for control and transparency from time to time. Long and arduous, such tasks can be successfully implemented only by involving people, enabling them to improve process quality through training and development, promoting a work ethic that creates a sense of pride and belonging (not alienation) to the community. These in essence are the kind of "Participative Processes" that should be accorded the highest priority.

Improve Organization, Systems & Leadership: Often, it is systems, not human, failure, that inhibit Governments' ability to provide quality services. Quality drives pride and satisfaction. Strong leadership is responsible for relentlessly striving to improving systems and work culture, motivating people by inculcating pride in individual as well as team work, thereby enabling them perform better and do a quality job. *Committed and responsible leadership* must provide motivation by continued education and training, build trust through effective rewards and punishments so as to empower upright officials in discharging assigned duties without fear or favor. TQM dynamics in e-Governance should percolate like in a brick and mortar dispensation, and the implications of such dynamics must be public knowledge.

Citizen Charter: Governments can come out with a "*Citizen's Charter*" proclaiming what citizens can expect from e-Governance endeavors, and must promise to deliver the same within a timeframe. Unless backed up by quality initiatives as cited above, Citizens Charters would not evoke much enthusiasm and only remain on paper.

2.2 The Concept of E-gov Toolkits

"e-Governance Toolkits" with a canvass of cross functionalities that reflects the highest common factors affecting Quality of Life at Nation/ State, Provincial and Local levels in relation to QOG Missions/ Themes must be promoted and marketed to find prominent market niches. "Weaving" the myriad dimensions of Quality of Life (QOL) into a wide assortment of e-Gov Toolkits represents a major challenge in this regard. It may be too ambitious at the very outset of an e-governance initiative to live up to the exacting expectations such as those aroused by a "QOG" mission-driven e-Governance portal. A beginning can be made, however, by profiling different "e-Governance Toolkits" to suit

typical requirements at national, provincial and local (village) levels in a sort of R&D endeavor as it were. This entails identification of factors that significantly explain poverty reduction outcomes relative to the peculiarities of each developing country, or sub-national (provincial/ local) level entities within each, and putting together solutions for the same. Such processes, being iterative, entail the design of an assortment of *e-Gov Toolkits*, and cannot be construed as a panacea. The e-Gov Toolkits, updated both for strategy and content, via interactive networking and web-enabled public policy advocacy, can draw analogies, for example, from the assortment intensive standards and specials product program (*) of *Sandvik AB, Sweden*.

e-Gov Toolkits will need to be developed, to serve both as diagnostic and treatment models, on the following lines:

1. *Diagnostic Toolkits (D-Toolkits)*: To diagnose the Governance process deficiencies vis-à-vis World Bank's Quality of Growth norms (to be developed case by case) as pre-set criteria; and
2. *Treatment Toolkits (T-Toolkits)*: To recommend appropriate e-Governance treatments, given the issues at hand and problems to be resolved.

The Analogy of an Assortment Intensive Product Program: The product and R & D programs of the Swedish multinational *Sandvik Aktiebolag, Sweden* may be cited here. (*Sandvik Asia, Pune (India)*, where the Senior Author of this Paper worked as a Marketing Services Staffer, is an important subsidiary of *Sandvik AB, Stockholm*). Their standard product program, an assortment intensive, high-tech product range of Tungsten Carbide T-Max Metal Cutting Tools, Inserts and Spares, -- in Turning, Milling and Drilling application areas --, running into over 2,500 items is a matter of corporate pride and image for the Sandvik group. Bulk of them is manufactured as part of a standard products program comprising different styles, tool geometries and carbide grades, and some to custom-built engineering specifications. Each tool item: holder/ insert/ spare is coded into a 24-digit generic coding system that uniquely identifies the product in the standard program with a level of disaggregation stretching up to styles, tool (cutting edge) geometries, carbide grades and the metal cutting application areas.

Sandvik has a strong bias on planning, performance monitoring, with vast investments in research and development built in as a *deliberate strategic edge*. The principals Sandvik AB, Sandviken, Sweden, as the world leader in the field, control their global stocking and inventory operations through sophisticated computerized systems, regular assortment analyses of their standard program in order to help maintain an optimum stock turnover ratio as well as a desired delivery security, the two balancing factors in the finished goods inventory management of assortment intensive product lines.

