Management for Professionals

Bernd X. Weis

From Idea to Innovation

A Handbook for Inventors, Decision Makers and Organizations

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Bernd X. Weis
Waldkirch
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We must have the courage to let the NOTHING *encounter us. Face to face with the NOTHING, we do realize that we are not only SOMETHING real, but that we are creative beings able to let something emerge from the* NOTHING.
Martin Heidegger

Foreword by Dr. Martin Stark

The ability to innovate is a fundamental property an enterprise needs to achieve sustainable success.

This book examines innovation holistically, taking into account the variety of aspects and the corresponding interactions, which determine innovativeness in the real economy. Especially the many known, but most of all the unknown and therefore not considered interactions assess the complexity of innovation processes. Successful enterprises are able to actively manage or influence these interactions and the associated risks. Examples of this are abound. For an enterprise, the management of innovation is of fundamental importance: a failing innovation may shake the enterprise, but must not endanger its very existence. This is the maxim.

In this book, Bernd Weis shows how innovation occurs—from the initial spark of an exciting idea, its sometimes tedious elaboration, to the organizational integration into the daily business of the enterprise. Based on his experience as inventor, innovator and experienced leader he knows the traps and pitfalls in which inventors, decision-makers and entire organizations may fall, thus defeating in their very beginning promising innovative approaches. He analyzes these pitfalls and provides methods and techniques to circumvent them.

The range of the issues discussed stretches far. Innovation is enabled by the—not always harmonious—interplay of creative people in an organization that supports an innovative, creative development while at the same time preserves its existential economic interests. This book provides the reader with an overview of the factors that shape and influence this interplay. However, despite all efforts, the result of the innovation process often depends on luck or chance—and also this is not withheld here.

For your own path to innovation competence, this book is an exceptional and therefore valuable companion for those who want to delve deeper into the subject of innovation in its fascinating diversity and complexity.

Weinheim, December 2013 Martin Stark

Preface

"Another book about innovation—the bookshops are full of them."… but anyway.

The purpose of this book is to venture beyond the phenomenology of innovation and to shed some light on the causes, reasons and drivers of innovation. It is about the why, about the understanding of innovation, which comes in so many facets. It is about people who have ideas, who invent, about organizations for which innovation is the elixir of life and whose existence depends on it, about markets that cannot get enough innovation. It is about success and failure, chance and luck.

Innovation leads to change and change leads to innovation. This elementary cycle forces perpetual change. It is also the causes of the complexity of innovation processes, and complex processes have the truly unpleasant property that it is not easy—if at all possible—to understand, to see through them. Therefore, the underlying general tenor in every reasoning is that the future is by its very nature unforeseeable and certainly not predictable. Future is contingent—it can turn out one way, but also some quite different way. The reader will notice that I used in the text often weak words like "often," "usually," "sometimes," "occasionally," "hardly" is used, rather than strong words such as "always" or "never." This has precisely to do with the fact that statements are not always or never true—even if they seem so obvious and counter-arguments or examples do not immediately come to one's mind.

Innovation is art. An artist should master the techniques and rules of his profession, even when he develops other techniques and breaks the rules—the art lies in the idea, the composition and the specific execution. Likewise, the innovator must master the techniques and rules that lead from idea to innovation, even if he intends to go an entirely different course himself. The art of innovation lies in the idea, the design and implementation in different proportions.

The book is the result of over 30 years working with innovation. In these years, I discussed and debated in countless meetings with teachers, work colleagues and friends even on evenings and weekends. From each of these encounters I have taken a lot. From this perspective, many are involved in this book, including Professor Herbert Kroemer, who is Nobel Prize laureate (2000) in Physics, and Michael Ashby, grandson of Ross Ashby, one of the founders of cybernetics, who I will refer to in this book. However, to list them all would be beyond the scope of this book as well as my recollections.

Essential for this book are the contributions, constructive criticism, and the enthusiasm of Dr. Joachim Crone (Munich), Ines Engel (Asperg), Peter Graeser (Berlin/Freiburg), Dr. Susanne Happ (Bonn), Susanne Moser (Munich), Dr. Astrid Sandweg (Stuttgart) and Thomas Volk (London/Bobingen).

Waldkirch, December 2013 Bernd X. Weis

Endorsements

Each day, we are confronted with opportunities, large ones or small ones, on which we need to act. The problem lies in the sheer number of data that we receive the challenge of prioritizing and the limited time to take the right decisions. This book creates a system to sift through the opportunities, detect the very best ones and thereafter identify what needs to be done to capture the benefits. Dr. Bernd Weis does a marvellous job in offering a systematic approach to innovation, enhancing the chances for success. Good luck with applying these timeless principles and strategies to your business!

Johan Vanderplaetse, Area Vice President, Emerson Process Management

This book offers a fresh and accessible approach to innovation. Innovation may be the hottest discipline around today—in business circles and beyond. And for good reason. Innovation transforms companies and markets as well as persons and societies. For all the enthusiasm the topic inspires, however, the practice of innovation remains stubbornly impenetrable. Bernd X. Weis presents a simple definition of innovation, breaks down the essential differences between types of innovation, and illuminates innovation's vital role in organizational success and personal growth.

Romano Valussi, GM New Business, Board Member, SIAE Micro

In this book on innovation, it is not just about the formal processes of innovation. It discusses in depth the various contexts and conditions that are observed in innovative organizations and institutions. As the origin of life ultimately remains a myth, one knows that it exists and that the conditions for it were favorable. It is the same with innovation: favorable conditions can be created that enable and support the creative act of human ingenuity. In addition, practical tools that will lead step by step the actual implementation of the idea/ invention into a successful innovation. This guide explains more than even more clever words.

Prof. Dr. Dr. h.c. Guenter Müller, Universität Freiburg

What characterizes an "innovation“? Is every invention "innovative“? Which organizational characteristics are preconditions for an innovation culture? These are

the questions, which the key actors have to face in a typical innovation drama in organizations.

The “From Idea to Innovation” provides practical tools, how innovation managers can implement the "new" in practice. Scenes of a drama and checklists go hand in hand. Another perspective—inspiring and practical.

Prof. Dr. Helmut Krcmar, Information Systems, Technische Universität München (TUM)

Organizational culture, structure, processes, individual attitudes, open spaces for ideas (“Freiraeume”), creativity, … Innovations successful in the market only come about when organizations succeed in letting many influential factors constructively interact. It shows time and again, however, that they not always succeed. Often, influential factors conjoin rather by chance than design; some may be missing entirely.

The “From Idea to Innovation” manages to portray the contexts of innovation comprehensively and yet very practically. Thus, it valuably contributes to enhancing innovativeness at all levels—and this differentiates it from the mass of books on the subject.

Bonifaz Maag, Executive Director, KUGLER MAAG CIE GmbH

Strategy, culture and process are the three key elements, with which an organization can regulate innovation. “From Idea to Innovation” focuses on the last two, which in corporate reality committed innovators can actually influence. The book maintains a wonderful balance between theory and practice. With pertinent definitions and the right models, it introduces the reader to the topic quickly and explains the techniques and rules of being innovative. However, the most important and novel component of the book are the tools that assist the inventor in developing ideas into successful products and help him to structure and evaluate the elusive field of innovation.

“From Idea to Innovation” is a reliable companion for the inventor and the decision-maker on the challenging path of innovation.

Dr. Utz Täuber, Head of Innovation Center, INVENSITY GmbH Wiesbaden

Contents

Introduction 1

The following story tells an everyday working experience of an innovator.

> Thomas E. had an entirely new idea and on top of it invented an implementation, a system. Thomas E. visits his manager, John G. John listens to the idea and he likes it—in a sense, since he asks whether the idea is actually viable. Furthermore, he remarks that there no users, no customers for this idea out there, and asks the question of all questions: "Thomas, and how big do you think is the market for it?" Thomas E. has no clue about that; his new idea is so super, that it will be without any doubt a market success. However, Thomas E. is frustrated because he lacks the appropriate skills and the knowledge to come up with an answer to his manager's question. His manager is frustrated, because now he has another topic on his desk he eventually needs to decide upon, and that on the base of rather vague and unreliable information. His budget is very tight to start with. But, the company is happy because again a cute idea and invention has been made in-house.

This story explicates the multitude of aspects related to innovation. Innovation creates on the one hand motivation, but on the other hand frustrations and disturbances. One loves the upside advantages, however one would also like to avoid the downside effects such as financial risks. Whether an idea is really successful, one only knows by hindsight.

1.1 Goal of the Book

An idea becomes an innovation when successfully introduced into the market. The path from idea to innovation can be steep and stony, because within an organization there are three different perceptions of an idea, here represented by the three main protagonists—inventor, decision-maker, and organization as an abstract entity. To

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push innovations forward sustainably, the three protagonists have to understand each other.

- The inventor himself is convinced of his idea, his invention, and its innovation potential.
- For an idea to become an innovation, resources need to be allocated. The decision-maker adjudges about this within the means available.
- The organization itself demands and supports in an abstract sense inventions and innovation. Almost all published business strategies mention innovation very prominently.

There are many books on innovation, its management, and its organizational foundations. This literature, however, only deals with innovation from an organization's viewpoint and dwells on the question, what an organization has to do to foster innovation. These considerations ignore the inventor and the decision-maker. What—very specifically—has an inventor to accomplish on top of his invention to gain the attention of the decision-maker? Moreover, what—very specifically—does a decision-maker need to assign the scarce resources he has the mandate to allocate to the most promising inventions and ideas for the organization?

This book aims to describe the different requirements imposed on the protagonists, and—entirely in the sense of a handbook—to provide guidance, how and with which means the protagonists communicate, and which information in the different innovation phases can be expected and which are required, respectively. Eventually, a business model integrates the perspectives of inventor, decision-maker, and organization, which enables a common "language" and communication platform for the emerging tension field and allows asking and answering the right questions.

1.2 Generic Structure

Each chapter is divided into four parts. In the first part scenes from the *drama "Being Innovative,"* in which the protagonists articulate their confidence, hopes, concerns, doubts, worries and difficulties, trials and tribulations, introduce the topic of the chapter. Then *Selected Topics,* which arise in the corresponding context, but are often neglected and ignored, are given some attention. Mostly these special topics divert somehow from the core. They offer different perspectives and stimulate the reader's own thoughts—many things are much more complicated and at the same time much easier than one tends to believe. The part *Concepts and Contexts* offers a pragmatically detailed description of the corresponding chapter's topic. Finally, the part *Tools* provides field-proven templates, checklists, questionnaires etc., which assist in systematically approaching and handling the topic.

The general higher-level concept, frequently referred to, is the development of a business model specific to the invention at hand. The business model allows communication in a common language and with terms, that are important to all protagonists. In the beginning, the inventor has to rely solely on his own resources—and

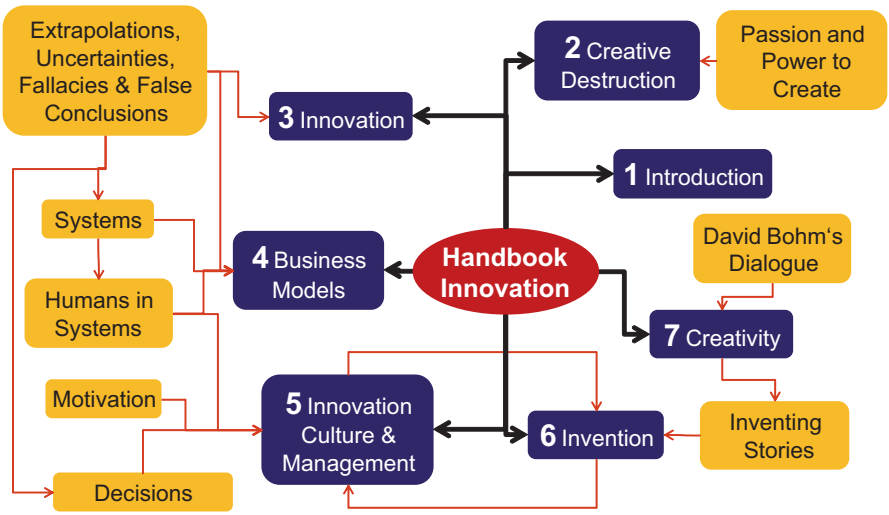

Fig. 1.1 Structure of the book. (Source: Bernd X. Weis)

he typically has not the expertise on how to build a business model to convince the decision-maker. To the inventor this handbook makes a variety of tools available to soundly embed his invention into a business model.

The business model clarifies who needs which information in which stage of development and in which level of detail. If organization, decision-maker, and inventor agree on the process, it facilitates a smooth and frictionless communication and coordination.

1.3 Overview of Content

Figure 1.1 presents the topical structure and the interdependencies of the different topics. The following briefly describes the contents.

1.3.1 Creative Destruction

A book on innovation has to discuss the creative destruction as the Austrian economist Joseph Schumpeter characterized innovation. Creative destruction is also the topic of the introducing monologues in the drama "Being Innovative" illustrating the tension fields "destruct the old" and "create the new," in which the three principal characters of the drama—the inventor, the decision-maker, and the organization—exist.

1.3.2 Innovation

The *Selected Topics* deal among others with "Uncertainties and Probabilities," "Anomalies and Fallacies," and "Perpetuations and False Inferences". Uncertainties are the fundamental characteristic of innovation; one does not know a priori whether an innovation will truly be successful. Perpetuation of the past and uncertainties about the future lead to cognitive anomalies and fallacies, which deceive people when confronted with uncertainties.

In *Concepts and Contexts,* at first innovation is defined and a typology according to content (what is the innovation), creation (how has the innovation been created), and impact (what are the effects and consequences of the innovation) is developed. Disruptive innovations can fundamentally change and shape markets. Most organizations provide only inadequately for this type of innovation. The classification of an innovation according to the typology has far-reaching consequences. Thus, e.g., disruptive open product innovations require a fundamentally different management paradigm than sustainable closed process innovations do.

1.3.3 Business Models

The *Selected Topics* are among others "Business Model as a System" and "People in the System: Ecosystem." Complex systems have the rather unpleasant property to elude themselves from a reliable cause-and-effect analysis. In "People in the System: Ecosystem" the human factor is additionally considered. People can deal with complex systems in three possible ways: control, embrace or shape. Furthermore, cooperation and trust as overarching behavioral patterns in communities are discussed.

In *Concepts and Contexts,* business models are defined based on value creation. A typical business model comprises three elements:

(1) the value proposition for customers and business partners (answers the questions "with whom," "whereby," and "what for"),
(2) a description of the architecture of value creation, i.e., how the benefits are created (answering the question "how"), and
(3) a description of the revenue model, i.e., by what means revenues are obtained (answers the question "by what means").

1.3.4 Innovation Culture and Innovation Management

The *Selected Topics* are "Motivation" and "Decisions." Motivating and deciding are essential elements of an innovation culture and of innovation management, because there the bright and dark side come very close, and eventually cannot even be distinguished.

In *Concepts and Contexts,* organizational culture and innovation culture are developed from the general concept of culture. Edgar Schein defines culture as "*a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems.*" Innovation culture has to be conceived a trans-disciplinary culture. Its imperative is to integrate pragmatically anything desirable, necessary, useful, feasible, and appropriate. Thus, innovation culture is an organizational culture in which creativity and innovation can bloom and thrive.

Innovation management is the systematic planning, control and supervision of innovations in organizations. Innovation management aims to commercialize the ideas, i.e., to create from them economically successful products and services. The management of innovation is part of the implementation of the corporate strategy. The main characteristic of innovations is that with and through them, one accesses a virgin soil, a new "terra incognita." To make them successful mandates change, i.e., innovation management is also change management.

1.3.5 Invention

The *Selected Topics* are "Inventing Stories" and "Additional Concepts," e.g., ME-CEness and hypothesis are explained, concepts which contribute to a more thorough understanding. A story that describes the application of the potential outcome of an invention can splendidly explain the underlying idea.

In *Concepts and Contexts,* the business model approach is practically applied to inventions and augmented with thorough financial considerations—the business case. With this in every phase, the uncertainties and imponderabilities of an invention are mapped onto financial risks. This allows an optimized resource allocation with respect to the development progress and development adaptation with respect the availability of resources. A variety of tools and methods are presented to support this analytical process.

1.3.6 Creativity

The *Selected Topics* addresses the "Creative Process" and in more depth "Bohm's Dialogue as Creative Process," in which coherence is established within a group and which enables better access to one's own intuition.

Concepts and Contexts deals with the thinking patterns of creative persons. For creativity techniques, task definition and goal formulation are important. Scenarios offer the opportunity to portray different developments in the future. Subsequently, a selection of the most effective creativity techniques is presented.

1.4 The Purpose of this Book

This book pragmatically bridges the chasms between engineering, technology, economics, and business management. It conveys with which means and tools this can be achieved especially for someone who is layman in economics. It is recommended to use the tools, techniques and checklists pragmatically and selectively. Not all of them are needed or required for every purpose.

1.5 The Usage of this Book

Not all elaborations of this handbook are of the same imminent significance for the three protagonists, inventor, decision-maker, and organization.

1.5.1 For all Three Protagonists

The sections *Concepts and Contexts* in the chapters *Innovation, Business Models,* and *Invention* are of general importance for the assessment and evaluation of innovations. The section *Selected Topics* in chapter *Innovation* assists in facing the uncertainties of the entire innovation process and dealing with them. Chapter *Creativity* assists in unveiling innovation potential.

1.5.2 For the Inventor

The sections *Selected Topics* and *Tools* in chapter *Invention* enable the inventor to "market" his idea, serve as information source and are to be used as needed.

1.5.3 For the Decision-Maker

The entire chapter *Innovation Culture and Innovation Management* supports decision-makers to re-evaluate their organization's culture and management of innovation. The sections *Selected Topics* and *Tools* in chapter *Invention* define what the decision-maker can expect from the inventor.

1.5.4 For the Organization

The sections *Selected Topics* and *Tools* in chapter *Business Models* assist the organization in perceiving the systemic character of a business model. The entire chapter *Innovation Culture and Innovation Management* supports in reflecting culture and management of innovation.

Creative Destruction

2

The drama "Being Innovative"—prelude with introducing monologues of the protagonists.

When imagining the innovation process as staging a drama, the following three characters need to be casted:

- Thomas E., the inventor: Thomas E. has the idea and is keen to implement it or to see it implemented,
- John G., the decision-maker: John G. has to assess whether the idea is pursued further and whether resources will be made available, and
- POLMY Inc., the artificial character "the organization": POLYM is represented by the board member, Alexander H., he demands of inventor and decision-maker to be of benefit, and Walter K., his management assistant.

The drama allows to express lines of thought that may at first glance appear confusing, but orientate themselves along an expressionist reality, and to broach areas that would not otherwise properly fit into the flow of discussion. Thus, it enables parallelism and multiperspective considerations, which could hardly be achieved otherwise.

The drama begins with a prelude of monologues of the main characters on "Creation and Destruction."

Inventor Thomas E. (Creation Monologue): How long have I been pondering this topic, reflected, reasoned, and looked at it from different angles. I reshaped the task into different forms, alienated it in entirely different contexts, abstracted it to the conceptual, to the big picture, detailed it to small and tiny bits, zoomed into clear-cut and thus manageable ways of looking at the problem. And then, unexpectedly and surprisingly, in a situation and a place with apparently no connection whatsoever, washing my hair in the shower, it came, the idea, the solution. The puzzle pieces, which I collected and compiled up to now, suddenly find their places, as if by themselves the items that previously seemed bulky and incompatible connect and assemble. The solution emerged, images appear—how this solution effects

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changes, how everything gets better, more beautiful, easier. Nobody else but I could have achieved this. My idea is bold and brave, and when I place this idea smartly in the company, then that would be a very great success, the company and the customer would benefit, and it certainly will not hurt my personal career. In addition, others will pay attention to my invention and me. Who can say what eventually could develop out of this. This is really balm for my soul.

Inventor Thomas E. (Destruction Monologue): My solution is really great, can really achieve something. If we implement this idea, that will create quite a few distortions in the company. This is anything but a walk. Dr. Maier is certainly against it, he is against anything that moves faster than a snail. On the other hand, my project is behind schedule, we run right out of time. Mr. Tan, the customer, calls constantly to inquire when the system will be up and running. Mr. Tan sits in Malaysia and his English is just not very good. I can barely understand him, and then the Asians communicate differently. I always try to read between the lines, whether there is something to read. The project has the highest priority, the management looks very closely and they are already mad and sulky. If I fail on this project, then I can put my career on hold for the time being. Even my colleagues in the project are beginning to put pressure on me. Sure, my idea was just so incidental, but it's got to be someone here who has some understanding and values my idea for its importance. Now the phone is ringing. Mr. Tan asks for the umpteenth time for the rest of the documents of the user manual. Isn't it possible to think just one thought in peace and quiet!