2.3 Methodologies Akin to Statistical Design of Experiments

The dichotomy of Toolkits as “D” and “T”-type will enable e-Governance practitioners with knowledge of the kind of treatments that could provide the best fit, given the resource endowments and public policy environment contexts (at hand/ encountered), and the problems to be resolved (as identified by “Diagnostic Toolkits). To be structured by Specialists in Development Economics, the T-Type Toolkits will incor-

porate experiential knowledge that encompasses resource endowment factors such as natural: geographic, soil and climatic conditions, human resource development level (education and literacy), the macro-micro dimensions of local issues, the authority of administrative unit responsible for governance. In juxtaposition to these data must be the Governance problem in question with an evaluation of achievements made against sustainable levels of QOG outcomes as diagnosed by the D-Type Toolkits. In a “Synthesis Matrix”. Such experiential learning also lends itself to knowledge of scalability / replicability as well of the e-Gov Toolkits. Through a persistent R&D process, e-Gov *Toolkits* can be perfected as a standard product program of knowledge products.

2.4 KM-Based E-governance Toolkits

Experiential knowledge about the success or failure of specific e-development interventions constitute in essence the building blocks of KM-based Development policy Interventions. KM-based toolkits aimed at better concert and coordination in “priming” e-governance at the grass-roots level for achieving development outcomes and ensconcing systems capable of securing their integration into higher Governance echelons is most likely to be the future trend in Governance technology. With KM-based value enhanced Portals, which, perhaps, can be operated efficiently by private entrepreneurship, besides the above, Artificial Intelligence (Media Lab, MIT), Business Intelligence and combinations of these should work.

Toolkits are Knowledge Products: Quality assurance methods based on TQM Process methodologies can be devised to address the e-learning challenges of devising and perfecting e-Government Toolkits. Considering that QOG problems faced by developing countries are variegated, a wide “Assortment of Toolkits”, devolving on the central concept of a phased realization of QOG outcomes can be devised to suit strategic e-development and thence the e-Governance needs at various echelon levels. To be successful, e-Gov entrepreneurs should take care to diligently scan local development environment and its interface with the hierarchical level constraints and opportunities (in a supply-demand scenario analysis as it were) and duly incorporate the insights in the development of e-Governance Toolkits:

1. The learning process involved in perfecting Toolkits is akin to an R&D effort. The interactive power of the Internet, the multi-media, and the networking and wireless technologies can be harnessed in two major domains, viz., (i)-An Assortment Intensive e-Governance Toolkit Product Program; and (ii)-A Web mounted ERP, CRM and management of the Toolkits Program, both provide a launch pad for a Knowledge-based Initiative. A Micro-to-Macro-Economic Planning Interface of considerable import can then be mapped out re-affirming thereby that economic planning is a bottom-up rather than a top-down exercise.
2. In order to serve as useful instruments for ushering in e-Governance, the effectiveness of each e-Gov Toolkit as an efficient, replicable treatment for different e-Government needs should be monitored across a “*launch to maturity product cycle*”, consistent with the market demand (*for e-Gov Products*) identifiable as part of an assortment intensive product program with extensive *R&D back-up*, analogous to the standard product program of the Swedish multinational Sandvik AB as mentioned above.

Assortment Intensive e-Gov Toolkits: The variables that can be woven into an *e-Gov Toolkit Product Program* should be chosen with good care in a manner encompassing all possible situations, bearing in mind that e-Governance is a complex process, as also the kind of QOG outcomes which the Country, State/ District/ Village/ Community would wish to see addressed. It would take a good number of iterations to develop an imaginative *e-Gov Standard Product Program* consistent with the *e-Gov market requirements*. The coding structure might take into account the following, *illustrative but not exhaustive, dimensions and product attributes* that seek to describe the e-Gov Toolkits:
(based on knowledge of India's current governance hierarchies and situational contexts)

2.4.1 Planning Philosophy

Approach Used (Employment Oriented/ Investment and Growth-oriented, Top-down/ Bottom-up etc), resource endowments, political clout of current regime holding the reins of governance.