Decision-Maker John G. (Creation Monologue): My business unit needs to develop. Urgently needed are new ideas of the sort that bring fresh air into the portfolio, the company's management has expressed this very clearly in the recent management meeting. With new products, new markets and new customer groups are to be developed. Exploiting the economies of scale we can produce more cost effective and our share of the total fixed cost will become smaller. It will be best if I spread the word, that new ideas are always at any time most welcome and that my door is always open to discuss them. There are really very good people in the unit who have great potential, I just need to manage to somehow tap this potential. I've already hired a consultant, who hopefully will boost creativity in some workshops and seminars. I am convinced that this opens up some options for change. Who, if not we ourselves, could otherwise achieve this?

Decision-Maker John G. (Destruction Monologue): Hopefully they come up with some sustainable ideas in the workshops. Probably they have again so many ideas. And we can't implement them all. How do I know which ones are really good and which ones are not, I can't figure that out at first glance, and do I really have the time for a second? They always want everything at once—the full Monty—and they always justify this saying that you make it either right or leave it, they just don't know what it all costs. In addition, my budget has to be fixed. As always, there are too many tasks and I can't deal with them with the resources I have available; too

few staff, investment restrictions, almost no money for external support. How am I supposed to pull off all those upcoming projects? There are important projects that certainly have the potential to steer the company in one or the other direction. The competition is not sleeping, offerings become cheaper every day. How they deal with their costs, most probably there are tacit subsidies; these prices can't otherwise be explained. Soon, the quarter is coming to an end, and we have to do the accounting, we still lack some revenue, if only this customer hadn't jumped, I was ever so sure we bagged him. Management is not going to like this. How could I possibly reconcile all this?

POLYM Inc. Alexander H. (Creation Monologue): For quite some time the competition is pressing us; the products that once established the success of our company, get on in years and require a much-needed overhaul; even though these markets don't grow that much, moreover even a stagnation is expected. But it will generate profits—the pressure on margins notwithstanding. For the company to grow, we need to broaden our traditional markets, and for this, we will need new products. With these, we even can tackle completely new markets. What are the new products with which we could serve a new market? Which customer groups are we addressing now and which could we address in the future? How is this market structured, is the market already dominated by someone and if so, by whom? It would be ever so wonderful if we could teach our competitors a lesson with an innovative product and an ingenious market approach. We have great researchers and developers, and our marketers don't need to hide. There must be something we can do. We will make innovation a top priority, so that the ball finally gets rolling.

POLYM Inc. Alexander H. (Destruction Monologue): The latest customer surveys were very positive; it is very gratifying that we are praised for our reliability and our quality. But with this new idea, we could possibly reposition ourselves in the market. Both, our customers and our competition, could perceive us very differently. For this, however, we need to do something; first of all, we have to modify our product portfolio, our processes, and eventually a large part of our culture. And this now, when the processes are running smoothly, when almost no errors happen. The customers honor this. We need to change so much, and that even at the risk that our efforts are not as successful as we hope and expect. Of what we have built so far, we have to check everything again and change what obstructs or hinders our success. The company could certainly do with a little routine and rest. Ah, here we have so many things to ponder and decide. Ultimately, it boils down to the question "To be or not to be."

2.1 Creative Destruction: Selected Topics

The Austrian economist, Joseph Schumpeter, has been the first to look closely upon innovation and its economic impact, and in this context, has coined the concept of "creative destruction" (Schumpeter 1950).

Of the Beautiful Bird Phoenix and of the Hindu Pantheon

The idea that the birth of something new often requires the destruction of something existing is old. From the Egyptians, the Greeks adopted the myth of the Phoenix, a symbol of the rising sun. Phoenix lives 500 years, and at the end of this period, it builds its own funeral pyre and fans it with the beating of its wings. Phoenix burns to ashes and from the ashes, a new Phoenix arises, an eternal cycle. Nietzsche puts it more dramatic: *You must be ready to burn yourself in your own flame; how could you rise anew if you have not first become ashes!* (Nietzsche 1891)—creative destruction.

In Hinduism, creative destruction is an endless cycle: Brahma, the builder, creates the universe anew all the time, Vishnu, the preserver, nourishes the created, and Shiva, the destroyer, destroys it, so that Brahma can build it again—creative destruction.

Power, Passion, and Burden to Create

In the economy of the nineteenth and twentieth century, "power to create" was a key concept—the continuous improvement of production capability was seen as the key to national prosperity. "Passion to create" Goethe calls it, thus expressing both, the power to create and the pleasure of creating.

> When the world in its deepest beginnings
> Was laying at God's eternal chest,
> He arranged the first hour
> With the sublime passion to create,
> And he said the word: Let there be!
> There came a painful Oh!
> As the universe with gestures of power
> Broke into realities. (von Goethe 1819)

> *(Als die Welt im tiefsten Grunde*
> *Lag an Gottes ewger Brust,*
> *Ordnet er die erste Stunde*
> *Mit erhabner Schöpfungslust,*
> *Und er sprach das Wort: Es werde!*
> *Da erklang ein schmerzlich Ach!*
> *Als das All mit Machtgebärde*
> *In die Wirklichkeiten brach.)*

According to the idea of man in the Renaissance—man being the image of God—it was a joyful duty of man to create something new, a duty, with which he had to comply. Exactly this idea is also found in Schumpeter's entrepreneur again; being the one who creates something new not just for the sake of profit but also driven by an inner desire to have to do just this, driven by passion to create. However, in Goethe's verse, the passionate act of creation came with a "painful Oh!"

Passion and burden to create: The creative person has a hard time, because in addition to personal change, to inner joy and fulfillment, in the process of creation, one has to overcome many obstacles—both internal and external. Here again, Nietzsche said, "*Creating—that is the great salvation from suffering, and life's allevia-*

tion. But for the creator to appear, suffering itself is needed, and much transformation" (Nietzsche 1891).

Similarly, the neurobiologist and brain researcher, Professor Gerald Huether, expressed this in a lecture[1] on change quoting Karl Marx, "*Ideas that defeat our intelligence, that capture our conviction to which the mind has forged our conscience, these are chains from which one cannot wrest without breaking one's heart, these are demons that man can only defeat by submitting to them*" (Marx 1958).

2.2 Creative Destruction: Concepts and Contexts

The paradoxical concept of "creative destruction" strikingly describes the events that happen when "innovating." It is an economic renewal process, destroying the old and creating the new.

2.2.1 Entrepreneur and Organization

In economic terms, it is perfectly clear: The innovator challenges the existing market structures; he wants to find and conquer his own place in the tournament of economic forces. For Schumpeter (Schumpeter 1950), the innovation process is the fundamental process that determines economies. He describes this process as follows: "*The opening up of new markets, foreign or domestic, and the organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the same process of industrial mutation—if I may use that biological term—that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in.*"

Entrepreneur

For Schumpeter, the central figure of this process is the entrepreneur, who, due to his power and passion to create, is willing and able to implement new ideas and inventions into successful innovations. He eventually is the cause of change. Thus, the shoulders of the entrepreneur bear the burden of economic development, who according to Schumpeter has an extraordinary personality, that makes him sort of member of an economic elite. With a focus on the ability of the entrepreneur on the marketing of innovations rather than on their invention and development, Schumpeter, however, loses sight of the general human creativity, ingenuity, and motivation as core elements of change.

Also, because of the exclusive consideration of innovations of the heroic entrepreneurs, the less spectacular contributions of smaller innovations to development

[1] Gerald Hüther at Hospitalhof, Stuttgart, September 12, 2011.

are downplayed ("*take as many coaches as you want, you will never get a railway*"). However, if one assumes the entrepreneur to have the capabilities of "learning" and "resourcefulness", i.e., the eagerness to track down and follow up with opportunities, then the sequence of decisions along the time line can be seen as the result of a learning process, of course including the possibility of errors and mistakes. Thus, minor innovations along this course of time are recognized accordingly as contributing to the overall development.

Power to Create

Established companies market good products or solid services. However, they do not participate in shaping the market, but rather respond to change with the usual standard means. By continuous improvement, they make efforts to adapt to changes and to meet their expectations. This is often a very successful strategy.

Another promising strategy is to wait and observe closely; let the would-be innovator do and try. If one anticipates that the strategy of the innovator adds up, that the would-be innovator has become a real innovator, then one can follow and copy the now proven recipe for success. More though, copying is cheaper; the mistakes in the early phases of development and market positioning can be avoided, but one must also meet elevated customer price expectations and/or create packages with additional benefits, and one has to expect lower margins. Or—if the purse well filled with cash—one just buys the innovator and integrates the innovation into one's own product portfolio. However, the integration of an acquired company into one's own is difficult, and not to be underestimated. In any case, the timing of action is crucial—whoever is too early, carries the big risks (which actually was meant to be avoided), whoever is too late, may not be able to position himself as a competitor, or as Mikhail Gorbachev said, "*is punished by life.*"

Passion to Create

Innovative companies differ from traditional firms in that they actively precipitate changes in the markets or at least perceive changes and participate in these transitions. With innovative companies, being innovative, the passion to create is a central aspect of their entrepreneurial activity and firmly embedded, incorporated, and anchored in their corporate vision, strategy and culture. Being innovative means to pursue a permanent quest for customer benefit and to make this the central focal point. Being innovative does not succumb to day-to-day business, but is all the time exemplified and correspondingly communicated. Successful strategies that derive from being innovative are unique in themselves, creative and original, point to paths that lead into the unknown and nobody have explored yet. They are closely interwoven with the company and the persons therein and properly arranged along the time line. Thus, initially they are rather difficult to imitate. So successful innovative companies have inherently a competitive advantage, but only so for a certain time.

The dark side of being innovative is the sword of Damocles of defeat and failure, which always hangs over innovative companies. If a company does not show the above characteristics, then it is struggling with innovativeness, with being innovative. If it does, however, then there is a priori the chance to be successful. Eventually, there are only the happy successful and fortuneless unsuccessful.

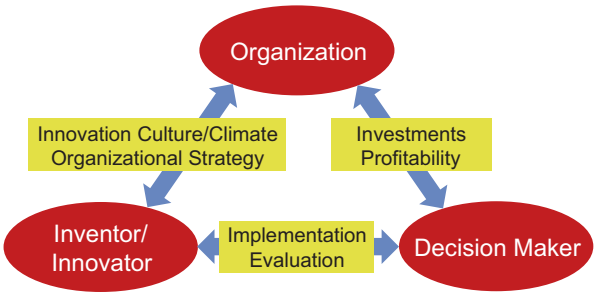

Fig. 2.1 Protagonists in the drama "Being Innovative." (Source: Bernd X. Weis)

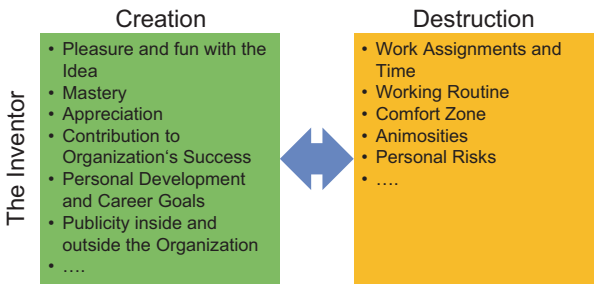

Fig. 2.2 The inventor—"Creation and Destruction." (Source: Bernd X. Weis)

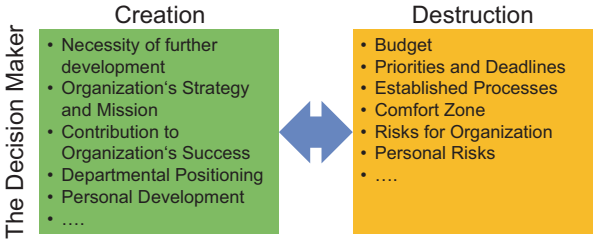

Fig. 2.3 The decision-maker—"Creation and Destruction." (Source: Bernd X. Weis)

2.2.2 Protagonists in the Drama "Being Innovative"

The protagonists in the drama "Being Innovative" have presented themselves or were already briefly introduced– the inventor, the decision-maker and the company as an abstract character. Figure 2.1 shows the relationships between the protagonists with their main characteristics.

All the main characters in this drama exist in this tension field of creation and destruction, in a manner of speaking they have to confront this primal antagonism. But, the specific occurrences of this primal antagonism that were set forth in the monologues are less spectacular—the following Figs. 2.2, 2.3, and 2.4 illustrate the different tension fields.

The issues raised in the tension fields will be discussed in more detail in the following chapters.

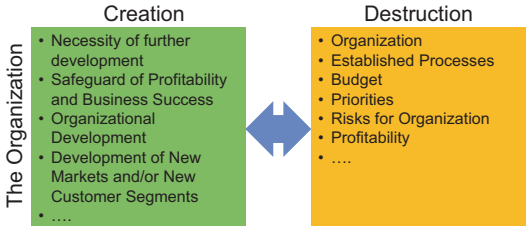

Fig. 2.4 The organization—"Creation and Destruction." (Source: Bernd X. Weis)

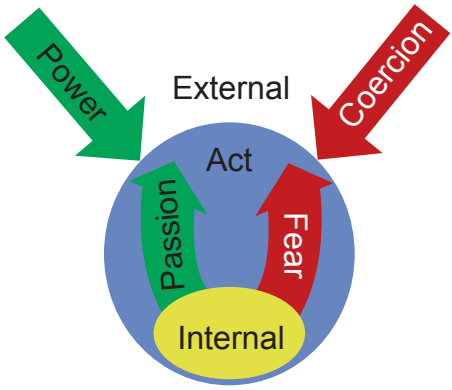

Fig. 2.5 Drive/inhibition to act. (Source: Bernd X. Weis)

2.3 Creative Destruction: Tools

Cube of Befindlichkeiten[2]

Both, an individual person as well as a group or an organization can use this tool.

In addition to creation and destruction, one distinguishes whether the drive or inhibition to act, respectively, stem from within (passion/fear) or are imposed from the outside (power/coercion) (see Fig. 2.5). Fear and coercion can let us withdraw from the opportunities to act and enable moments of reflection; passion and power are the drivers for eliciting just these options to act and for pursuing them eventually.

[2] The German noun *Befindlichkeit (plural: Befindlichkeiten) has been* coined by Heidegger. *Befindlichkeit* refers to what is ordinarily called "being in a mood," and also what is called "feeling" and "affect." *Befindlichkeit* refers to the kind of beings that humans are, that aspect of these beings which makes for them having moods, feelings, or affects.

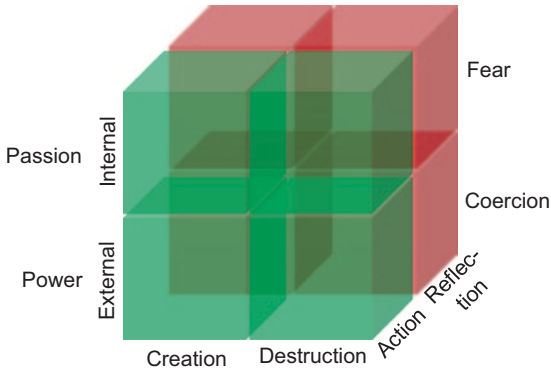

Fig. 2.6 Cube of Befindlichkeiten. (Source: Bernd X. Weis)

This results in the cube of Befindlichkeiten (see Fig. 2.6) in three dimensions. Each dimension has two attributes:

$$\text{Creation} \leftrightarrow \text{Destruction}$$
$$\text{Internal (passion/fear)} \leftrightarrow \text{External(power/coercion)}$$
$$\text{Action} \leftrightarrow \text{Reflection}$$

When considering the internal dimension, the needs, values, or motives are specified which lead to passion and fear. When considering the external, the influences are listed, which are sources of power to master acts of creation as well as destruction, or which exert coercions that vigorously influence the freedom of decision and of action and which attempt to avoid or even prevent exactly these acts.

The structure of the cube allows different attribute combinations detailed in the following.

Passion to Create
The overwhelming desire, lust and thrill to leave for new unknown shores, to create something entirely new.
- What have I (we) always wanted to make, build, invent, create?
- What is it that I would (we would) love to create?
- *Example: I want to implement my idea and make it successful.*

Power to Create
Perceiving the ongoing changes in the world as opportunity to shape and to create something new.
- Which outside influences inspire my (our) creativity, which motivate me (us)?
- *Example: People want new ideas.*

Passion to Destruct
The overpowering desire to leave the old ways, to get rid of, and to leave behind the old.

- What did I (we) have always liked to get rid of, to tear down? What is in my (our) way?
- What is it that I (we) will happily destroy?
- *Example: I want to give up old solutions, paradigms, and concepts of thought.*

Power to Destruct
Perceiving the ongoing changes in the world as opportunity to evolve, to develop, to let go of the old, and to adapt to the new.
- What changes in the external dimension question the hitherto existing?
- What possibilities are there to throw off ballast?
- *Example: The old solutions do not find customers anymore. They hinder more than they are useful.*

Fear to Create
The deep anxiety to leave for new unknown shores, to embark on something new, to create something completely unknown yet.
- Why am (are) I (we) afraid to begin something new?
- Why am (are) I (we) afraid of failure?
- *Example: They consider me a loser, if my idea is not successful.*

Coercion to Create
Perceiving the ongoing changes in the world as coercion of having to create the yet unknown.
- What external influences force me (us) to change, to renew?
- *Example: All the time people want something different, something new.*

Fear to Destruct
The deep anxiety to leave the old ways, to get rid of and to leave behind of what one has grown fond.
- What attaches me (us) to what I (we) should get rid of and tear down?
- What binds me (us) to the well known?
- *Example: Up to date everything works quite perfectly.*

Coercion to Destruct
Perceiving the ongoing changes in the world as coercion, as force to change, to let go of what one has grown fond of, and to adapt to the unknown.
- What changes in the external dimension question what I (we) have done so far? Why do they force me (us) to let go?
- *Example: My solutions find no more customers. But, they are of such high quality.*

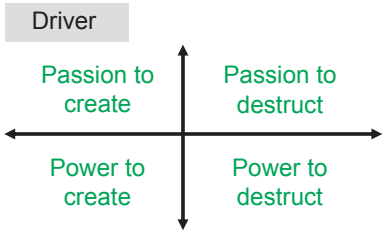

Fig. 2.7 Example of a projection in two dimensions. (Source: Bernd X. Weis)

Projections

With the filled cube of Befindlichkeiten, an analysis in two dimensions may lead to additional insights (see Fig. 2.7). Selecting an attribute in one dimension (e.g., a driver in Fig. 2.7), the corresponding attributes of the other dimensions are then organized in a kind of strengths, weaknesses, opportunities, and threats (SWOT) structure (see Sect. 6.3). Doing so for all attributes, one gets six of these projections. In this representation, hidden contradictions and inconsistencies can been unveiled more easily.

Creative Destruction: Summary

In the economy of the nineteenth and twentieth century, the "power to create" was a key concept—the continuous improvement of production capacity was considered the key to national prosperity.

The entrepreneur creates something new not only for the profit's sake, but also driven by an inner passion and desire to just have to do that, by passion to create.

The creative person does not go the easy way—besides the personal change, the inner joy, and fulfillment, numerous obstacles need to be overcome in the creative process—both internal and external.

Because of his power and passion to create, the entrepreneur is ready and able to implement new ideas and inventions into successful innovations. He is the cause of change.

A promising strategy for established companies is to wait and closely observe the would-be innovator. If one anticipates that the strategy of the innovator adds up, then one can follow and copy the now proven recipe for success. Because copying or taking over is economic. In any case, the time to act is crucial.

Innovative companies differ from traditional ones in that they actively precipitate changes in the markets or at least participate in these transitions. With innovative companies, being innovative is a central aspect of entrepreneurial activity and is firmly embedded, incorporated and entrenched in their corporate vision, strategy, and culture.

The cube of BEFINDLICHKEITEN[3] has three dimensions, each with two attributes:

Creation ↔ Destruction
Internal(passion/fear) ↔ External(power/coercion)
Action ↔ Reflection

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[3] For the definition of BEFINDLICHKEITEN, see p. 14.

Innovation

3

The drama "Being Innovative"—Act 1, Scene 1

Inventor Thomas E., decision-maker John G. and Walter K., management assistant at POLYM Inc., are in a meeting room. After the presentation of the idea the following discussion develops.

Inventor Thomas E.: This new system will turn everything hitherto existing upside down. Never has the customer had a similar experience. The whole world is lying at his feet—of course not real, but virtual. With this system, we can only be successful!

POLYM Inc. Walter K.: Has anyone ever done such a thing? Are there any experiences? Did not YLMOP do something similar?

Inventor Thomas E.: That's just it. Never ever has anything like this been offered on the market. To my knowledge, it is light years ahead of the products that are already on the market.

POLYM Inc. Walter K.: Yes, I think it's conceptually highly interesting. But why should the customer want such a thing? Are there any studies on the subject matter?

Inventor Thomas E.: I haven't seen any studies on this. How could I? The idea is so new, nobody has ever thought into it—except me of course.

Decision-Maker John G.: Have you ever thought about what it would cost to develop? Do we already have something we could reuse?

Inventor Thomas E.: The costs are marginal compared to the revenues that we will have; the profits will compensate the cost in no time. People will wrench it from our hands. Just think of Stephen J.; his products have sold like hotcakes. I have discussed this once—all confidential of course—with my sports friends—and they were all thrilled.

B. X. Weis, *From Idea to Innovation,* Management for Professionals,
DOI 10.1007/978-3-642-54171-1_3, © Springer-Verlag Berlin Heidelberg 2015

POLYM Inc. Walter K.: I'd happily believe you. But do you have an idea on how we could capture this a bit more specific?

Decision-Maker John G.: I suggest that you investigate this in more detail. When can we expect further results?

Inventor Thomas E. and decision-maker John G. leave. Walter K. is alone in the meeting room.

POLYM Inc. Walter K.: That's an interesting approach, and that it is new, I'll believe on the spot. Unfortunately, I myself do not have the time to make much use of it. If this invention is really as good as this Thomas E. claims, it would be a great success for our company. But, what is at stake for us? Hmm, this Thomas E., he looks like an inventor, he could do with a haircut and a new pair of pants—these jeans all the time. Well, on the other hand, Levi Strauss has built an empire with them and made a lot of money.

3.1 Innovation: Selected Topics

At the beginning there is always the idea—would not it be great if something would work as you want it to work, this way or that way? You ponder over this question, this problem you identified, you mentally circulate and rotate it in all directions, you view it from different perspectives, and you take into account additional aspects. Maybe, eventually there comes the thought, what a solution might look like—yes, it could work that way. And again, you start pondering over this idea, you mentally circulate and rotate it in all directions, you view it from different perspectives, you take into account yet more additional aspects, and you consider potential obstacles that may hinder further development. Eventually, if you are convinced that it could possibly work this way, then an invention is born.

Then again, you deal with your invention, you take more detailed aspects into consideration, resolve any obstacles or bypass them, and develop the invention into a product.

With this product, you go to the market—hopefully, there are more people who find it great when something works, as they want it to work, this way or that way. When they become customers, use and deploy the product efficaciously, then the idea has become an innovation.

3.1.1 Hand Axes: Example of an Innovation

These hand axes (Fig. 3.1) were discovered in the Turkana Basin in Kenya and are estimated to be 1.76 million years old, the oldest prehistoric tools yet discovered (MacGregor 2010).[1]

[1] Stuttgarter Zeitung: *Forscher entdecken älteste Faustkeile*, 1.9.2011.

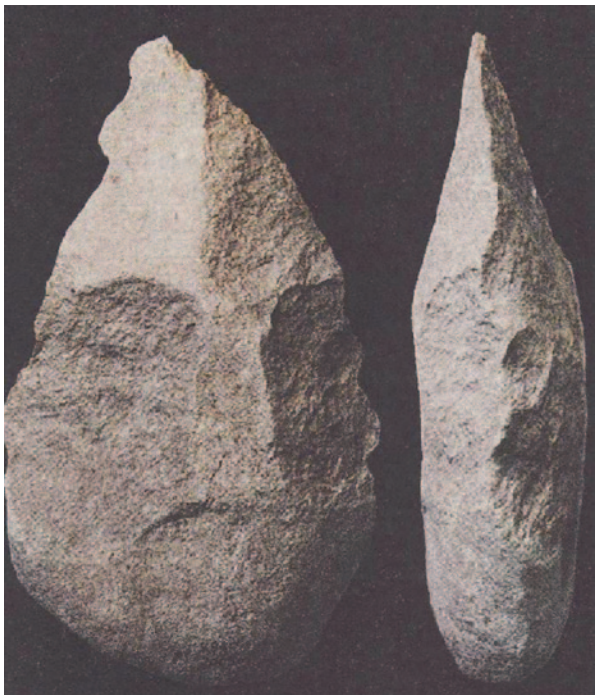

Fig. 3.1 Hand axe. (Source: picture alliance/dpa/P.-J. Texier/MPK/WTAP, Rights: picture alliance/dpa/P-J. Texier/MPK/WTAP)

The traces of wear indicate that these devices were used for tearing the hunted prey or for woodwork. These are specialized tools, the pointed hand axes or splitting wedges have an elongated blade, typically shaped on both sides. The production of these tools requires a series of operations ranging from finding a suitable stone to hewing and shaping it in such a way that the desired tool emerges. It also involves a significant degree of skill and strength. The hand-axe culture (Acheulean) spread from Africa to Europe and then to Asia.

Homo erectus populated large parts of Africa, Europe, and Asia, between 1.8 million and 150 thousand years before our era. He was "*the first hominid type, who used fire, the first, who began hunting as an essential element to secure their food supply, the first, who could walk like a modern man.*" [2] In addition, he must have been able to imitate. The ability to imitate is one basis for developing a language; each generation must not repeatedly develop language anew. The fact that homo erectus was able to walk upright modified the corresponding structures in his brain, enabling him to make better use of his hands and his facial expressions. Thus, it is quite conceivable that he could have had developed a sign language.

The hand-axe also coined the name of this culture: the hand-axe culture. Hand axes exhibit all the characteristics of an innovation: one, homo erectus wanted to make himself independent of the fortune, chance, or luck; two, he wanted to find a suitable hand axe; and three, he tried to form a hand axe by himself (**idea**). He

[2] http://de.wikipedia.org/wiki/Homo_erectus.

invented a way (**invention**) to perform this forming work, and thereby improved his skills as needed and necessary. The manufacturing process was copied and exported, so that hand-axe production prevailed in the three continents of the old world (**diffusion**). Hence, the hand-axe culture dominated most of the hominid populated world for a very long time.

What may have been the thoughts of that homo erectus at that time, when he realized that he does not have to look for a suitable stone, but that he could form this useful tool all by himself and thus, could reproduce it? By today's standards, he should have felt an immense pleasure and satisfaction, and if he was able to speak, most certainly a "Cool!" would have slipped his tongue.

Homo erectus obviously had about 1.6 million years to establish hand axes in his culture. To relate this period of innovation and usage to today's perspective, consider the development of the mechanical typewriter. The US company Remington produced typewriters in large numbers 1874 onwards. The last production facility for mechanical typewriters was in India and was closed in 2011; in 2010, it produced just 800 pieces. In between, however, the typewriter was indispensable in daily life—hardly any office, hardly any household where a typewriter was not there to bring important documents on paper legibly for everyone. After all, the mechanical typewriter proliferated for 135 years. A much shorter product life was granted to the videocassette systems. The companies Grundig and Philips brought the first devices for home use to market in 1971, which found in the following years a wide market acceptance. With the introduction of the DVD in 1997, consumers began to opt for this higher quality technology. Since 2006 videocassette recorders are no longer in the market—this technology was then just 35 years old.

3.1.2 Cycles of Innovation

The consideration of economic cycles, which relate to innovations, or which innovations even initiate, can shed some light on when and why some innovations are successful and others are not.

Kondratieff Cycles

In the 1920s, the Russian economist Nikolai D. Kondratieff established based on empirical data from Germany, France, Great Britain, and USA, that the economic cycle follows a sequence of boom, recession, depression, and recovery in long waves of about 40–60 years. He was able to forecast the third wave with the stock market crash, Black Friday, and the world economic crisis of the late 1920s correctly from the analysis of the first two cycles he identified. Ten years later, Joseph Schumpeter recognized that fundamental technical innovations are the causes of these long waves—he called them Kondratieff cycles—and coined the concept of base innovations, which inspire or enable further innovations (see Fig. 3.2).

Fundamental inventions even change how a society organizes itself—after all, people want to make optimal use of any new base innovations. Therefore, new rules

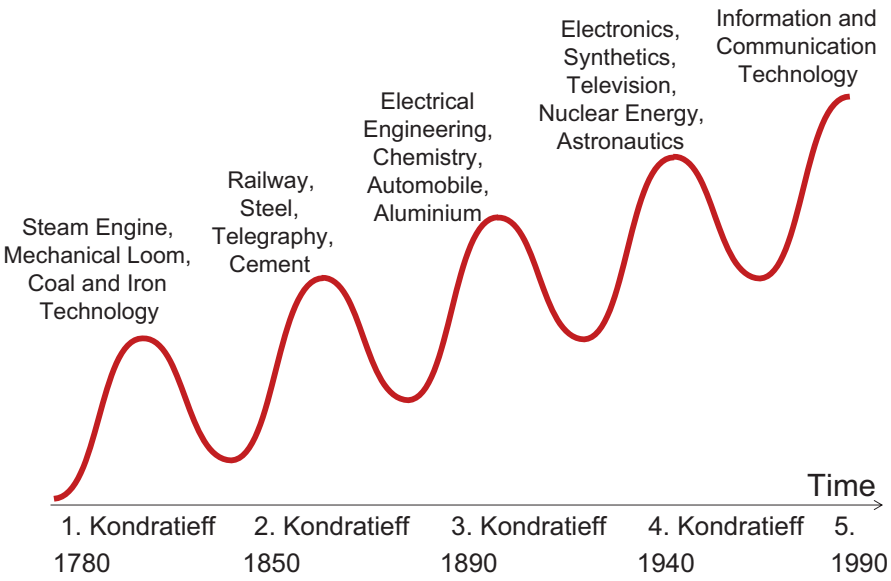

Fig. 3.2 Kondratieff cycles. (Source: Bernd X. Weis)

and success patterns arise on how to create wealth, with new educational content, new management, and organizational concepts in the businesses. In the nineteenth century, the British were not so rich and powerful because wages, government spending, or money supply were high or low, but because they overcame the current shortage of resources first with the steam engine, then with the railroad.

The Austrian futurologist Hans Millendorfer (Gaspari 1978) could established the link between economic development, innovation, and motivation based on a valid social psychological investigation. In somewhat simplified terms, a new cycle begins with the dissatisfaction of the next generation with—technologically influenced—conditions of work and life of the previous generation. This dissatisfaction and discontent calls for a paradigm shift and leads to technical innovations, which also open up new social perspectives and thus have structure-changing influence on society. Growing prosperity and stabilization accompany this process. As a result, the change loses momentum and the resulting structures forfeit their flexibility and innovative power—they lose the ability to resolve the pending socio-economic issues and the motivating force for change resulting in an economic downturn. Then again, innovations and alternatives to what already exists initially develop in niches. Some of them establish themselves; they grow, stagnate, and eventually more suitable innovations will replace them.

And then it starts all over again..

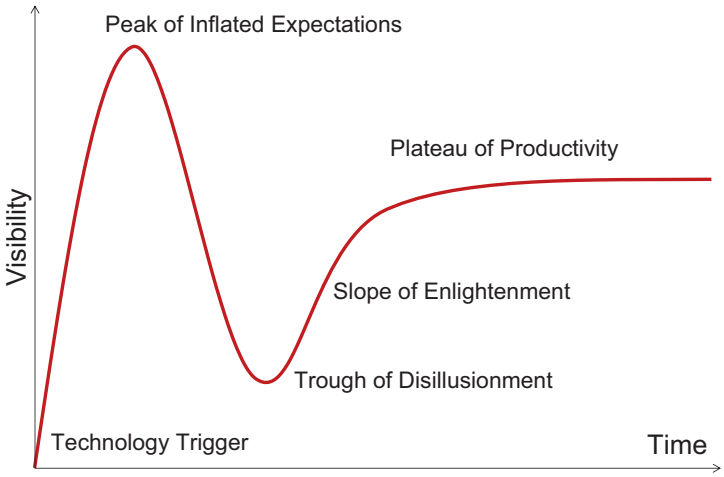

Fig. 3.3 Hype cycle. (Source: Bernd X. Weis)

Hype Cycles

At the American consulting firm Gartner Group (Gartner Group 2011)[3] the consultant Jackie Fenn discovered that when introducing new technologies very often the same pattern develops with respect to public attention for this technology over time. This pattern consists of phases that technologies undergo until they are thoroughly established in the market. At Gartner, they gave these phases catchy names. Starting with the first attempts attention increases to the "peak of inflated expectations." Eventually, when it turns out that the technology still has to struggle with "teething" troubles and anyway cannot meet all its flowerily attributed expectations, attention falls into the "trough of disillusionment." With the resolution of the "teething" problems, the establishment of standards and the integration of complete solutions, a system of suppliers and service providers emerges that characterizes the phase "slope of enlightenment." On the "plateau of productivity," the technology has finally found its proper place (see Fig. 3.3).

Analyses with hype cycles predicted in November 1999 the end of the dotcom boom within the following half year.

Companies that rely on a technological head start should think from the beginning a great deal about suitable applications knowing that probably they must endure a series of disappointments and setbacks over time. Eventually, if they reach the slope of enlightenment, they will already have products and know-how, while others have yet to deal with the technology. In general, the more important the technology is for the enterprise, the earlier it has to properly deal with it—and of course vice versa. There are also technologies that become obsolete even while on the way to market, that have not yet succeeded despite of renewed thrusts in public attention to make it to the market. And furthermore, in general, the estimates, where in the

[3] Spiegel, 21.10.2006, http://www.spiegel.de/netzwelt/tech/0,1518,443717,00.html.

hype cycle a specific technology is, are subjective and can vary greatly depending on who does the assessment.

The value of hype cycles is to raise awareness of these cycles, among other things, that certain technologies, even if they—perhaps only for the moment—have escaped public attention, can come back with even stronger impact.

Both, the Kondratieff cycles as well as the hype cycles were conceptualized from the analysis of empirical data and observations of how people, businesses, markets, and societies act and behave in the corresponding situations. From these analyses, instructions for action may arise from the perpetuation from experiences.

3.1.3 Russell's Chicken and Black Swans

The English philosopher and mathematician Bertrand Russell also asked himself whether it is possible to conclude from frequent observations of the same cause-and-effect linkages that the next occurrence of this cause again entails the same effect (Russell 1912). One usually expects that a carrot tastes like a carrot, because carrots have always tasted like carrots. He tells the following story referred to as Russell's chicken.

> On a farm, there was a flock of chickens. One chicken started talking with another, remarking, "How good our farmer has been to us. He comes every morning to feed us." The other chicken added "and he has been feeding us here every day like clockwork, every day without fail since we were all just little baby chicks." Indeed, when queried, most of the other chickens clucked in agreement, about how benevolent their farmer was. But there was one chicken, intelligent but eccentric, who countered saying "How do you know he is all that good? I remember, not too long ago, that there were some older chickens who were taken away, and I haven't seen them since. What ever happened to them?" In the morning, the farmer came as usual, this time scattering even more corn around. The chickens loved it except one, which squawked in alarm, "He is just fattening us up! We are going to be slaughtered in a week's time!" But none listened, all just thought it was a troublemaker. A week later, all the chickens were placed into cages and driven to the slaughterhouse.

The chickens become accustomed, that the farmer feeds them daily. They deduced from these observations that this should continue to be so in all their conceivable future. The underlying "theory" of the chickens could have been that the farmer is a person who just liked chickens and therefore, fed them daily. Other concepts such as "chicken on the grill or in the pan" were so entirely alien to them; they just had no concept of it. If the farmer brought them food, it confirmed that every time that their "theory" was correct.

David Deutsch (1998) even goes so far in claiming that it is altogether impossible to extrapolate observations without embedding them first in an explanatory framework. Thus, the chickens had the explanatory framework "benevolent farmer," and within this framework, they could predict well the daily feeding. Would the chickens have come up with the explanatory framework "barbecue or cooker," they would have also be able to predict the daily feeding well, but also the slaughtering feast at the end of fattening (see Fig. 3.4).

Russell remarks somewhat tersely that it would have been quite useful for the chickens, if they had a deeper understanding of the regularity of nature.

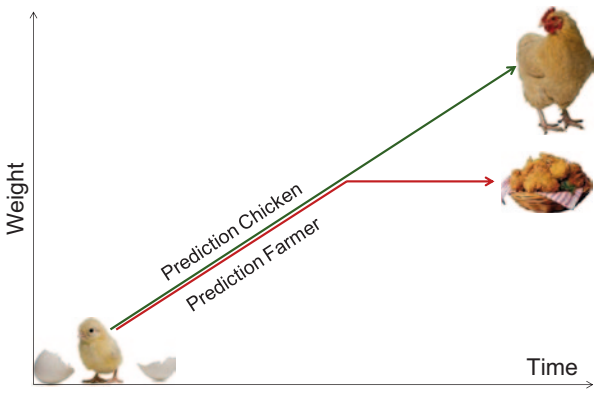

Fig. 3.4 Predictions. (Source: Bernd X. Weis)

Table 3.1 Continuation of number series: possible rules and explanatory framework

Rule—explanatory framework	Continuation
The following number is the last +2	**0 2 4 6** 8 10 12 14
The following number is even and is not in the list	**0 2 4 6** 256 24 396 10532
The following number is greater than the last	**0 2 4 6** 7 99 396 123456
The last 4 numbers in reverse order added	**0 2 4 6** 6 4 2 0 0 2 4 6
Any 4 numbers and then only 1	**0 2 4 6** 1 1 1 1 1 1 1 1

To dig even deeper the question could be asked which consequences the intelligent but eccentric chicken had drawn from its presumption. Would it have been happier in its last week?—But that would take us too far.

In various tests, a series of numbers are to be continued logically, such as the series of numbers

0 2 4 6 …

From the analysis of this number series, various hypotheses on the formation rules can be derived (see Table 3.1).

One can still think of many other rules that are not contradicting the original set of numbers.

In general, one can say that it is not possible to predict with absolute certainty from events experienced or observed in the past that these events will occur in the future. One can only suggest that these events are likely to occur.

Karl Popper considers it a mistake to conclude on laws from facts gathered by induction (Popper 1934). Theories, with how much creativity they may also have been developed, can never be verified by experiments. It is however possible but to falsify them. One counter-example may suffice to let a theory collapse. Ultimately, those theories will prevail that, despite all efforts, could not be refuted up to now. Moreover, these come probably closest to the truth. “All swans are white.” Popper took this statement as an example to illustrate his theories. This sentence was a true statement until the discovery of Australia, where in the end of the seventeenth

century swans were discovered that were black and the sighting of one single black swan sustainably repudiated the veracity of the all-swans-are-white-statement. However, the black swan has since then remained a metaphor for extremely rare events that are unknown or hardly predictable, but have a major impact and in hindsight great influence on our thinking and actions. A quip on the edge: In 1946, Popper met the philosopher Ludwig Wittgenstein in Cambridge to discuss these issues. It is said that in the heat of the debate Wittgenstein had threatened Popper with a poker (Edmonds and Eidinow 2002).

There are always such theories, rules, beliefs, dogmas, etc., which are derived from experience and observations, and which make believe that the world has to behave accordingly, or that it is structured agreeing with them. However, as shown above, this may, but need not be the case.

The management thinker Tom Peters says, "*Predictability is a thing of the past*" *(Peters 1987)*. The Lebanese-American ex-stockbroker Nassim Taleb adopted also the subject of uncertainty and predictability (or not). He takes the Popper's example of the black swan from above, when he asserts that the past cannot be used to predict the future, at least not if one simply perpetuates the past into the future with a dash of naivety. He calls an event "Black Swan" (Taleb 2010) when it shows the following three attributes:

1. The event itself was unknown and thus unimaginable or was considered almost impossible. In terms of probabilities, the occurrence of almost impossible events is equivalent to the non-occurrence of almost certain events.
2. When the event occurs, then it has implications and consequences that are enormous and extremely far-reaching.
3. In retrospect, why this event happened or even had to happen is explicated with all sorts of explanations.

Often catastrophic Black Swans evade prediction just because of their immediacy. Sometimes one knows that it can happen, but one does not know exactly when and to what extent—the ignorance—, other times one does not know anything, because a completely unknown and thus a per se unexpected event occurs—the unknown.