2.4.2 Contextual

Supply Side: Year of Structuring, Political Entity (Country, State/ District/ Village/ Block Community (with a pre-specified remit of Administrative Authority)

Demand Side: Persona / Orientation (Diagnostic or Treatment types) Local development issues (State/ District. / Village/ Block/ Panchayat/ Community

2.4.3 Developmental

Local Development Planning Machinery, bottom-up as against top-down, Capacity Building, Social Capital, Gender, Women's Self Help Groups, Micro-finance etc

2.4.4 Technical

E-Platform, Networking (outreach and potential) Middleware, Relational Database Management (RDBMS), Enterprise Resource Planning (ERP), Business Intelligence (BI) data-mining, transaction payment processing, business modeling, e-security.

As one-size does not fit for all, within the ambit of Quality of Life missions/themes on which the e-Governance Toolkit(s) devolve, it is important to design *Futuristic Toolkits*, as far as possible, as down-to-earth simple as they must be easy-to-operate instruments for developing country *G2B environments*. Such products entail intensive R & D backed by experiential learning, incorporating in-built KM approaches, and can find excellent markets worldwide. Looking back, it might be admitted that ventures of the kind envisaged above are fraught with tremendous complexity. Hence it is better to start with a low ambition level, perhaps using a "cut and sew" approach to deal with turbulence. Rigor in identifying the mission critical attributes of toolkits in each PPI is an important task in this respect.

A *Networked Monitoring Mechanism* that connects panels of select economists, legal, judicial specialists and Government experts will be an important feature of operating the *e-Governance Service Sites*. Innovative "Design of Experiments Approaches in Social Sciences" aimed at securing Development Solutions (using the power of

ICTs) can be tried in this regard. While such an endeavor should minimize the mismatch between *policies and micro-level* development outcomes ought to be engendering “Quality”, as far as the Government Portals are concerned, the tasks to be undertaken are fraught with complexity, entailing tremendous coordination and concert. Thanks to *XML and Business Intelligence Techniques* enabling in-depth relational data mining, new e-Gov ventures trying these techniques, we surmise, must be already on the horizon.

Dissemination Mechanisms: Once toolkits are developed, they should be linked to websites at national and supranational levels in the domains of Development Economics/ Governance Technology Research etc. Linking them to all existing e-Governance sites on as “reciprocal knowledge exchanges” will go a long way in furthering a “collaborative e-learning process” with intrinsic synergies. Periodic announcements can be made on networked websites, as also on web pages of international organizations/ conferences dealing with development research such as of the World Development Institute, Washington, World Bank Development Forum, the UNDP’s Millennium Development Goals, International Development Research Center (IDRC), Organization for Economic Cooperation and Development (OECD), World Economic Forum (WEF), Global Development Network (GDNet), International Institute of Communications Development (IICD), Poverty Net.org etc. for a worldwide audience.

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A Framework for Developing Local E-government

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Abstract. The paper proposes a framework for developing local e-government. The framework is based on software engineering discipline and its real practice. The framework suggests four perspectives that need to be considered: stakeholders, business drivers, technology drivers, and methodology. It provides a guideline of what to consider in order to set up local e-government in an appropriate direction. It is then applied in Thai local e-government context which has a particular characteristic of cluster structure. Finally, the paper also mentions some benefits of knowledge management for Thai local e-government.

1 Introduction

There are some frameworks which have been proposed for local e-governments in other countries such as England [1], [2], India [3], and Canada [4]. In general, these frameworks suggest various aspects in developing local e-government with emphasis on what to consider in order to deliver government services to citizens. However, there are some other factors that also influence local e-government projects which are not emphasised in these frameworks such as stakeholders, government policies. Hence, this paper suggests a framework for developing local e-government based on software engineering discipline, in an attempt to include broader perspectives.

2 A Framework for Developing Thai Local E-government

2.1 A Framework for Developing Local E-government

The framework proposed in this paper is based on perspectives which are generally mentioned in the discipline of software engineering, or software development, with its real practice [5], [6], [7], [8]. The framework focuses on an information system with its four perspectives: the stakeholders (players) in the information system, the business drivers influencing the information system, the technology drivers used by the information system, and the methodology used to develop the information system.