An example of events that were entirely outside the imagination of the majority of humankind are those of September 11, 2001, when in New York, aircrafts were flown into the twin towers of the World Trade Center. The consequences that have grown from it were immense—many thousands of people died, the survivors are still traumatized in their fear of further attacks, the capital markets collapsed and more—and are still clearly noticeable in daily life. The Chernobyl accident in 1986 still has had devastating consequences in Ukraine; the tsunami following an earthquake in the Indian Ocean off the island of Sumatra, Indonesia, in 2004 killed more than 200,000 people; in 2011, the tsunami following an earthquake off the coast of Japan killed over 10,000 people and caused the Fukushima nuclear disaster. It was known that the Chernobyl reactor was a security hazard, which was believed to be under control, that the Australian tectonic plate slides under the Sunda plate and thus, that a high risk of earthquakes prevails in Indonesia, that the east of Japan is a particularly vulnerable earthquake zone—all these facts were known.

However, what was obviously not clearly conceived was the extent of the disasters these events resulted in. These most extreme earthquakes—the earthquakes had a magnitude of 9 and more—resulted in tsunami waves that were much higher and arrived with greater force on the coasts than the foreseen catastrophe scenarios ever predicted. Excessive demands on the ones involved in as well as the ones suffering from such extreme situations led to mistakes and failures made in combating the disaster.

According to Taleb (Taleb 2004), many people when assessing situations seem to take into account only the probabilities of events rather than the risks involved, i.e., probabilities and consequences. Even if an event "on average occurs only every 100,000 years," it may occur tomorrow and the day after. However, the statement about the mean value remains correct.

Nevertheless, unforeseen and unforeseeable Black Swans do not always have to be disastrous and fatal.

The discovery of America in 1492 by the Genoese navigator Christopher Columbus is one of the most important events in history. Columbus believed that the earth is spherical, and planned to find a sea route to India sailing west. For this plan, he found support amongst the catholic king Ferdinand and queen Isabella of Spain. With three ships on August 3, 1492, he set sail, and arrived at the Bahamas October 12, 1492. In total, Columbus made four voyages to the New World. It is interesting to know that Columbus did not realize even until his death that he had not come to the east coast of Asia, but had discovered an entire new continent. Sure, around the year 1000 Greenlanders under Leif Eriksson were the first Europeans who discovered the American mainland somewhere in the north of the east coast. They called the lands discovered Vinland—because of the many berries, from which they made berry wines. However, the lack of women and continuous battles with the natives made them abandon Vinland after few years. Eventually, they decided not to take possession of the new land and not to settle there.

At Sutter's Mill near Coloma at the American River in California the carpenter James W. Marshall found several gold nuggets on January 24, 1848 and started the California gold rush of 1848. In the next few years, several hundred thousand people moved to California seeking their fortune. Between January 1848 and December 1849, San Francisco grew from 1000 to 25,000 inhabitants. A Californian newspaper had to cease publication because they had no workers, dozens of ships were mooring off San Francisco, because right after their arrival the sailors decided to move on to the gold fields and try their luck, rather than to eke out a meager existence as a sailor.

As it is, disasters are most memorable because the immediacy of the event itself and its consequences that appear directly and inevitably. From these consequences, there is no escape; one has to face them. The lucky Black Swans—i.e., those events with positively assessed consequences—also have the immediacy of the event itself, but with the consequences, there always is the choice whether to accept them or not, as the examples above illustrate. Therefore, the consequences of the lucky Black Swans have often a long "incubation period" until they fully unfold.

Examples of Black Swans in the more technical fields—so-called disruptive innovation—are the development of telephony, computer, laser, and the Internet. Like many of the technical Black Swans these events radiate a rather positive image.

"*The horse does not eat cucumber salad*" was the first sentence, the young teacher Philipp Reis transferred between workshop and garden with a device and a "talking wire." When in 1861 he presented to an illustrious group of German Physical Society his device, which he called telephone, with which one could transmit language over a distance, the renowned Professor Christian Poggendorf reprimanded him as "childish." The journal "Annals of Physics" rejected his contribution. Just 16 years later in the USA, Alexander Graham Bell founded the company Bell Telephone Company, from which then AT&T evolved being for a long period of time the world's largest telephone company. In 2010, telecommunications revenues in Germany alone were over 60 billion €.

Although in the beginning of the nineteenth century the first attempts constructing a calculating machine were not really successful, in particular the construction of an analytical engine by Charles Babbage in England, they provided a fundamental understanding of computing machines even though. On May 12, 1941, the German engineer Konrad Zuse presented the calculating machine Z3 for floating-point calculations. In 1943 the former IBM CEO Thomas John Watson reportedly said, "I believe that there will be a need in the world of maybe five computers." After the Zuse Z4 in 1951, with the UNIVAC the second commercial calculating machine came into the market. From then on there was no holding back—in 2010, nearly 14 million PCs were sold in Germany alone.

When in May 1960 the young physicist Theodore Maiman presented the first working laser, news reported, "*Man from Los Angeles invents science fiction death beam.*" Maiman succeeded after lengthy preparations, using a cylindrical ruby to generate a red point of light. Since then, medical, communications, and consumer electronics without the high-energy, highly concentrated beams of laser light is no longer conceivable, the lasers themselves are getting smaller, faster, and more powerful, and applied in ever-new areas. Around 1 billion laser diodes are deployed in drives to write or read data. Many thousands surgeries for vision correction are annually performed with lasers. The fiber optic cables installed all over the world, which enable transmitting data using lasers, reach a total length of 23,000 times the length of the circumference of the earth.

The Internet was launched in the fall of 1969, when the first four mainframe computers at the University of California, Los Angeles (UCLA), the Stanford Research Institute, the University of California, Santa Barbara (UCSB) and the University of Utah were interconnected.

On October 29, 1969, "Io" was the first successful Internet message sent in this experiment from UCLA to the Stanford Research Institute. In 1990, the Internet opened for commercial use. According to estimates, the Internet exchanged only 1% of the information flow in 1993, this share was 97% in 2007.

These technologies have produced fundamental changes. Martin Hilbert (Hilbert 2011) of the University of Southern California has tracked 60 analogue and digital technologies for over 10 years. He estimates that worldwide in 2007 memory ca-

pacity of 2.9×10^{20} byte (annual growth 23 %), communication capacity of almost 2×10^{21} bytes (28 % annual growth) and computing capacity of 6.4×10^{18} instructions per second on general purpose computers (annual growth of 58 %) were available. And there is no end to growth in sight.

How wrong have Poggendorf and Watson been with their predictions. Even the experts of that time did not foresee, could not foresee or did not want to foresee these developments.

For people with small tolerance for ambiguity, i.e., for people who can hardly withstand ambiguity or even contradictions, and who will do everything to rationalize when encountering them and thus, to provide some resolution, it is easier to not consider Black Swans with their full implications. Because of them, they feel just stress and discomfort, and therefore, they try to restore order by either ignoring or making them fit to the rules. Today, in retrospect, everything seems clear and unambiguous; the developments were almost evident, inevitable, and inexorable.

Actually, the occurrence of improbable events—of Black Swans—can sustainably change entire structures. By definition, these events do not follow a plan, but occur more or less just by chance, they even might have been unknown to exist until they occur. In general, it can be concluded that Black Swans occur much more frequently than is commonly believed. The sociologist Niklas Luhmann[4] speaks of a normalization of the improbable, thereof, that it is not about a causality that follows some rule, or even a probable causality, but about improbable changes of structures—and these are contingent, i.e., they are as they are, but by chance, because they could just as well have turned out completely different.

3.1.4 Uncertainties and Probabilities

All Black Swans have in common that it is uncertain if and when they occur. Therefore, a brief excursion to uncertainty is appropriate. To approach the subject, it is obvious to look at probabilities. Probability theory formalizes the concept of uncertainty and allows calculating with numbers. The Russian mathematician Andrei Kolmogorov founded probability theory with the help of concepts of set theory based on just three axioms (Heinhold 1972). By then, some experiences with probability calculus had already been made. Gambling and especially its analysis—in the hope of predicting the outcome—were extremely attractive even for great mathematicians like Geralomo Cardano in the sixteenth century, Blaise Pascal and Pierre de Fermat in the seventeenth century (Mlodinow 2009). These studies and experiences of course influenced the formulation of Kolmogorov's three axioms. Kolmogorov defined elementary events, of which any arbitrary events can be composed. Take, e.g., throwing a dice, an example quite appropriate given its history. An elementary event is the result of one throw, an event could, for example be the result of ten consecutive throws. Now the axioms:

[4] Interview mit Niklas Luhmann (1994): http://www.fifoost.org/user/luhmann.html.

1. Every event E has a probability value between 0 and 1, i.e.,
   $0 \leq p(E) \leq 1$.
2. The probability, that any event of all possible events occurs, is 1, i.e., with S the set of all possible events
   $p(S) = 1$.
3. The probability that one of two mutually exclusive events occurs is the sum of the probabilities of the two events, i.e., with $\varnothing$ the empty set (the impossible event), $\cap$ for the intersection (E_1 AND E_2) and $\cup$ for the union of two sets (E_1 OR E_2),
   $E_1 \cap E_2 = \varnothing \Rightarrow p(E_1 \cup E_2) = p(E_1) + p(E_2)$.

When playing dice, the probability to throw a 5 in one throw is 1/6 (1), the probability of throwing a number between 1 and 6, inclusive respectively, is 1 (2), the probability to throw a 5 or a 6 is 1/6 + 1/6 = 2/6 (3). It is interesting to note that there is no statement in probability calculus on how individual probabilities of events come about, but rather on how one can do calculations with them. Thus, the assignment of the probability 1/6 to the event "5 thrown" is the result of considerations which comprise the physics of throwing a dice and the symmetry of the cube and which exclude the results "dice on the edge or corner," although this not impossible, but rather unlikely.

Thomas Bayes was an English clergyman and mathematician, and gained great importance because of his investigations of conditional probabilities. Let H be a hypothesis, p(H) the a priori probability that this hypothesis is correct, D an outcome of observations, and p(D) the probability of this outcome of these observations. Then, p(D|H) is the conditional a priori probability that, if the hypothesis H is correct, then outcome D is observed, and p(H|D) the conditional a posteriori probability that hypothesis H is true, if outcome D is observed. Then the following holds—and this is the Bayes theorem—

$$p(H|D) = \frac{p(D|H)\,p(H)}{p(D)}.$$

Example

According to weather proverbs, a red evening sky's afterglow is a sign for fine weather.

Assume that the conditional probability that if on the evening before an afterglow has been observed the day's weather is going to be fine, is p(afterglow | fine weather) = 0.8. On the other hand the conditional probability of observing afterglow on the evening before, the next day brings no fine weather is p(afterglow | bad weather) = 0.3. Note that these two conditional probabilities do not need to add up to 1. Now assume further, that the probability of the hypothesis that the weather will be fine tomorrow, is p(fine weather) = 0.7.

The a priori probability to observe an afterglow is then

$$\begin{aligned} p(\text{afterglow}) &= p(\text{afterglow} \mid \text{fine weather}) \cdot p(\text{fine weather}) + \\ &\quad p(\text{afterglow} \mid \text{bad weather}) \cdot p(\text{bad weather}) \\ p(\text{afterglow}) &= 0.8 \cdot 0.7 + 0.3 \cdot 0.3 = 0.65. \end{aligned}$$

Now the probability that the hypothesis "the weather is fine tomorrow" when afterglow is observed is true, can be calculated, namely

$$p(\text{fine weather} \mid \text{afterglow}) = \frac{p(\text{afterglow} \mid \text{fine weather}) \cdot p(\text{fine weather})}{p(\text{afterglow})}$$

$$p(\text{fine weather} \mid \text{afterglow}) = \frac{0.8 \cdot 0.7}{0.65} \approx 0.86.$$

Suppose one would not observe the afterglow. In addition, the conditional probability that no afterglow is observed on the eve when the next day brings fine weather, is p(no afterglow | fine weather) = 0.2 (= 1 − 0.8). On the other hand, the conditional probability that we observed no afterglow on the evening before, when the next day brings bad weather, is p(no afterglow | bad weather) = 0.7 (= 1 − 0.3). The probability of the hypothesis that weather is fine tomorrow, is unchanged p(fine weather) = 0.7.

The probability of the hypothesis if no afterglow is observed can now be calculated,

$$p(\text{fine weather} \mid \text{no afterglow}) = \frac{p(\text{no afterglow} \mid \text{fine weather}) \cdot p(\text{fine weather})}{p(\text{no fine weather})}$$

$$p(\text{fine weather} \mid \text{no afterglow}) = \frac{0.2 \cdot 0.7}{0.35} = 0.4.$$

The conditional a posteriori probabilities add up to the a priori probability for fine weather once multiplied by the respective probabilities of the observed outcomes. .

The evening's view out of the window increases the subjective probability of fine weather. As this example shows, probability calculus allows supporting hypotheses with corresponding empirical observations. It also shows that the results are just only probabilities and thus remain uncertain, even if empirical data support them (see Russell's chicken). It should be noted that the American mathematician and electrical engineer Claude Shannon with similar considerations developed the entirely new concepts of information theory (Shannon 1948; McEliese 1984).

3.1.5 Anomalies and Fallacies

Up to now, humans have not been taken into account—and apparently, they give a twist to these considerations. The two Israeli researchers Daniel Kahneman, Nobel Laureate for Economics in 2002, and Amos Tversky have investigated how people assess uncertainties focusing on which distortions facilitate that sometimes they are

assessed erroneously. Here are some results of Kahneman and Tversky (Kahneman et al. 1982; Jungermann et al. 2005) describing these cognitive anomalies and fallacies, as they call it.

They identified three very simple heuristics that people apply to make assumptions about the relevant situation: availability, representativeness, and anchoring heuristics. And these may at the same time be the cause of the anomalies.

The **availability heuristic** states that the frequency of a set of events is estimated by the ease with which one remembers relevant examples that are vivid, unusual, or emotionally charged. Therefore, the decision process will not be incorporated with all the essential information, but only those most recently or easily remembered.

Events from real life or that have received attention in the media are perceived to occur with higher frequency with respect to those that are difficult to remember or seen as mere statistics.

Representativeness heuristic is based on the fact that individuals pay too much attention to more noticeable, palpable features, and disregard information about probabilities of occurrence of events. For example, most people overestimate the likelihood that someone exercises a certain profession, as soon as he looks like a typical representative of this profession. Given the choice, whether a shy person is a librarian or rather a sales person, most persons will assume, he is a librarian, because this property "shy" is considered representative of that profession. In fact, however, there are far more sales persons than there are librarians. The base rate probability of someone exercising these professions are often neglected (see below base rate error).

The **anchoring heuristic** states that people often use a temporary, convenient estimate for the evaluation of a situation—the anchor—to adapt subsequently when additional information becomes available. Experiments show, however, that people tend to stick to their initial estimate and that they refuse to adapt later on or that they only adjust very inadequately their assessment.

Example

Groups of students were presented the following multiplication problems with the instruction to estimate the product of the eight numbers within five seconds.

1. Group : 8*7*6*5*4*3*2*1
2. Group : 1*2*3*4*5*6*7*8

Since a complete calculation in such a short time is impossible, most do a multiplication by the first two to four numbers from the beginning (their anchor) and then estimate the final result. The resulting distortion yields exactly the predicted result: the median estimate in the first group was 2,259, in the second group only 512 (the correct answer is 40,320).

Typical sources of error or cognitive fallacies are base rate errors, conjunction errors, the gambler's fallacy, overconfidence effect, ambiguity aversion, and hindsight bias briefly discussed hereafter.

Base rate error: People intuitively tend to ignore the base rates and to rely on the case-specific information, even when the base rates are explicitly stated.

Example

For the example above: Suppose an afterglow is not observed. Many persons would then state the probability of fine weather with 0.2, although the probability is 0.4 if the base rate information "likelihood of (no) fine weather" 0.7 (0.3) is considered. One factor for this is the cognitive and emotional significance that is attributed to case-specific information.

Conjunction error: *Linda is 31 years old, lives alone, talks frankly, and is very smart. She studied philosophy. As a student she was very much involved in issues of social discrimination; she also participated in various demonstrations. Which statement do you think is more likely?*
a. Linda is a bank teller.
b. Linda is a bank teller and active in the feminist movement.
The vast majority of the probates believed the second statement to be more likely. However, the set of women who are both, bank employee and active in the women's movement is certainly a subset of the set of women who are bank employees. If statement b is true, then certainly statement a is also true. Therefore, statement b can never have a higher probability than statement a. This error derives from the fact that the description strongly suggests a causal relationship between the events. The stronger the assumed causal relationship is, the more plausible the common occurrence of events becomes.

The gambler's fallacy: *A regular, fair coin, i.e., a coin, for which, when thrown, the probability of heads or tails on top is 50/50, is thrown 99 times and the result is 99 times head. On which result of the next throw would you put money—heads or tails?*

A majority of subjects relies on tails, because it is simply time that tails "must" come. Anyone who is somewhat familiar with probability theory will argue that each throw is independent of the previous ones and therefore the probability of tails remains unchanged at 50 %.

Taleb (Taleb 2010) tells a nice story to illustrate that one could also question the assumptions. His Fat Tony, a real skeptic and obviously well acquainted with the abysses of human behavior came to a result of about 1 %. He argued that the coin is not fair, that it is more likely that the assumption of a regular, fair coin is wrong than that head shows up 99 times ($< 10^{-30}$).

Overconfidence effect: *Which city has more inhabitants Berlin or Paris? How sure are you that your answer is correct, 50, 60, 70, 80, 90, or 100 %?*

The answers of 80 % of the probates who were 100 % sure that their answer is correct, were wrong, the answers of 75 %, who were 90 % sure, were wrong, etc.

The certainty in relation to the correctness of the answers is consistently higher than the relative frequency of correct answers. People are too confident of the correctness of their answers and overestimate the quality of their own knowledge.

Ambiguity aversion: *You have the choice between two games. With both, you win 10 € if you draw a white ball from the urn. Game 1: The urn contains 5 white and 5 black balls. Game 2: There are 10 balls in the urn, each of which is either black or white.*

Most probates prefer Game 1 because of the precise definition of Game 1. Here the probability to draw a white ball is 50 %. In the Game 2, this is not clear, but because of not knowing any better, the assumption of 50 % is also justified. Ambiguity emerges from a lack of information and refers to the uncertainty about the uncertainty, the cognitive feeling of "I know that I do not know something." The impression of ambiguity is greater, the less one believes to know about an issue one needs to decide, assess, or appraise.

Hindsight bias: (see definition of Black Swan) When a certain event of several possible events has occurred, most probates find very good reasons in retrospect, why exactly this event had to occur, even if the information available does not permit to distinguish the probabilities of the possible events.

There are still a number of other phenomena, affecting human (mis)judgments on probabilities.

Think of the many success stories told—be they from economy, science, or politics—from which the special abilities of the protagonists were condensed to be courage, risk-taking, optimism, and perseverance, it seems that if one only possesses those abilities, success comes about almost certainly. On the other hand, in the cemetery of failed endeavors there lie buried many whose protagonists have had and have shown courage, risk-taking, optimism, and perseverance. Some of the cognitive fallacies described above coincide. These are base rate error—e.g., there are many attempts to create successful businesses, of which not all but only a few are successful and on those attention is directed—and hindsight bias—these abilities and characteristics have made success possible.

However, if it is not only these abilities, then what is it that makes the difference? Taleb believes that success is not only the result of these special abilities, but also very significantly sheer and mere luck is needed for this.

3.1.6 Perpetuations and False Inferences

"It was never like this!"
"We have never done that!"
"We've already tried it!"
"This has never worked!"
"That never works!"
"Nobody wants this!"
"It's there already!"
…

Every creative, inventor, innovator knows these sentences only too well—they all are factual, and exude a certitude, which probably is not justified. In any case, such sentences are evidence that it pays to dig deeper and go into more detail. They are

often more an expression of a *"Noli turbare circulos meos"*[5] or that one has fallen into one of those traps that have been set by all the above perpetuations, projections, cognitive fallacies, and anomalies.

Uncertainties characterized the way from idea to innovation—and whether it will be a flop or a lucky Black Swan is not easy to predict with certainty. Also, fortune that one—possibly—needs for success, requires an object that it can make fortunate: only those who attempt something may also have luck—nothing ventured, nothing gained. This statement however, is definitely true.

3.2 Innovation: Concepts and Contexts

There is hardly any published corporate strategy, in which the credo of the necessity of innovation for the company's development does not appear in a prominent position.

After all, innovation is the lifeblood of an organization. Only with innovation, an organization can grow and compete: become even better, venture in new directions. Only with innovative products with new features, an organization can increase the demand for its products/services or its market share. With innovative new business processes, an organization can optimize its cost structure and thus sustainably position products/services more economically and/or more profitably in the market or reach customers better and respond better to their needs. The ultimate goal is always to prepare the organization for the future, to maintain and improve competitiveness and ultimately to operate profitably.

On the other hand, innovation decisions are always decisions pointing to the future. Will the market accept these novelties? Will we actually achieve the cost savings? Will the innovation fulfill expectations? Often, large investments are at stake.

3.2.1 What is an Innovation?

Yet, a good idea is not an innovation. First, the idea must be elaborated to make a new product, a new service, or a new process (invention) eventually possible. If this invention is then successfully positioned in the market (diffusion)—be it in form of products, services, or business processes—then, this idea has become an innovation.

Idea + Invention + Diffusion = Innovation

Thus, an idea, an invention becomes an innovation then when it is successful in the market. Innovations can be new to the company, new to a market or industry, or can

[5] "Do not disturb my circles", the last words of Archimedes of Syracuse (212 BCE).

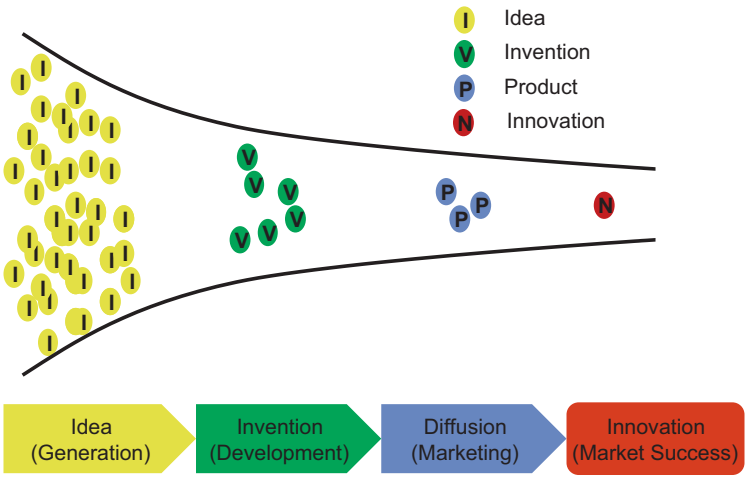

Fig. 3.5 Innovation funnel. (Source: Bernd X. Weis)

be entirely new, "from scratch," i.e., this innovation has neither been implemented nor applied anywhere else yet.

The innovation funnel illustrates how ideas become inventions, how the inventions generate products/services, which then have to prove themselves in the market. In each of these steps, there are losses. Not all ideas make it to become inventions. Some are so "over the top" or technically so challenging that they have no chance of realization for the time being, and are therefore discarded immediately. Others do not fit into the market, in which the organization operates, or into the corporate landscape so they are discarded for those reasons.

In any case, the multitude of ideas reduces to a few, which then become inventions and receive further consideration. For many of them one will already in the concept phase discover, that it is not worthwhile to pursue these. For them, maybe resources are needed that are not available within the organization and cannot be procured or require prohibitive financial expenditures.

However, on the other hand, other inventions have such a great potential for success that the organization decides to develop a product and provides resources necessary. Nevertheless, again history shows that not all innovative products are successful in the market, so that ultimately, only very few remain which have successfully completed the entire process—and these eventually are the innovations (see Fig. 3.5).

3.2.2 Innovation Typology

Here innovations are typified accordingly to content, creation, and impact. The content of an innovation describes the "what" of an innovation, i.e., what exactly is the

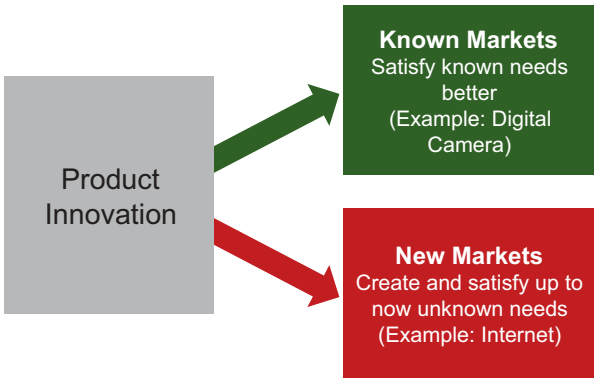

Fig. 3.6 Targets of product innovations. (Source: Bernd X. Weis)

goal of the innovation. The Organization for Economic Cooperation and Development (OECD) defines differentiating factors and uses them for their surveys. The creation of an innovation answers the "how" question, i.e., it describes how the innovation has been created. In general the type of impact answers the "why" question, i.e., the innovation's impacts and effects.

Please note that here and in the following products refer to both, goods and services.

3.2.3 Innovation Aspect Content: Definitions According to OECD

According to the dictum "What you cannot measure, you cannot control," in 1992 the OECD has started to develop guidelines for the assessment of the innovativeness of enterprises. The Oslo Manual "Guidelines for Collecting and Interpreting Innovation Data" compiles these guidelines. The manual was revised in 1997 and is now in its third edition (2005). In this manual, different types of innovation are defined used in the following.

The OECD distinguishes in its Oslo Manual "Guidelines for Collecting and Interpreting Innovation Data, Third Edition" of 2005 (OECD 2005), four types of innovation: product, process, marketing, and organizational innovations. In the sequel because of its ever-growing importance business model innovation is also defined here.

- A **product innovation** is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness, or other functional characteristics.

Product innovations can serve an existing market better, easier and/or more demanding, or develop an entirely new market (see Fig. 3.6).

New products are goods or services that differ significantly in their characteristics and features or in their areas of application from the enterprise's existing prod-

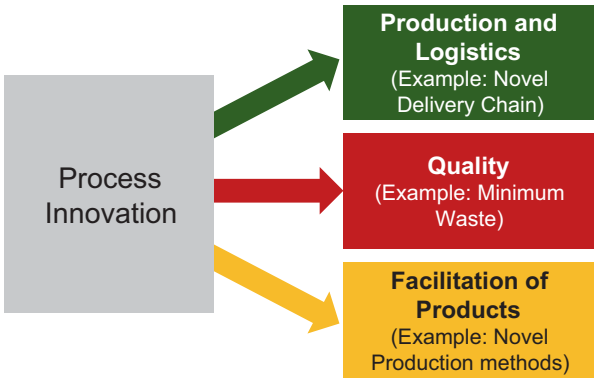

Fig. 3.7 Targets of process innovations. (Source: Bernd X. Weis)

ucts. On the one hand, they deploy new technologies or on the other hand, make use of already existing technologies, but in a novel combination. Digital cameras are such new products that use new technologies in the photographic market. MP3 players newly combine already known technologies in a developed market already formed by the various technical variations of the Walkman.

It is also a product innovation if a product that is already established in the market enables an entirely new application with only minor changes to the technical design. The Post-It products of 3M are examples for these. Both, pieces of paper and adhesives were well known, but by an appropriate combination made a completely new application possible.

Significantly improved products originate mainly from changing materials, components, or other properties that improve the performance of the products. Many product innovations in the automotive sector are typical. With new components, vehicles get improved driving, comfort, and/or safety properties. Functional outfits as widely used in sports, which have with new, modern materials significantly improved properties, are yet another example.

In the service sector, product innovations arise mainly in that services are provided easier and/or faster and/or more effective. For this, services linked to the Internet offer an abundance of examples, such as online and Internet banking, Internet shops, and many more.

► A **process innovation** is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.

Process innovations typically have three targets (see Fig. 3.7). These are
- reducing unit costs in production or in distribution and delivery of products,
- improving product quality,
- facilitating the production of new or significantly improved products.

The application of computers and computer programs has enabled a multitude of process innovations. Through the automation of production processes, the proce-

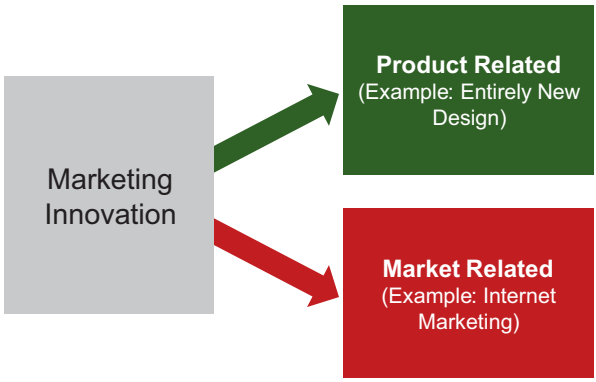

Fig. 3.8 Targets of marketing innovations. (Source: Bernd X. Weis)

dures became leaner, simpler, and therefore faster with the corresponding positive impact on unit cost and quality. Computer-aided design can now be found almost anywhere; hardly any development department can do without those tools. Barcodes and the new Radio Frequency Identification (RFID) chips allow to easily tracking goods, and thus enable a seamless trace of the product's route from producer to consumer. Avoiding unnecessary human intervention in these processes eliminates many sources of error, thereby significantly improving product quality. The services sector benefits from significant improvements through process innovations. Automatic reservation systems reduce waiting times; Enterprise Resource Planning (ERP) systems allow a significantly improved coordination of internal processes and the processes between enterprises and their suppliers, buyers, and customers.

► A **marketing innovation** is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion, or pricing.

Marketing innovations (see Fig. 3.8) aim to improve the way customer needs are addressed, to develop new markets or customer segments or to realign the enterprise's positioning in the market—all under the proviso to increase the enterprise's product sales. It is essential that the enterprise has not yet been deploying this marketing method, where, however, it is irrelevant whether the enterprise has perfected this method itself or has copied it from some else.

In this context, product design refers not to the functional or technical product characteristics, but rather to shape and appearance of the product. Especially design heavy lifestyle products make use of innovations in product design. A good example of this is Apple's iPhone, which is extremely successful on the market not only because of its technical innovations, but also because of its marketing innovations of captivating product design and of simplified handling in significant elements.

In this context product distribution is meant to be the ways how the enterprise's products are delivered and sold to customers, not the logistical measures by which mainly an increase in efficiency is achieved. These ways include the introduction

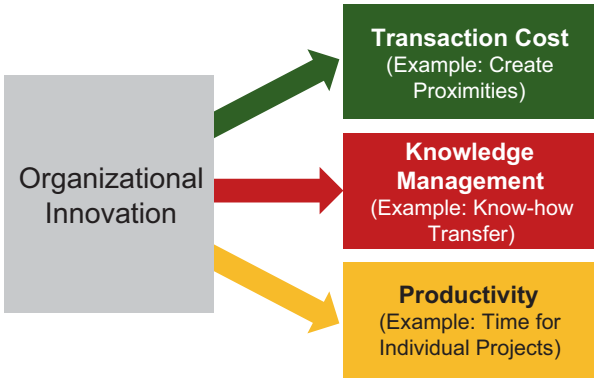

Fig. 3.9 Targets of organizational innovations. (Source: Bernd X. Weis)

of new distribution and sales channels such as introducing a franchise system or an online shop, the launch of new products, substantially modified decor of stores, and much more.

An innovation in product communication is, e.g., a new brand concept. For instance, Sony has been successful for a long time with the slogan "*It's a Sony*" regardless of the product being advertised. Further examples of innovative brand management are the brand differentiation efforts of mobile communications operators. Today each operator has—along its standard product—at least one lower priced product brand on the market, taking care not to create cannibalization effects between the individual brands.

Pricing of a product is always a touchy topic. New pricing schemes are for example flat rates for telephony, film distribution, cinemas, and for many other products. Pay-as-you-grow models open up rather popular pricing options, e.g., in capital-intensive equipment. In addition, Michael Dell has gone new paths when he enabled the option to configure PCs at home on the computer coming with an instantaneous price quotation. This marketing innovation is likewise based on a process innovation, namely to directly manufacture the PCs on demand in the manufacturer's premises and deliver it from there to customers.

► An **organizational innovation** is the implementation of a new organizational method in the firm's business practices, workplace organization, or external relations.

Organizational innovations (see Fig. 3.9) aim at increasing the performance of a company by reducing the administrative or transactional costs by improving employee productivity through access to intangible assets that are not traded, such as non-codified external knowledge, expertise, and know-how. Typical examples are improving operations through easy access to the existing, passed on knowledge on how to decide and to act best in specific situations. For example, writing down and codifying the knowledge, know-how, and experience in in-house databases can achieve this. Lived empowerment is an example of innovation in the workplace or-

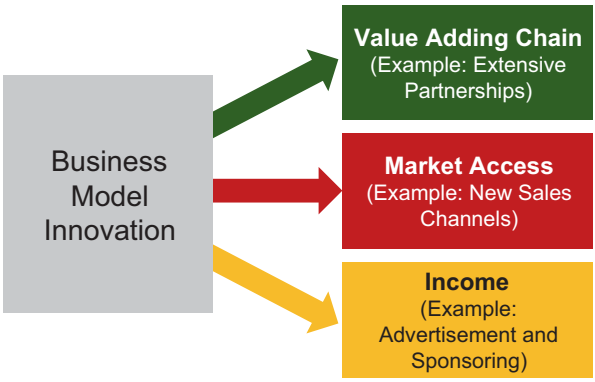

Fig. 3.10 Targets of business model innovations. (Source: Bernd X. Weis)

ganization. The mode of cooperation with, e.g., research institutions or universities is an example for innovation in the external relations of a company.

► A **business model innovation** is the implementation of a new business model or the new implementation of a significant proportion of the existing business model.

A business model innovation is the consciously intended change of an existing or the creation a new business model that will satisfy customer needs in a novel and superior way. It is about creating a competitive advantage through differentiating from competitors. Business model innovations are profound, strategic innovations since they change the fundamentals of the structure of a business (see Fig. 3.10).

OECD did not specifically list this innovation type, but because of its growing significance, it is defined here.

An example is the Amazon bookstore, which completely abstains from retail shops and sells exclusively via Internet and parcel services. A most interesting and also surprising business model innovation, is the "Local Motors" company in the United States, which produces in a variety of local production facilities cars that exactly match customer requirements, either custom-built or in mini-series. Business models will be discussed in detail in Chap. 4.

3.2.4 Innovation Aspect Creation

Closed and open innovations are distinguished by the way, how innovations are created.

► A **closed innovation** is developed in a self-contained environment—typically an enterprise or other entity.

The underlying belief that innovation can only be successful if know-how, technology, processes, and intellectual property remain under the control and the property of the innovating organization, characterizes a closed innovation process. In the

past, organizations have invested heavily in expanding their research and development capabilities. Ultimately, the intention is to reap the fruits of this investment in terms of innovation. In addition, a strong research and development position builds a barrier that competitors or would-be entrants cannot easily overcome by due to the high investment and related expenditures.

At first glance, these arguments in favor of closed innovation are understandable and comprehensible, since the organization wants to gain a competitive advantage and additional income with these innovations. The so-called "Not Invented Here" syndrome provides additional assistance for this perspective; everything coming from the outside is cautiously considered assuming that it may not be adequately accurate or reliable.

► An **open innovation** is created by the interaction of both internal and external contributions of ideas, technologies, processes, and distribution channels with the aim of the organization, to develop at the same time their own technologies further.

Open innovation and distributed innovation (mass innovation, "crowd innovation") are used synonymously; they closely relate to other concepts such as user innovation and know-how trading. Here the term "open innovation" is used.

The view that individual organizations cannot afford to rely solely on their own internal innovation capabilities characterizes the paradigm of an open innovation process. Too highly distributed are knowledge and skills throughout today's world. Therefore, many organizations, in particular large ones, are already progressing to acquire the necessary licenses and patents from other organizations or even to buy entire innovative organizations with a correspondingly innovative portfolio. The big advantage for these organizations is that they save the expenditures in research and development and that the portfolio purchased is already to some extent tested in the market. Another option is that organizations join forces in joint ventures, to elicit a particular potential for innovation. If this procedure of open innovation has solid anchors in and is consistent with the organization's culture, then the organization can offer on the market also proprietary inventions, which it does not immediately require. Through this type of collaboration, intellectual property wanders between the involved parties back and forth, and eventually the origin of an invention often cannot accurately be determined (see Fig. 3.11).

The concepts of open innovation require functioning marketplaces for know-how. In these marketplaces, knowledge, know-how, and expertise can be traded for money. Usually very specific, often complex problems are disclosed. The suitable solution is remunerated accordingly.

Yet another type of open innovation collaboration is involving customers in the development process. Customers want solutions that precisely meet their wants and needs. To facilitate this, good and direct communication with customers is mandatory, so that their requirements are incorporated in the solutions quickly and smoothly. In his research, Tuomi[6] found that the developers often did not intend the key applications, which users virtually invented anew, thus fundamentally expanding the

[6] http://en.wikipedia.org/wiki/User_innovation.

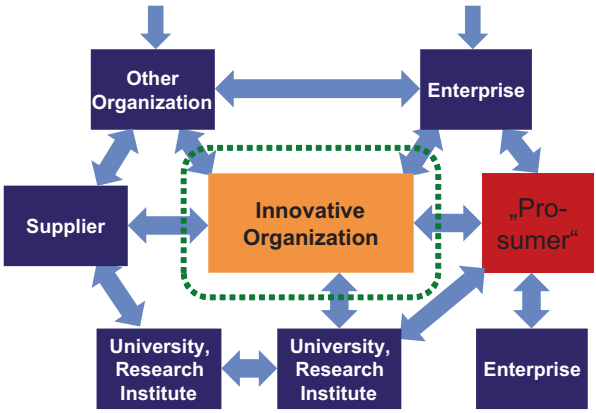

Fig. 3.11 Closed versus open innovations in a network. (Source: Bernd X. Weis)

possibilities of the invention. Then, the customer is not only consumer, but also producer. The made-up word "prosumer" expresses these two roles of the customer.

The Cologne Institute for Economic Research (Institut der Deutschen Wirtschaft Köln) (IW 2006) has collected in a survey data on cooperation behavior. According to these data, the customer plays the central role in the innovation network, 93 % of respondents consider the customer's role as important or somewhat important, followed by suppliers, with 68 %, universities, colleges, and other research institutions with 54 %, and other enterprises are far behind with 29 %. From these results it is evident that cooperation with enterprises are considered with quite some skepticism, although right there is a huge potential for increasing competitiveness.

At this point, the difference of open innovation and open source is briefly commented on. The basic difference is that the use of open source is within wide limits unrestricted, whereas in the open innovation concept the rights of use and intellectual property are definitely traded.

3.2.5 Innovation Aspect Impact

In the 1990s of last century, Clayton Christensen (Christensen 2000) developed another important distinctive feature of innovation. He distinguishes innovations based on their effect, their impact. An innovation is continuous, incremental, and sustainable or groundbreaking, revolutionary, and disruptive.

- A **sustainable innovation** ("make it better!") improves a product or service in a way that the market already appreciates. Most organizations sufficiently to excellently developed processes for these types of innovations.

The organizations in the market are actually doing everything important right. They invest in the improvement of their products. However, it often happens that products are improved beyond the point at which further improvements do not really make sense and are thus useless. The customers and the market do not reward this

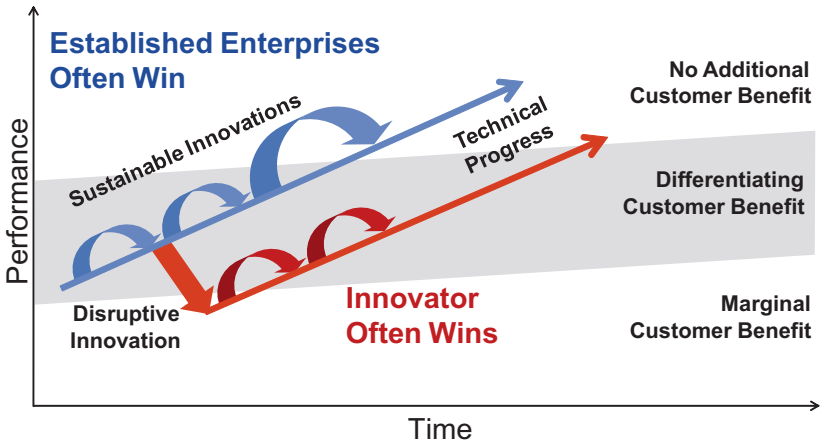

Fig. 3.12 Sustainable and disruptive innovations (according to Christensen). (Source: Bernd X. Weis)

by an appropriate purchasing behavior. They may have no interest in even better quality, a possibly even more expensive product, when preceding model has already fulfilled and maybe even exceeded all needs.

These organizations have more or less shaped this market and have developed up to now successful corporate cultures, which are similar in the fundamental values and the expected margins. Accordingly, they behave rather more cautiously, reluctantly, or hesitantly towards innovations that could shatter and change their traditional markets in the foundations.

► A **disruptive innovation** ("do it differently" or "do something different!") creates an entirely new market with the introduction of a completely novel type of product or service. It penetrates new market segments and uses technological innovations or new business models. Most organizations have no or only insufficiently developed processes for these types of innovations.