Local e-government can be considered as a kind of information system which is a tool for governance. Thus the framework for local e-government can be developed as shown in Fig. 1.

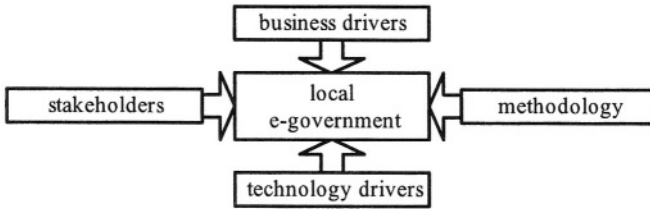


Fig. 1. A general framework for local e-government

2.2 Thai Local Government

This paper addresses local e-government in Thai context where a local government is the authority in charge of a province. Some of the problems that Thai local authorities face in their operations are: lack of cooperation both between internal units within an organization and between an organization and other agencies; lack of sharing: resources, information, knowledge, etc.; lack of standards in many aspects such as work flow, documentation, etc.; and the turnover as staff could be moved to different posts annually.

Thai local e-government has a particular characteristic: cluster structure. Thai government has a policy that a group of neighbour provinces should form a cluster to work together. Furthermore, each of these clusters will need to cooperate with other clusters. Thus, the framework for Thai local e-government should take into account such cluster structure.

2.3 A Framework for Developing Thai Local E-government

In order to be more specific to the development of Thai local e-government and to reflect the cluster relationship among Thai local e-governments, more details are added to the general framework, resulting in the framework for developing Thai local e-government in Fig. 2. The details of each of the four perspectives will be described in the following sections. The diagram in Fig. 2 depicts the cluster structure of Thai local e-governments. The stack of “local e-government” implies the communication and cooperation between local e-governments in a cluster.

The framework is intended to be used as a guideline for developing Thai local e-government in the setting up stage. The guideline in the following sections describes what to consider in the four perspectives in order to set up local e-government in an appropriate direction. The success of up-and-running local e-government is beyond the scope of this guideline although it recognises that once the local e-government has been set up, there is a need for evaluation and improvement.

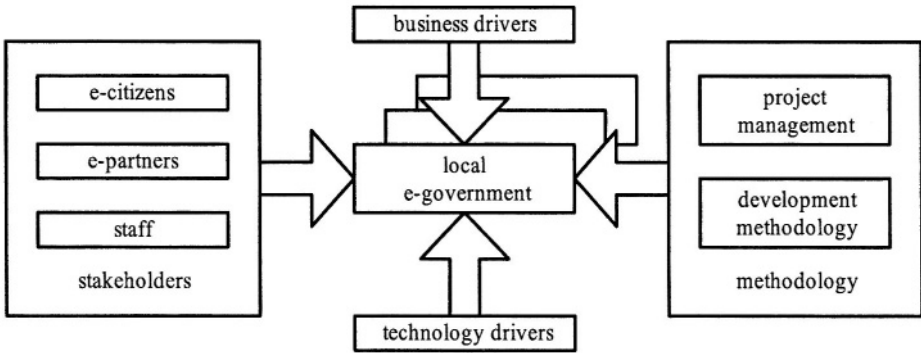


Fig. 2. A framework for developing Thai local e-government

3 Stakeholders

3.1 E-citizens

E-citizens have three roles in the relationship between them and local e-government: e-supporters (They use ICTs to participate in democratic political activities), e-customers (They receive information and services from local e-government), e-monitors (They use local e-government as a tool to monitor local government in terms of their conduct, accountability, and transparency). In developing local e-government, the needs of e-citizens have to be discovered and seriously considered.

3.2 E-partners

E-partners are those who cooperate with local e-government to enable local e-government to function. They can be divided into four groups:

- E-government. E-government is the main sponsor for local e-government who provides support to local e-government. The needs, policies, and directions of e-government should be taken into account in developing local e-government.
- E-agencies. Here, e-agencies are defined as government agencies who cooperate with local e-government in order to enable the local government to discharge its responsibilities. While the relationship between e-government and local e-government tends to be at a strategic level, the relationship between e-agencies and local e-government is at an operational level.
- E-suppliers. E-suppliers are private agencies from whom local government makes purchases through e-procurement.
- Local e-government development team.