The market is not immediately accepting disruptive innovations, but eventually they can change and shape markets fundamentally. Often entirely new customer segments will be addressed that were previously not served, or customer segments, which the "old bulls" consider unprofitable. In these segments, the innovators must make a special effort to address the corresponding need, to raise the demand, and to meet the requirements of quality and/or price. The margins are lower, the market is smaller, and perhaps the products may be a little easier. However, in due course these products improve. As a result, customers previously not interested will also become aware and now discover that with this innovation a need is favorably satisfied. The innovation works its way up with the market (see Fig. 3.12).

Often incumbents cannot really keep up, although they discovered or invented many disruptive innovations, but their traditional customers often have no interest in these novelties. Moreover, because the organizational culture is geared towards the above-mentioned optimized processes, organizations find it difficult to diversify

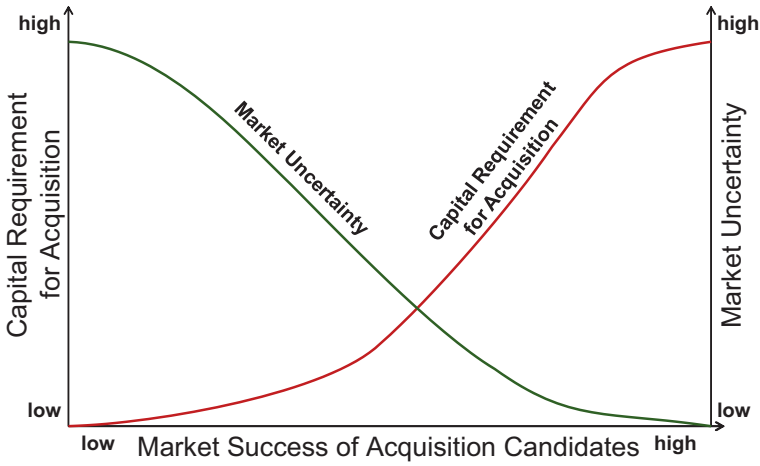

Fig. 3.13 Acquisition of innovations. (Source: Bernd X. Weis)

into a new technology and/or market segments because of these adversities. It just does not fit right.

If disruptive organizations, i.e., one with a disruptive innovation, challenge these established organizations in their traditional market, they are often too ponderous to withstand the competition. Therefore, large companies have begun to buy the disruptive innovations if and when they have proven themselves in the market with some success, and hence, market uncertainty is low. Figure 3.13 shows a typical curve of market uncertainty and capital requirements for the acquisition of a disruptive innovation. This graph is only qualitative since in each case a number of factors need to be assessed.

A nice example of a disruptive innovation is mobile communications, now even preparing to replace fixed line communications completely.

3.2.6 Life Cycle Models of Products and Technologies

Innovations rarely "happen" on the green field. In general, they are competing from the beginning with other products and need to prevail against them. For the analysis and the description of the environment as well as enabling classification of innovations in terms of market relevance, life cycles models of products and technologies are briefly introduced.

The **product life cycle model** (Kotler and Keller 2009) assumes that every product and every service undergoes a life cycle from launch to discontinuation of the offer, which characterizes the profiles of sales volumes, sales revenues, and profit expectations over time. The typical cycle consists of four phases: introduction, growth, maturity/saturation, and decline. They differ in the relationship between volume (number of products sold), revenue (income from products sold), and profits as shown in Fig. 3.14. In each phase, the organization faces different challenges, opportunities, and problems and thus, requires different strategies for marketing, finance, production, purchasing, supplies, and personnel.

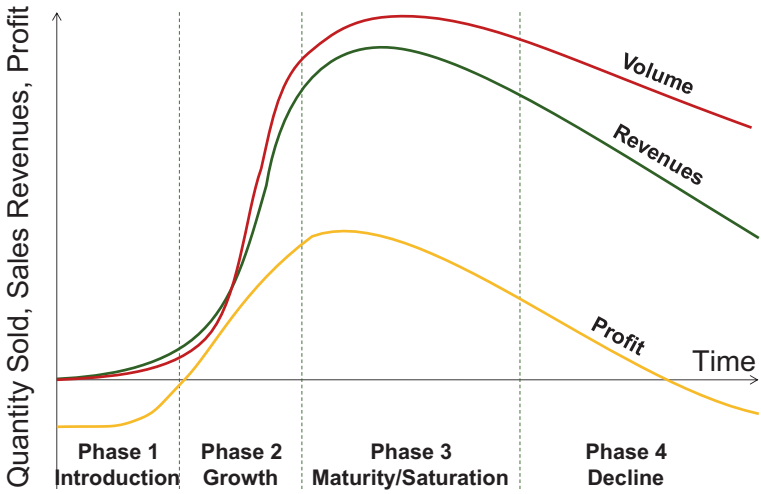

Fig. 3.14 Product life cycle. (Source: Bernd X. Weis)

In the **introduction** phase, the product is new and almost unknown in the market. In this phase, the most important tasks are to increase the awareness for the product and to overcome technical start-up problems and market resistance. Only those consumers particularly excited by new products usually buy the product. Its price is not yet optimal, since no effects of mass production are exploited. However, pricing is crucial at this stage: a price point must be found at which on the one hand a sufficient number of buyers are found, i.e., as economical as possible, and on the other that the customers' engendered price expectations do not jeopardize profits at a later point in time.

In this phase, it is eventually determined whether a product idea has eventually become a marketable product. Despite the often very high expenditures that have already been incurred for the product up to this point (development, investments in the manufacturing and marketing for market introduction), many products do not reach the critical growth phase. Often products cannot prevail against alternative offers, do not set technical de-facto standards or do not offer enough possibilities of usage and application. This phase lasts approximately until break even.

Once the product has convinced a critical mass of buyers, it reaches the **growth** phase, in which the product passes over the threshold from a niche product to mass-produce. Generally, the price level will still be high, and therefore, this phase allows for the highest margins. However, since the market is now very attractive first competitors/imitators emerge in the market. It is essential to exploit the benefits from the acquired customer awareness level and differentiate very clearly with respect to alternative products.

Intensified competitive pressure characterizes the **maturity** stage where further growth can be only partially achieved or at very high expenses. The market is saturated and the level of profit margin decreases. Now the strategic goal becomes to maintain and stabilize the market share achieved, to leverage the cost benefits of mass production, and to differentiate the product by augmenting the offer with appropriate services.

Table 3.2 Characteristics of the different phases of the product life cycle

	Introduction	Growth	Maturity/ saturation	Decline
	Properties			
Sales volume	Slowly rising	Further increasing	Slightly increasing to decreasing	Decreasing
Sales revenues	Small	Increasing quickly	Slowly increasing to decreasing	Decreasing
Profit	Negative	Increasing quickly	Decreasing	Decreasing
Cash flow	Negative	Medium	High	Medium
	Strategy			
Goal	Market entry	More Market share	Maximize profits	"Milking"
Measures, customers	Win new customers, "pioneers, early adopters"	Win market segments, "mainstream"	Defend market share, "late adopters"	Reduce cost, "laggards"
Competitors	Few	Increasing	Many	Decreasing
Differentiation	Product	Brand	Price/service	Price

In the phase of **decline** sales volumes of the product decreases. By now the product is outdated with respect to both, technology as well as fashion, and buyers are more interested in new offers that are at the beginning their life cycle. With new models, technical upgrades, a repositioning of the product image, changes in the distribution system, or by addressing new customer groups this point in time may be delayed. Ultimately, however, the product is discontinued when sales volumes, revenues, and profits as well as their perspectives fall below an economically acceptable level.

Nevertheless, products can be profitable even in the phase of decline. Namely, if the competitors already have retreated from the market, and hence, without competition, without major investments and by leveraging efficient production means the remaining market can well be served at a profit. This process is called "milking."

Table 3.2 summarizes the phases and their characteristics.

The product life cycle describes the empirically established sales performance of a product or the expected trend in sales during the period in which the product is on the market. Thus, the product life cycle considers only the period of time, in which the product is actually on the market. This is different, perhaps substantially, from the time in which the product is or can be used. Thus, the product life cycle model does not express a general law, but rather it may be advantageous as a thought pattern. The course of a product's life cycle is not predetermined and fixed, e.g., the product of an internationally operating enterprise can be in different phases in different markets.

The **technology life cycle model of Arthur D. Little** Little 1991) (see Fig. 3.15) implies that a technology with increasing degree of exploitation of its competitive potential traverses through the four phases of development, growth, maturity, and obsolescence. Depending on competitive importance, each phase represents a technology category:

- **Pacing technologies** will (probably) prevail in the market in the future and promise high (latent) competitive advantages for the enterprises involved, and will (probably) have a major impact on the performance of products or the cost structures;

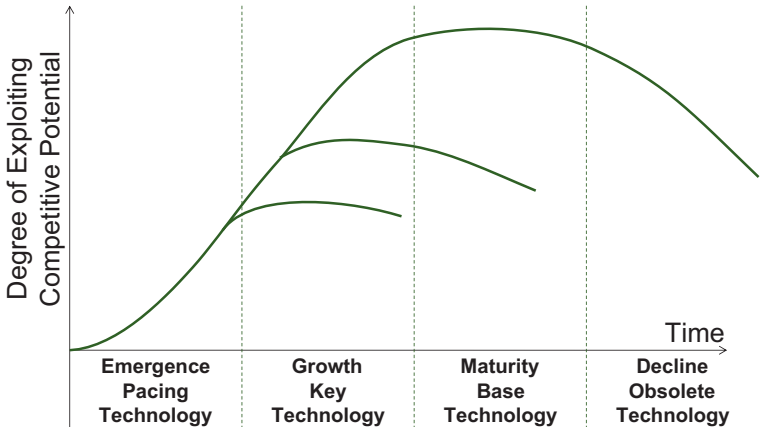

Fig. 3.15 Technology life cycle by A. D. Little. (Source: Bernd X. Weis)

- **Key technologies** are already established in the market and outstandingly influence the competitiveness of the enterprises mastering them, and also strongly influence the options and possibilities of product and/or cost differentiation;
- **Base technologies** are already established in the market and mastered by the relevant competitors without explicitly offering further benefits of differentiation;
- **Obsolete technologies** are (almost) completely replaced by substitution technologies.

Table 3.3 compares the essential characteristics of the technology phases.

For the early identification of technological advances and of the point in time at which one should seriously analyze and consider using a new technology, the **McKinsey S-curve model** suits well. It assumes that every technology eventually reaches its limits. As in the model of AD Little the curve is divided in phases: firstly, emergence; secondly, highest growth; and thirdly, maturity; substitution implicitly models the fourth phase obsolescence. As Fig. 3.16 shows, there is a point at which a change to a substitution technology makes most sense, even if it has not yet revealed its full potential.

Table 3.3 Characteristics of the different technology phases

	Pacing-Technology	Key Technology	Base Technology	Obsolete Technology
Uncertainty about performance	High	Medium	Low	None
Development investments	Low	Maximum	Low	Negligible
Potential deployment areas	Unknown	Large	Established	Decreasing
Development requirement	Scientific	Application oriented, maximum	Application oriented, marginal	Cost oriented
Impact on cost-performance ratio	Secondary	High	Decreasing	Marginal
Strategic role	High		Low	None
Patents	Conceptual, increasing		Process related, licenses	
Availability	Very limited ——————————> High			

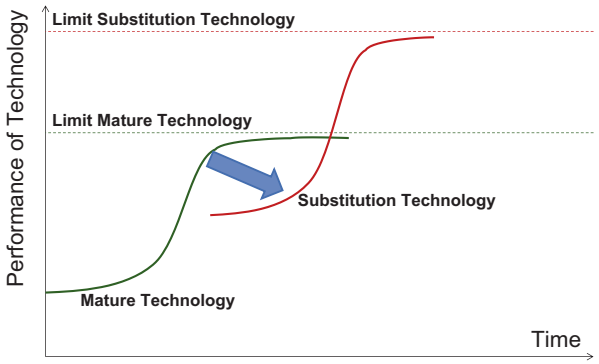

Fig. 3.16 Technology life cycle according to McKinsey. (Source: Bernd X. Weis)

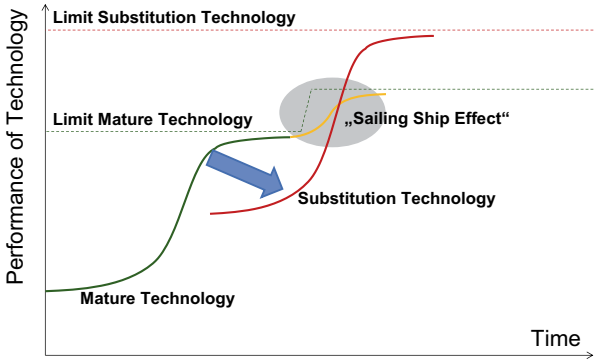

Fig. 3.17 "Sailing ship effect." (Source: Bernd X. Weis)

In this context, an interesting effect can be observed. The conviction that the prevailing technology is superior, and the belief that development potentials are not yet being fully realized, often result in increased development efforts that somewhat push the performance boundary of the technology. This is called the "sailing ship effect" since—as a historical note—with the advent of steamships shipyards resumed development efforts to improve sailing ships (see Fig. 3.17).

The "sailing ship effect" often supports the arguments to stick to an outdated technology—the technology is known and mastered, and one always discovers further development potential.

3.3 Innovation: Tools

Below some questionnaires are listed that support the analysis around an innovation project.

3.3.1 Around an Innovation Project: Questionnaires

Goal and impact of innovation (Table 3.4)

Table 3.4 Goal and impact of innovation

	Assessment		
Competition, demand, and markets	Relevant	Partially relevant	Not relevant
Replace products, which became obsolete			
Enlarge scope of applications			
Increase market share			
Enter into new markets			
Improve response time to customer needs			
Improve visibility or presentation of products			
Develop environmentally friendly products			
Production and supply			
Improve quality			
Improve flexibility			
Increase capacity			
Reduce unit labor costs			
Reduce resources consumption			
Reduce design costs			
Reduce set-up times			
Reducing operating costs			
Catch up with industry standards			
Increase delivery efficiency and times			
Improve use of IT			
Organization			
Improve communication and collaboration within the organization			
Increase of exchange of knowledge and experience with other organizations			
Increase the adaptability to different customer needs			
Develop stronger customer relationships			
Improve working conditions			
Other			
Minimize impact on health and environment			
Increase safety and security			
Comply with regulatory requirements			

Reasons that hinder or prevent innovation (Table 3.5)

Open or Closed Innovation Table 3.6 summarizes the major principles of closed and open innovation. The answers to the statements may be different from innovation project to innovation project. Depending on the type of innovation sometimes, it is more appropriate to pursue it in a closed context; sometimes it is better to pursue it in an open context.

3.3.2 Key Indicators of Innovativeness

Table 3.7 presents the key indicators of innovativeness.

3.3.3 Innovation Platforms

A number of platforms rely on so-called crowd sourcing. The following describes two of them as examples.

Quirky (www.quirky.com) Brings Ideas to Life
The company Quirky specializes in the successful implementation of product ideas. For a fee of $ 10 a product idea can online be registered (as of September 2011), and for a successful idea one receives a certain proportion of global sales revenues. The target price of the product should be less than US $ 150.

The Quirky community (65,000 members and rapidly growing) is evaluating the idea. They vote on whether they would buy the product later, and if so, at what price. This feedback further completes all the other market research results available. Then Quirky decides whether to pursue the product idea. In each further process step the community is decisively involved; so-called "influencers" contribute to the emerging product with their own ideas and proposals, e.g., for a name, a logo, proposals for industrial design.

At its own risk and on its own account Quirky evaluates the idea, calculates production costs, sets a competitive selling price, seeks and finds a suitable manufacturer, evaluates the distribution channels, and develops and sets up the supply chain. In return, Quirky reserves 70 % of sales revenues through its own Quirky shopping portal, 90 % of sales revenues for sales through retail partners, and eventually the creator of the idea and the influencers split the remains between themselves.

The involvement of the community through social media in the exploratory phase of a product decision saves money and protects against many erroneous decisions.

InnoCentive (www.innocentive.com) Teams Up the Ones that Have a Task and the Ones that Solve the Task
InnoCentive is a challenge-driven organization. A challenge is a well-formulated task whose solution has a value for an organization. It can be formulated both as a vague question to stimulate new ideas, and as one that requires higher accuracy of the solution, e.g., physical characteristics of materials. By definition, a challenge is specific, detailed, and executable. In a stringent process, a challenge is formulated, prioritized, and published on the platform. The results are tracked, evaluated, and rewarded. The protection of intellectual property is an essential component of the process.

The InnoCentive Challenge Platform (ICCP) is the first innovation management system for businesses. It enables organizations to solve the most important challenges by quickly and easily involving various internal and external innovation communities. The platform is the focal point for open innovation that allows commercial, public, and non-profit organizations to find easy access to the right people, communities, and networks. Thus, new ideas are created, major problems solved, and innovations created faster, more economical and with less risk.

Table 3.5 Reasons that hinder or prevent innovation

	Assessment		
Expenditures	Relevant	Partially relevant	Not relevant
Costs too high			
To large perceived risk			
Insufficient internal funds			
Insufficient external agents such as venture capital, public funds			
Know-how			
Inadequate potential for innovation (R & D, design, etc.)			
Not enough qualified staff in the organization and the labor market			
Inadequate knowledge of the technologies			
Inadequate knowledge of the markets			
Inadequate availability of external services			
Difficulties in finding suitable partners for product or process development			
Marketing			
Organizational barriers within the organization			
Staff attitude to changes			
Management's attitude towards change			
Management structure of the organization			
Inadequate staffing of innovation activities			
Markets			
Uncertainties in demand for innovative products			
Dominance of the "top dogs" in the potential markets			
Institutional factors			
Lack of appropriate infrastructure			
Legislation, regulations, standards, taxation			
Legal uncertainties			
Other reasons			
No need for innovation			

Table 3.6 Open or closed innovation

Principles of closed innovation							Principles of open innovation
We are the real experts in the field							Not all specialists in the field to work with us. We must work together with other specialists
We need the entire value creation chain under our control							Others can contribute significantly to value creation. However, we must ensure our contribution
We are faster to market with our own inventions							We do not need to invent everything ourselves in order to benefit from it
We need to invent the best inventions in our industry ourselves							We optimize the benefits of our own, as well as of external inventions
We need control of our intellectual property							We sell licenses of our own intellectual property, and we buy licenses of intellectual property of others

Table 3.7 Key indicators of innovativeness

Income	
Total sales $\text{Sales(period)} = \text{SalesMarketNovelties(period)} + \text{SalesGenericProducts(period)} + \text{SalesStandardProducts(period)}$	
New or significantly improved products that have been introduced during the observation period which were new in the market $\frac{\text{Sales of Market Novelties (period)}}{\text{Total Sales(period)}}$	
New or significantly improved products that have been introduced during the observation period which were new for the company, but not new for the market (generic products) $\frac{\text{Sales of Generic Products (period)}}{\text{Total Sales (period)}}$	
Standard products, which were not or only marginally changed during the observation period $\frac{\text{Sales of Standard Products (period)}}{\text{Total Sales (period)}}$	
Sales that result from marketing innovation projects to total sales $\frac{\text{Sales Resulting from Maketing Innovation (period)}}{\text{Total Sales (period)}}$	
Sales that result from business model innovation projects to total sales $\frac{\text{Sales Resulting from Business Model Innovation (period)}}{\text{Total Sales (period)}}$	
Profits	
Cost savings through process innovation projects to total sales $\frac{\text{Savings through process innovation (period)}}{\text{Total Sales (period)}}$	
Cost savings through other innovation projects (marketing, organizational, and business model innovation) to total sales $\frac{\text{Savings through other innovation projects (period)}}{\text{Total Sales (period)}}$	
Expenditures	
Research and development expenses (product and process innovations) to total sales $\frac{\text{R \& D Expenditures (period)}}{\text{Total Sales (period)}}$	
Expenses of other innovation projects (marketing, organizational, and business model innovation) to total sales $\frac{\text{Expenditures of Other Innovation Projects (period)}}{\text{Total Sales (period)}}$	
Number of closed innovation projects to total number of innovation projects, $\frac{\text{Closed Innovation Projects (period)}}{\text{All Innovation Projects (period)}}$	

Table 3.7 (Continued)

Income	
Financing closed innovation projects	
Own resources (equity) Own Resources (period) Total Funding (period)	
External funds (venture capital, loans) External Funding (period) Total Funding (period)	
Public funding (national Projects, EU Projects, etc.) Public Funding (period) Total Funding (period)	
Number of open innovation projects to total number of innovation projects, Open Innovation Projects (period) All Innovation Projects (period)	
Financing open innovation projects	
Own resources (equity) Own Resources (period) Total Funding (period)	
External funds (venture capital, loans) External Funding (period) Total Funding (period)	
Public funds (national Projects, EU Projects, etc.) Public Funding (period) Total Funding (period)	
Safeguarding	
Number of confidentiality agreements	
Number of patent and utility model applications	
Number of granted patents and utility models	
Structure	
Number of R&D employees to total workforce in percent	

Innovation: Summary

Forecasts of future customer behavior and market development often avail the perpetuation of past and present experience. However, it is impossible to conclude with certainty from the past experienced or observed events that these events will occur in the future. The only conclusion to be drawn is that these events are likely to occur. The occurrence of actually improbable events (Black Swans) can alter structures sustainably. These events do not follow a plan, but more or less just happen by chance, until they occur they might even have been unknown.

Probability theory allows supporting hypotheses with corresponding empirical observations. However, the results are just probabilities and thus uncertainties remain.

People assess uncertainties heuristically, where various distortions cause a sometimes incorrect assessment. People use three very simple heuristics to make assumptions about the relevant environment: availability, representativeness, and anchoring. These heuristics often lead to false conclusions.

An idea must first be elaborated to enable a new product, a new service, or a new process (invention). If this invention is then applied successfully (diffusion)—be it in products, services, or business processes—then this idea becomes an innovation: **Idea + Invention + Diffusion = Innovation**. Thus, an idea, an invention becomes an innovation when it is successfully placed in the market.

The OECD distinguishes four types of innovation according to content: product, process, marketing, and organizational innovations. In addition, today business model innovations are important.

Closed and open innovations are distinguished according to how innovations are created. Closed innovations are created in the organization under its control, open innovations are developed in collaboration with partners.

The impact of innovations distinguishes on the one hand incremental, continuous, and sustainable and on the other ground-breaking, revolutionary, and disruptive innovations. Sustainable innovations satisfy a customer need better than it has been before, and are advanced developments of existing products. Disruptive innovations satisfy a customer need differently than in the past or a customer need, which has hitherto been present only latently.

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Business Models

4

The drama "Being Innovative"—Act 1, Scene 2

The board member of POLYM Inc. Alexander H. sits with his assistant Walter K. in his office. Walter K. reports on the conversation he had with inventor Thomas E. and decision-maker John G.

POLYM Inc. Walter K.: I have just spoken to Thomas E. and John G. about their innovation. That sounds very promising. An innovative product that could become a huge success for us. Perhaps it is even a Black Swan.

POLYM Inc. Alexander H.: How far have the considerations progressed already? As far as I understand it, we have to pursue entirely new ways. Is there something specific, I should know about?

POLYM Inc. Walter K.: No, but one thing I can tell already. It probably will not be enough to launch this product in the market with our existing business model. We will have to start with thinking about business models.

POLYM Inc. Alexander H.: Kill two birds with one stone, we have to go for two innovations in one stroke—a new product and a new business model. Two in one go—that's a lot. I'd rather preferred we could do one by one. Do you already have ideas about how such a new innovative business model could look like? I mean, a business model describes the way we do our business. So far, we did fairly well with our old one. What we need to change in the old one, to make a good fit for this new situation?

POLYM Inc. Walter K.: We have not gone that far yet. At the moment, we are still clarifying some technical issues.

POLYM Inc. Alexander H.: I'm very much interested in the business model. We don't have that much experience on that matter. If we don't implement it right, then we will not have much of this innovation. Am I correct that we need some external

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contacts for this new business model? Once you start doing something with others, you'll fetch quite a bit of uncertainty as well. Do we already know which partners we could cooperate with? We need to choose carefully. When you are ready, I can help you to open some of the doors of those companies. Once they know that our board of directors is behind the project, that shouldn't be too difficult.

POLYM Inc. Walter K.: I'll do a profile list of the skills that we need, and of potential partners that match this profile.

The drama "Being Innovative"—Act 1, Scene 3

Inventor Thomas E. is alone in his office.

Inventor Thomas E.: Oh man, they always want to know everything. This bloated wretched creature of assistant—acts as if he is the management. How could I know all this already? They want everything always so simple, if we do it this way, so and such happens. As if it always were that easy, but everything depends on everything else, it's just complex, what can you do. Even if everything is well considered, still just quite a few uncertainties remain. And, who knows what else may be in it—yet that can't be foreseen in advance!

Decision-maker John G. is alone in his office.

Decision-Maker John G.: I really like the idea of Thomas E. But on our own, we can't do it. I'll ask him next time whether we should pick partners for cooperation—developers don't usually think of such things. Always want to do everything themselves. Shared sorrow is half sorrow, shared joy is double joy—or something like that. If others join in, then that gives a bit more security and we don't need to lean ourselves so far out of the window, and, if it is a success, so much stronger we could become, provided they play a fair game.

4.1 Business Models: Selected Topics

4.1.1 Motto of the New Economy

"New business model" is the motto of the new economy. Not that one had not thought about how and with what one can earn an income, but one is actually imprisoned by the very simplistic assumption that the conditions and references of relationships in business life are simple and actually obvious. From today's perspective, this assumption is outdated, most likely due to a stronger and distinct need for control and security.

The term "business model" suggests a mechanistic causal construct—it is something in, and then what comes out is determined exactly. That is, the input of the pre-products and the known functional operation determine the output of the products (see Fig. 4.1).

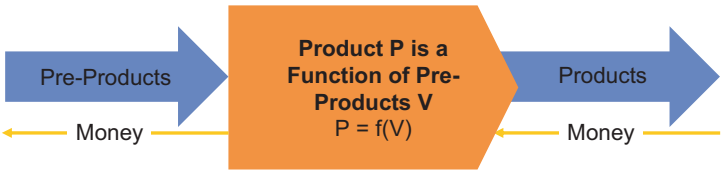

Fig. 4.1 Business model as a mechanistic causal construct. (Source: Bernd X. Weis)

The organization produces a product from the pre-products of suppliers, which are then bought by the customers. The money flows from customers through the company to suppliers, where the company retains some of it to cover its costs and to make a profit. In a demand-dominated industry, this form of a business model is certainly still adequate. For instance, with a revolutionary, ground-breaking innovation in mobile phones—the iPhone—Apple has created a massive demand for this product. When Apple announced the commercial availability of the iPhone, long queues of shoppers formed in front of the stores, who desperately wanted one of the first iPhones—at any cost.

How easy would a company's planning process be, if it were always like that in business reality. Today most established industries are supply-dominated, i.e., the customers can choose from a variety of offers, the one that suits them best, which is also tailored precisely to their needs. The organizations find it difficult to differentiate their products in such a way that the customer also perceives and appreciates this. Often, the distinguishing features are either very superficial or hidden and complicated, and customers may not even care.

A continuously increasing degree of cross-linking and networking of organizations characterize today's business models. The organizations enter into partnerships with other organizations, if the partnerships promise them a competitive advantage. The business partners have identical interests and create a win-win situation through their cooperation, which is beneficial for all of them. The business itself expands in total; it is not only differently distributed. Constructions, in which organizations are competitors in one business area and partner in another, are no rarity any more.

Partnerships carry many advantages—e.g., an organization can be relatively quick to get new technologies, outsource difficult processes to specialists, open up a completely different market access, address all of a sudden new customer groups, or set themselves up geographically much more diversified. However, were planning processes already difficult in organizations as mentioned above, with the networking they get yet another extra dimension.

4.1.2 Business Model Innovation: Examples I

Most business models have evolved historically. They describe how the business is done today based on how it was made in the past. However, business models also have the potential to be the target of innovation. They are very useful for analyzing the existing structures and/or for designing completely new structures with previ-

ously unused or unknown relationships. Innovative new business models, which usually rely heavily on modern communication technology, completely different, can establish new ways to customers and develop unprecedented revenue sources.

From the beginning, Apple had its focus on innovative products characterized by easy-to-use, intuitive, technically high-quality hardware, and a superb lifestyle design, and with these, differentiated itself from the products of many other computer manufacturers. In 1984 with the Macintosh, Apple launched a graphical user interface on the market and initiated the paradigm change from cryptic operating system commands towards simple operation with a mouse. They addressed and served the high-priced market segments of, e.g., designers and multimedia specialists. In the meantime, Apple with the Mac series has gained additional market segments.

With the iPod, Apple went into a market that at first sight had little to do with the core business of a computer manufacturer. Unlike the MP3 players from other manufacturers, which were very technical and complicated to use, the iPod was a nicely designed, easy-to-use device. With the introduction of the iPod, Apple interweaved the sale of the product with the sale of music through the iTunes store, now a completely new terrain for a computer manufacturer (**Napster** had the technology.) With this co-marketing, it was possible to offer a wide range of music for all tastes to users of iPods, which customers simply download via iTunes from the network. This combined offer became a sales success almost overnight.

Almost the same way, Apple went with the introduction of the iPhone—a via touch screen ingeniously simple to use mobile phone, which incidentally comprises elements of a computer and the iPod in one. With the App Store, Apple succeeded in hitting another jackpot. Therewith, Apple offers a platform to a community of app developers on which anyone can sell applications developed for the iPhone's operating system iOS. Because of the multitude and variety of applications, the iPhone is now more than just a mobile phone. The iPad is a tablet computer with a similarly simple handling as iPod and iPhone.

Apple created a closed ecosystem consisting of devices, operating system, and stores through which Apple has been able on the one hand to activate immense development resources for applications and on the other to create a new distribution channel for content. This markedly relieves the pressure on Apple's own resources, and it becomes obvious that one can live quite well by the commission on these sales. In this ecosystem, customers have access to a media cosmos that once they get in they do not need to leave. There is everything you need (and you do not need) from one source: software, music, books, movies. Between 2005 and 2011, the market price of Apple's stock has increased more than tenfold. Thus, Apple is a prime example of the innovation of a business model.

The computer manufacturer **Dell** has gained a competitive edge with a - for this industry - innovative new business model. Dell recognized that the private personal computer users are quite versed and are not only able to articulate their needs and requirements, but also to configure them in hardware and software with some support. Now, instead of offering a variety of different models through retailers like the other providers, Dell sought the direct route to customers. Dell gives the customers a web-based configuration tool with which they can configure their personal com-

puters (PCs) themselves. Each configuration step provides price quotations, and thus, the customer always has the actual product costs at hand. Additional services such as pick-up and repair services, online backup, etc., are also offered. For larger customers and public customers, Dell offers an IT infrastructure with a variety of additional services that relieves them from these important everyday tasks.

In the realization of this direct customer access, Dell abstains from resellers, retailers, and system integrators. Dell integrates their functions in the purchasing process with the appropriate services. Once the buyer has configured and ordered, the computer is being produced (build-to-order concept). This requires sophisticated coordination and logistics processes, because customers do not like to wait long for their computer. From receipt of payment, the computer is delivered in about 10 days, sometimes even sooner. Frequently ordered configurations are dispatched within 48 h.

The competitive advantages of this business model are clear. Since the computer is only produced upon order reception, customers receive exactly the computer that they want, and always with latest technology. For this and also because of the short cycles of about 6 months in this industry, they accept an eventually slightly higher price.

In return, Dell saves the costs of storing finished products. The typical duration of the traditional business model is about 90 days from production to customer. With the rapid technological advancements in this industry, 90 days mean a significant loss of value of the products, which can be up to 10 % per month. In this business model, another very positive effect for Dell is that the customer has already paid the computer before it is produced. As a result, there is hardly any working capital to be financed in the retail business. Many companies dream of such a financial structure.

These structures are also suitable for precisely addressing companies and public authorities, for which more elaborate packages are put together. These include services such as technical support, hotlines, and custom configurations. The design and quality of these services allow a differentiation from the competition, increased customer loyalty, and additional income.

The build-to-order concept has long history in the automotive industry. Again, the clients configure—sometimes even on the Internet—the car that they really like in a depth of detail that corresponds to the value of the product. However, car dealers as customer interface cannot yet be dispensed with—cars are not sent by mail. From the customers' perspective, this does not cause a problem, because of the significantly longer product and technology cycles in the automotive industry and the much higher complexity of the services to be provided in addition, such as maintenance and repair.

Reflection on Dell's business model leads to an interesting observation. While many organizations are increasingly aligning their innovative business models in networks, Dell just does it the other way around. The model requires such a high coordination and logistics efficiency that Dell has many of the tasks, which are often outsourced and handled by partners, either integrated into its own business or eliminated, thereby on the one hand ensuring smooth operations and on the other enabling to react quickly to outside changes.

eBay is the company that operates the auction platform of the same name. It has also established itself as a market leader in this market with a new and innovative business model. On this platform, sellers offer their goods and buyers bid for them. In the company's start-up phase, primarily individuals used the platform for their second-hand goods, which through this found new use. In the meantime, however, eBay has become a platform for the exchange of goods and services of all kinds. Because of the large number of users, now even companies sell their products via eBay. The platform provides them with a new, additional sales channel directly to the customer.

In its 2010 annual report, the company states the eBay buyers' benefits as follows: trust, value, selection, and convenience. For the seller, eBay provides access to global markets, efficiency in marketing and distribution, opportunities for increases in revenue as well as efficient and affordable payment processing.

Previously, it was actually left to chance whether a seller and a potential buyer will find each other. For second-hand goods, flea and rummage markets were the only places where such transactions took place. eBay takes care that both the spatial and temporal barriers (buyer and seller in the same place at the same time) are overcome; it brings together buyers and sellers cost effectively. The customers themselves, who are both providers and buyers of auctioned goods, provide the value added. Also, the clearing of the business transaction is organized by the business partners themselves, e.g., through banks for the money and parcel services for the goods. eBay just provides the platform for these exchanges.

For its platform eBay deploys the opportunities of communication networks and partners with existing service providers for the provision, e.g., for the logistics and payments.

In mobile communications beside the familiar classic business model with binding contracts "flat-rate" and "prepaid" concepts prevailed. In the classical model, contract customers pay the telecommunication companies the fees monthly that accrued the previous month. This model requires administratively complex charging and billing processes. The payment default risks prevent to target customers, who do not want to or can be bound contractually, e.g., like children and teenagers.

Addressing these customer groups with "prepaid" business models has led to a considerable expansion of the overall market of mobile communications. The customer does not pay a monthly basic fee, but buys in advance a certain amount of units, which are then consumed—eventually with a somewhat more expensive tariff. On part of the customers, this has the advantage that they only use pay for up units, i.e., there is no potential debt trap. On part of the operator, the advantage is that he has no payment default risk to fear because of the advance payment.

The "flat-rate" models promote on the one hand the use of telephony, but on the other also the use of mobile data services enabled by modern smartphones. On top, additional sources of revenue can be further developed.

Other innovative business models evolve when questioning the business ever deeper and deeper and eventually getting to the bottom of it. To make the point: Companies actually do not purchase a production machine, but they buy the ability to produce. These considerations are fundamental to rental and leasing busi-

ness models. Such business models transform the one-time purchase of a physical product into the many-time purchase of services; the physical product remains the property of the service provider who also has to provide some further services such as maintenance and replacement. The reasons are clear. If the physical product is an investment good, that is only very slowly "consumed" as machines and the likes, the company generates a revenue once when sold, possibly supplemented by additional periodic income through, e.g., maintenance. The buyer has the advantage that he need not finance an investment, but pay the services from current income. If it is now possible to construct a business model such that a buyer does not buy the physical product itself, but the effect of this product as a service, the seller has the advantage of a recurrent income possibly with a better overall margin, but has to provide the investment funds.

Both business models might also be very well in operation at the same time. For example, the company sells Schindler elevators and at the same time their maintenance. However, it is also possible to purchase the transport capacity as a service and pay according to usage. These business models are only possible with the use of modern communication technologies, since for these models to work, the networking of products in the field with the company is essential.

4.1.3 Business Model as a System

The opportunities innovative business models can offer are immense. However, they require having a closer look at the bigger picture. Innovative business models are based on the interaction and networking of potentially many participants, thus requiring considerations that often go far beyond the own organization.

Business models are descriptions and illustrations of system in systems. The study of systems and the effort to understand them have spawned a whole range of scientific disciplines as cybernetics (Wiener 1948; Ashby 1956) and control engineering (Foellinger 1994) with technical-scientific emphasis as well as systems theory (Luhmann 1984; Simon (2008); Robinson 1995; Cilliers 1998; Coveney and Highfield 1995), chaos theory (Waldrop 1993; Pleitgen et al. 1998; Pleitgen and Richter 1986; Wolfram 1994; Gleick 1996), and game theory (Von Neumann and Morgenstern 1944; Eigen and Winkler 1987; Riechmann 2008) with socioeconomic and natural scientific emphases, to name but a few.

The work of physicist David Bohm (Bohm 1980) shows how far the explanatory attempts with a system approach reach. He even considers thought and knowledge as a system and analyzes their interactions and dependencies. There is an active exchange between the disciplines and the boundaries between them have become transparent and flowing.

In this handbook, only those elements of these disciplines are selected that are helpful and useful for further clarification. The fundamental properties of systems are briefly explained and summarized.

The philosopher Kenneth E. Wilber explains systems (Wilber 1996), where he names "holon" what is here meant by system, a Greek term meaning "whole being"

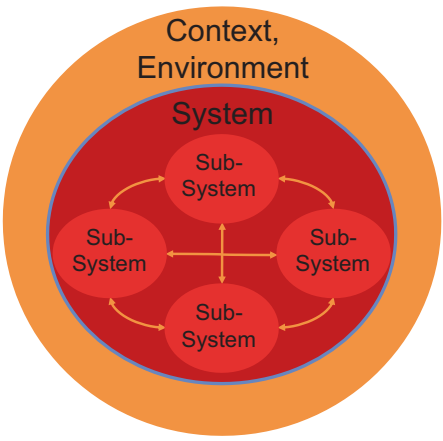

Fig. 4.2 System, sub-system, context, environment. (Source: Bernd X. Weis)

coined by Arthur Koestler (Koestler 1972). He does not define what systems are, but he axiomatically presupposes them in the sense that they simply exist. Their particular meaning derives from the respective contexts. A system consists of a number of interconnected, interdependent, and interacting subsystems. Each subsystem is in turn a system in its own right, and each system can be a subsystem of a higher-level system. Each system defines the context of next lower-level systems.

Systems are on the one hand closed within themselves, delimited by their system boundary. On the other hand, they are integrated in a larger context—they are usually elements of a system, i.e., they are always part of a context, an environment, interact constantly with their environment and thereby alter the environment as shown schematically in Fig. 4.2.

Gregory Bateson, an Anglo-American scholar who integrated many branches of science into his systemic-cybernetic way of thinking suggests, *"The way to delineate the system is to draw the limiting line in such a way that you do not cut any of these pathways in ways which leave things inexplicable."* (Bateson 1972) Very pragmatic, he points out that systems descriptions make sense if they provide an explanatory benefit in return.

The interdependencies and interactions of systems create a certain incomprehensibility not necessarily in arrangement, but in behavior, a break in strict "if-then" causal chains—the structures eventually become complex. Being complex means to have many interconnected components, patterns, and relationships that are difficult to separate, to analyze, or to dissolve. Complexity suggests an inevitable and necessary absence of simplicity, which is, however, not due to erroneous or mistaken designs and arrangements. Complexity therefore implies an interweavement of components and processes that cannot or only with difficulty be understood or followed.

Complex systems have a certain ability to maintain their individuality, their special separate entity and autonomy. They exist because of and through their interactions and their context, but they are not defined by the context, but by their own pattern, their individual form or structure, but also through their ability to perceive

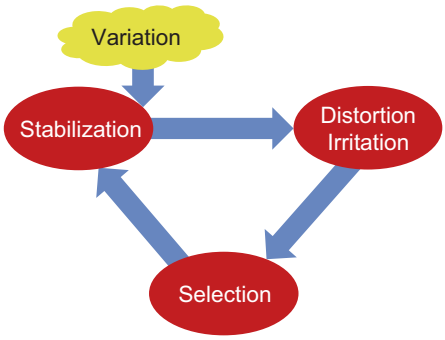

Fig. 4.3 Recursive change . (Source: Bernd X. Weis)

other systems and adapt to them—to blend with the environment encountered. Systems thus have the ability to organize themselves within the context. The stronger the tendencies for conservation, the weaker those for adaptation.

Complex systems usually have the peculiarity that the characteristic features cannot be fully derived from knowledge of the individual or consideration of partial combinations of components. They emerge with the result that the whole is more than the sum of the parts. Emergence means that indeterminacy is an essential characteristic, because if something emerges and is therefore not entirely attributable to and explained by what presently exists, and thus, is not entirely determined by the past. Systems emerge in a hierarchical sequence. Each emergent system incorporates its precursor. An emerging system preserves on the one hand the previous systems as such, but dissolves its separating and isolating aspects. The lower sets the possibilities of the higher, the higher the probabilities of lower.