3.3 Staff

One of the problems concerning internal staff in Thai local government is a turnover. As they are staff in civil service system, they could be moved to different posts annually. This causes disruption in local e-government project. The resulting problems include change of policies or priorities; lose of knowledge, skills. Local e-government could help easing some of these problems by providing corporate memory or corporate knowledge.

In order to set up local e-government, stakeholders' IT skills need to be taken into consideration, for examples, requisite competencies, skills possessed, the support or training needed, and access to local e-government.

4 Business Drivers

Aspects in the business driver perspective for developing local e-government include:

- Government policy. Government ICT policy concerning e-government could be an influential drive for local e-government.
- Objectives and values. Local government's overall visions and strategies should be identified, together with how local e-government can facilitate achieving those visions and strategies. The priorities of objectives and targets should be established. The rationales of local e-government projects may need investigation as well.
- Collaboration and partnership. Thai local e-government has to collaborate with other local e-governments within the same cluster, and a cluster of local e-governments has to collaborate with other clusters.

5 Technology Drivers

Information technology enables local e-government. It provides medium for information flows and transactions between local government and its stakeholders. Aspects in the technology driver perspective for developing local e-government include:

- Information. All aspects concerning data and information should be considered, including data standards, legal infrastructure, privacy and data protection.
- Technology infrastructure. The hardware and network infrastructures have to be investigated: what are available, what are needed, and how to acquire them.
- Software and tools. Software and tools needed to enable local e-government should be identified, together with how to acquire them.

6 Methodology

Aspects concerning methodology in developing local e-government include:

- Local e-government project management. Local e-government project is an information technology project. There are various aspects that need consideration, in-

cluding project scope, time, cost, change management. Developing local e-government also needs strong leadership, management support and commitment.

- Development methodology. The development of local e-government could follow an information system development process in an iterative model. The e-technique suggested in [9] is a methodology for e-government development which can be applied to local e-government development.

The mechanism for monitoring and evaluating local e-government by stakeholders should be established. Success indicator of local e-government should be identified. In addition to the levels of stakeholders' satisfaction, citizens' quality of life may be used as a success indicator as well.

7 Knowledge Management and Thai Local E-government

One of the services that Thai local e-government may provide to its citizens and communities is promoting the preservation of Thai traditional local cultures and wisdom. Hence the areas of knowledge that local e-government may consider to manage, in addition to the organisation's corporate knowledge, may include the local wisdom, know-how of local traditional handicrafts and products, and agricultural information.

The benefits of including local communities' knowledge in Thai local e-government's knowledge management system are:

- Protecting local communities' intellectual assets from decay. Although it may not be the direct responsibility of local government to preserve local heritages, it still could help initiate, support, and promote such preservation for the benefit of local communities.
- Helping local businesses. The management of the know-how of local handicrafts and art could support local businesses as it provides resources for people as they may apply the knowledge to improve their products and production.
- Generating further knowledge. Thai local wisdoms are often prescriptive. Based on the wisdoms, scientific studies may be conducted to provide scientific explanation. Thus the management of local wisdoms may help generating further knowledge and this adds more values to local intellectual assets.

8 Benefits

The benefits of using the proposed framework include:

- The framework considers local e-government as a kind of information system or a tool for improving local government activities. It considers not only the building blocks for actual delivery of local government services, but also other factors that influence the development of local e-government such as government policy.
- It also provides a guideline of what to consider in the framework's four perspectives in order to set up local e-government in an appropriate direction.
- The framework suggests that citizens' quality of life may be used as a success indicator of local e-government.

- The framework suggests the benefits of knowledge management for Thai local e-government.

9 Conclusion

Local e-government can be considered as a kind of information technology or a tool for improving local government activities. A framework for developing local e-government, based on software engineering discipline, is proposed. The framework suggests four perspectives that need to be considered: stakeholders, business drivers, technology drivers, and methodology. In addition to building blocks for actual implementation of local e-government, the framework also brings to attention other factors that influence the development of local e-government. It also provides a guideline for setting up local e-government in an appropriate direction. Finally, the framework suggests the benefits of including local communities' knowledge in Thai local e-government's knowledge management system.

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