Complex systems have a "memory." Depending on the situation which a system happens to be in, it chooses the next step with respect to itself; it is self-referential. Systems are therefore in a state that is dependent on the entire history. Interventions may therefore show effects not only immediately, but also with a time delay. In addition, no system develops only by itself. This is coevolution, which means that not the individual system is the "basic unit" of evolution, but the system and its environment combined. Since both are inextricably linked, they develop together due to their mutual interactions. Evolutionary changes (Dawkins 2009) follow a recursive pattern: a variation which can be induced spontaneously and randomly in a certain system state which causes a distortion/irritation in the system. The system responds upon this in forming the most likely successive state of the variety of possible successive states (selection), which the system ultimately aspires (stabilization) as shown in Fig. 4.3.

These evolutionary patterns can develop in two fundamentally different ways. In cybernetics and control technology, the first one is **feedback**, which ensures that the effect of a variation lets the system aspire toward some stable state. The second is **positive feedback**, and this amplifies the effect of a variation further and eventually drives the system to its limits, which under certain circumstances may also lead to destruction.

Stable system states are equilibrium states. For systems analysis, these equilibrium states are of great importance because they provide the direction in which a system aspires to, when disturbed by a variation. Real systems are often in such a dynamic environment that variations occur before the systems has arrived in a steady, stable state, so that systems in equilibrium are rarely found, and if then only temporarily.

System evolution is directed. The directive character is that of increasing complexity, increasing differentiation/integration, increasing organization/structuring, and increasing relative autonomy.

The fundamental properties and characteristics of complex systems are also observed in business models:

- **Boundary between system and environment**: A fundamental task of a business model is to determine the system boundary, i.e., the identification of those who are seen as key players in the business, and those who play only a minor role in it.
- **Emergence and indeterminacy:** Business models at work can develop a momentum inexplicable, considering only the inherent dynamics of the subsystems. How this materializes, is ultimately indeterminate. The best example of this is the Internet with its tremendous momentum that has revolutionized nearly all areas of life, and has a very special impact on economy. Hardly anyone had a priori anticipated the variety of applications possible (ironic side note—a posteriori all these developments can be explained with a certain inevitability—see Black Swans).

  A business model needs firstly to comprise an ability to adapt if the environment does not behave or perform as expected. Secondly, it must also have momentum of preservation, so it does not collapse immediately when economic headwinds blow. The trick is to find the appropriate balance between the two opposing poles, preservation and adaptation.

  The lower sets the possibilities of the higher, the higher the probabilities of the lower. The technological development (the lower) allows business applications (the higher). The economic success (the higher) and the resulting financial resources increase the likelihood of successful technological development (the lower). This clearly reveals the feedback-mechanisms.
- **Coevolution**: Changes in a business model change the business model itself, the economic system in which it is embedded, and the environment. Thus, in the modeling a "ceteris paribus" ("other things being equal") can't hold unrestricted, i.e., the business model must not be viewed and analyzed alone, but also its effects on the environment and especially the potential feedback of the environment have to be taken into account.

Now, and again to determine its validity, the business model has to be assessed against the real world in which it is deployed, as shown in Fig. 4.4.

In this review of the model, the basic systemic properties are scrutinized: How does the implemented model behave in the real world? Are the boundaries of the

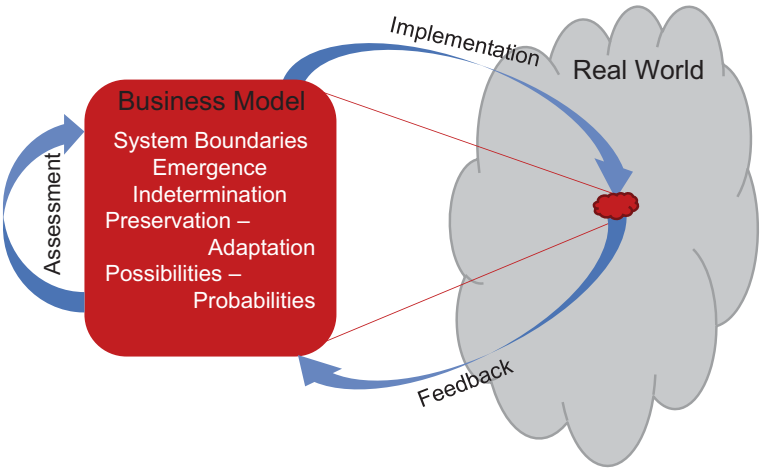

Fig. 4.4 Business model: implementation, feedback, assessment. (Source: Bernd X. Weis)

business model still well determined? Are there unforeseen effects? Are there changes both internal and external, which are either to be endured or to be adapted to or open up completely new opportunities? In modern cybernetics, a so-called second-order observer assumes the function to inquire along those questions.

4.1.4 People in the System: Ecosystem

How do people deal with complex systems? One way is passed on in the legend of the Alexander the Great and the Gordian knot, an intricate, but delicate knot of rope, which should inseparably join the drawbar of the chariot from the yoke. The chariot belonged to Gordias, king of Phrygia, and was dedicated to Zeus himself. An oracle prophesied that only the one who unties this knot would gain dominion over Asia. For this price, many wise and strong men tried, but none succeeded. In the spring of 334 BC, Alexander the Great is said to have "untied" this knot simply by slicing it apart with his sword, and then off he went to conquer Asia, an endeavor in which he ultimately succeeded. A simple solution.

Nevertheless, in a sense complex systems seem to withdraw themselves from being handled in a controlled manner. There are broadly three possible ways to deal with it: you can try to dominate, to embrace, or to shape it (see Fig. 4.5).

To dominate implies a direct intervention into the structure of the system. The system is subdued by rules and laws, good behavior is rewarded, deviation sanctioned, in ultimate consequence even to destruction and annihilation. As stated above, systems are always embedded in higher-level systems and embed them-

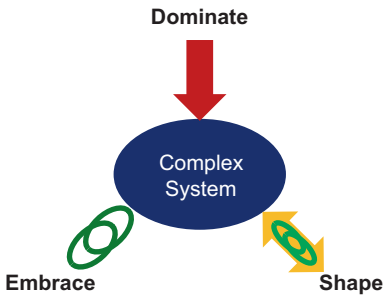

Fig. 4.5 Dealing with complex systems. (Source: Bernd X. Weis)

selves lower-level systems. However, the will to dominate rests usually on the belief that "cutting free" the system, i.e., a detachment from the interactions, is possible. This is a—usually fatal, often catastrophic, occasionally even devastating—fallacy.

To embrace means not to intervene in the structure, to come to terms with what really is, to adapt to and to accommodate oneself in the given context—it is as it is. However, one really wants to set oneself up the way one wants to. To embrace challenges the need for harmony, feeling secure, balance and equilibrium, clarity, security, even freedom from pain and physical personal integrity. To embrace comes with the risk of unintended and unforeseeable tremor and distortion as well as the loss of control, of goal and orientation that were believed to be definite and firm.

To shape is somewhere in between—heedfully control what is controllable, influence what can be influenced, and embrace what cannot be changed. Shaping not only means to analyze, structure, sort, and organize, but also to develop, design, persuade, and lead with open eyes to identify opportunities and exert influence.

Now, a comment on reduction of complexity is appropriate in this context, which is especially important in a will-to-dominate situation. In general, one can safely assume that the complexity reduction does not apply to the system per se, but "only" to its representation, to the system model one has in mind. However, the understanding of the real issues derived from the complexity-reduced model loses depth and accuracy. It is also clear that without reducing complexity in the models deployed, it is difficult to make good decisions. Nevertheless, one must not confuse: only the model has become easier, not reality itself, the reality still moves on its tangled unfathomable paths. However, reducing complexity of the model also implies an intensified monitoring of the interactions and the willingness to question critically the assumptions that simplified the model, if there are empirical inconsistencies, and to adjust if necessary and appropriate. This process is also known as trial-and-error method. People tend to fall for the often alluring but deceptive, fatal confusion between system and system model—this is especially true when the observed interactions over time correspond well with the expected ones.

Sometimes the term ecosystem is conceptually used for business models to highlight the systemic nature. Ecosystem also implies that the system behavior is influenced not only from outside but also from within by a natural environment (biosphere) and by fortuities and chances as well as by the people residing in this

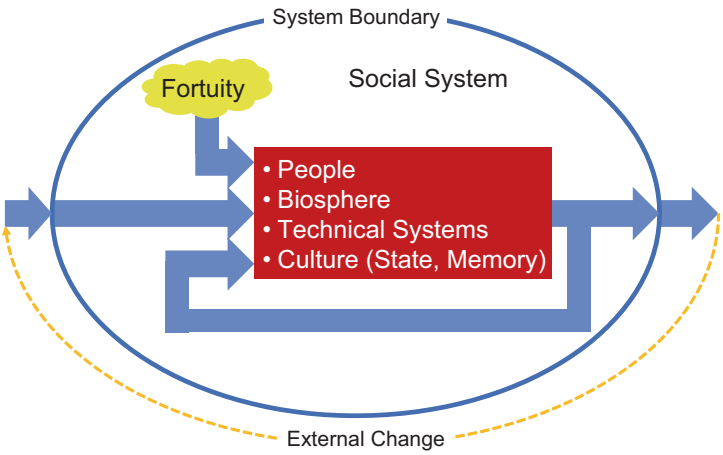

Fig. 4.6 Ecosystem—schematic representation. (Source: Bernd X. Weis)

system. Thus, a business model describes a **social system**; behind the model elements are people who live a life with all that this means (see Fig. 4.6).

But, how are people included in these models? In economics, the idea of man as a "homo economicus" is a useful matter. Homo economicus is a *"business entity acting in such a way that its economic practices fulfil the rationality principle, by pursuing maximum benefits or highest profit under given conditions."* (Woll 1993) Hence, he is an economic utility maximizer. He acts rationally and in particular in its own interest. Since his behavior is predictable, economics theories often count on this model. Because in the case of homo economicus coincide descriptive (as it is observed) and normative (as it should be) behavioral models, that allows a simplification of the already complicated matters. The German Nobel laureate Reinhard Selten calls this *"naive rationalism"* and is convinced that this human behavior model is only partially true (Selten 2001).

The homo economicus explains many economic phenomena from a macroscopic, summary perspective, but fails at modern models like Wikipedia and Open Source concepts, in general at any concept of charitable character, which come into existence because people get involved without direct immediate return.

A nice and simple experiment that supports Selten's conviction is the ultimatum game (Jungermann et al. 2005). Two players can split the amount of 10 € between them. One player, the dealer, offers the other player, the receiver, a certain amount. If the recipient accepts the offer, they split the 10 € accordingly, and if he does not accept the offer, both get nothing and go empty-handed. If the players are of the species homo economicus, the dealer provides the minimum amount knowing that the recipient will accept any offer greater than nothing. However, in carrying out this experiment, it is observed that most dealers offer 5 € or slightly less. This may stem on the one hand from the need for fairness, the other from the fear of rejection of the offer or maybe both, because if the offer is not accepted, both get nothing.

The receiver orientates himself on the principle of fairness, which leads to a 50–50 allocation. If the receiver perceives the offer as unfair, he refuses, even though in terms of utility maximization he cuts his own flesh and gets nothing.

In a variation of this experiment, the number of players is increased. There is one dealer and a number of potential recipients that apply in the style of an auction for a partial amount. The result here is that most recipients opt for the minimum amount, just as the homo economicus would. By changing the rules of the game, the principle of fairness is pushed aside and ignored.

These experiments show that human behavior is much differentiated and indeed very personal, and that in a very large bandwidth. For the English political scientist and philosopher Thomas Hobbes (Hobbes 1658) *"Homo Homini Lupus"* and *"Homo Homini Deus"*[1] . For him both hold true. In between, there is probably still a lot of leeway.

However, at this point, let us briefly review the economic utility maximizer. Broader and generally, more useful is the concept of the utility optimizer, in which the economic benefit is just one of a number of other aspects that an individual considers and feels to be useful and beneficial. From mathematics, optimization problems are well-known. They typically consist of an objective function to be optimized, and a number of conditions that must be fulfilled simultaneously by any solution. The objective function consists of variables each of which has a weight. The conditions delimit the possible values for each variable; values of the variables outside these limits are not taken into account. A change of the conditions and/or a change of the weights of the variables in the objective function initiate changes in behavior. Typically, changes of the conditions have an external cause and changes in the weights an internal. So far, it is actually quite simple. For a phenomenology of the utility optimizer, this type of structure is very helpful.

Example

I want a bike, which I can ride in the woods as well as on the road and with which I can cope with upward slopes (objective function). Because of the upward slopes, it should have at least 18 gears and it should not cost more than 1000 € (conditions).

If utility in the objective function is strictly limited to the purely economic benefit, by definition, one ends up with the homo economicus. For the hedonist, the optimum utility is to achieve maximum pleasure (Kanitscheider 2011). In the Aristotelian tradition, exercising the cardinal virtues of wisdom, justice, fortitude, and temperance[2], augmented with faith, hope, and love in the Christian canon, enables the way to felicitousness and happiness. Modern people tend to define the optimum benefits as the best quality of life and connect with a good quality of life elements

[1] „Man is a wolf to his fellow man" and „man is a god to his fellow man."

[2] Aristotle: *Nikomachian Ethics*.

such as communication, cooperation, trust, diversity, health, and sustainable economic activity in and with the environment.

A generalized objective function thus depends on a number of variables, some of which have already been mentioned and economic utility is one of them. In addition, temporary Befindlichkeiten (see Sect. 2.3) and sensitivities may slip in, reflected in time-varying weights for the variables. Fashions, fads, and zeitgeist do the rest. The specific objective function of the utility and the conditions to be met are therefore highly individual, situational, and complex—"the complex man" (Carnall 1990).

This individuality of the objective functions would, however, imply the end of a general description of behavior, if not, consistent patterns were observed in communities of people. One such behavioral pattern is cooperation. Some authors, such as the biologist, mathematician, and Harvard professor Martin Novak even go so far as to raise cooperation to the same level as the basic evolutionary principles of mutation and selection (Nowak 2006a). They claim that cooperation is the secret why the outcome of the evolutionary process is effectively open (Nowak 2006b).

Cooperation is lived and can be found in all areas of life. Harvard Professor Yochai Benkler (Benkler 2011) (as a counterpoint to Dawkin's notion of selfish genes, Dawkins 1976) summarizes the results of his studies on cooperative behavior in which, about 30% generally pursue rational selfish motives, 50% present themselves cooperatively, and 20% behave this way or that way depending on the situation. The behavior of those who behave cooperatively is within a wide range, some are consistently and unconditionally cooperative, while others tit for tat. Elements of effective cooperation are communication, credibility, empathy, solidarity, fairness, reputation and reciprocity, as well as diversity. However, cooperativeness mainly depends on one element, namely the ability for communication that supports credibility and builds trust.

Cooperative behavior is observed across all cultures. It often shows up in dealing with public goods or commons, which refers to cultural and natural resources accessible to all members of a society. The Nobel laureate Elinor Ostrom (Ostrom 2011) has researched how people deal with commons and found that they very often behave cooperatively and with solidarity in the community. A very modern commons is the Internet. Without getting or expecting something in return, people here offer knowledge, expertise, and experience in the various social networks where all of us can participate.

However, the homo economicus certainly knows the concept of cooperation. When cooperation in a strict rational–egoistic sense is useful, he will cooperate. But, what if the pursuit of purely individual interests has negative consequences for the community? Even in such situations, a variety of experiments has shown that social, ethical, and moral considerations of fairness often determine people's behavior with an objective function that integrates social principles based on information about the system and the knowledge of the behavior of others.

Gunter Dueck describes an additional aspect. While in the optimization process ("seeking the best") the conditions and the objective function are fixed at a certain point of time, he describes a behavior, which he calls with some irony "Topimization". Topimization allows adapting the objective function in a way as to persevere

with the status quo ("declaring what is given to be the best"). For this, new variables can be introduced and given meaning, i.e., weights, which might completely and inappropriately distort the issues at hand (Dueck 2002).

Accordingly, human behavior plays a key role in business models that are built on cooperation with customers and partners. Cooperation always presumes that a common clear value base exists so that customers behave fairly, that partners are credible and to be trusted.

Trust is the subject of the story rumored by Henry Chesbrough (Chesbrough 2006b). Founded in 1987, the start-up company GO had developed the operating system PenPoint for pen-based computer products and had like many other startups, the problem that it had to cooperate with other companies (e.g., customers, suppliers) to develop applications for PenPoint, thus pushing the technology into the market. However, a partner could only be won if GO disclosed much of the proprietary technical concepts and developments for evaluation of the potential partner. A large software company whose main business is operating systems, showed interest in developing applications for PenPoint; GO laid open their plans and developments. A collaboration with this great software company would have meant a breakthrough in the market for GO. A few months after the negotiations with GO, the software company itself brought a pen-based operating system to the market, which ultimately pushed PenPoint and GO out of the market. Ironically, the development engineer who had accompanied the negotiations with GO is believed to have been the project leader of this development project. It was a strategic misjudgment of the leadership team of GO that the software company would develop applications for PenPoint.

Indeed, it was not taken into account that the business models of GO (operating system) and the software company (also operating system as the main business) were actually competing and not complementary as supposed. The excess of openness and shown trust eventually inflicted maximum damage to the company GO.

As if networked business models are not in themselves sufficiently complex and difficult to understand, the human component adds yet another dimension of complexity to the model and uncertainty to its implementation.

Even if the description is very difficult and hardly any reliable prediction possible, there is still hope. The reality is indeed here and present, and could not care less whether an apt description for it is found. And yet we find our ways in it. Hence, if one observes it with attentiveness and openness, one can detect changes when they are small and minor, and then one can decide whether one wants to accept or to oppose them, where one can assume in good faith that a majority of people is of good will, if one meets them with good will. Accepting and opposing are both legitimate decisions, and there are many options in between. Cybernetics pioneer Heinz von Foerster makes the point where he advises in his ethical imperative to "always act so as to increase the total number of choices (Von Förster 1985)."

Curiosity and the need for communication and cooperation of individuals characterize modern social developments. With technological developments, especially the Internet, all these can be lived up to and satisfied, in epic scale and with global reach. A kind of virtual cosmos emerged with its own laws and rules, in which, also

the individual can seek self-actualization to a degree that is impossible to achieve without these technical possibilities.

4.1.5 Business Model Innovation: Examples II

Where would Google and the other search engines be today if there were not a huge number of websites that they could skilfully search? Many of these websites contain information made available to all free of charge and without expecting an immediate return, and the search engines make sure that this information can be found. Business and private users browse for content in their particular area of interest, to satisfy their information needs and to provide themselves with the latest knowledge. Similarly, the increasing need to share one's own knowledge and network with like-minded people is met.

Would smart phones be just as successful if it were not for the many app developers producing applications for the terminals, which Apple's App Store or the Android Market then distribute—often free of charge?

In these virtual spaces, marketplaces emerge for the sale of products and services in which large and small retailers and service providers can offer their products to a wider clientele. The business potential lies in the opportunity to be globally present, the immediate direct contact with customers, the information and knowledge exchange, as well as the opportunities for suppliers to cooperate within and outside the virtual marketplace.

In the network, virtual communities form for socialization and exchange of views. Till present, passive and anonymous consumers become users, who find an identification in the communication forum because there they can actively communicate. They become thus potential customers, the suppliers can directly address. In the communities products are critically assessed. This has an extraordinary weight and significantly influences buying decisions, and then again gives valuable feedback to the supplier. The success of a virtual market place or of a community depends on how valuable, up-to-date, active, professional, and of course competitive, the offered contents are.

"**Local Motors—**Next generation American car company" (http://www.local-motors.com/) initiated an extremely exciting community. At Local Motors, it is all about cars. The thrill is that Local Motors has set the goal to fully develop cars in a community and then to manufacture locally in many so-called micro-factories—a complete concept from beginning to end. Local Motors organizes the Local Motors Forge community in which designers, engineers, car makers, supporters, and onlookers come together virtually, to, as they claim, design vehicles and technologies of the future. Anyone can help, "*to lead a revolution that will transform the automotive industry for good*."

In contrast to the conventional automobile business, Local Motors plans a national network of local units, the micro-factories, each of which can produce, distribute, and service customers supplied with parts and subsystems from a globally integrated network of suppliers. Overall, the headquarter taking care of process mi-

gration, procurement, and commonalities in the developments connects these local units. The community drives the design style, customer research, work opportunities, and the demand, thus enabling a strong customer-oriented process and design, but Local Motors retains the full licensing rights.

Local Motors wants to license a lightweight chassis for highest safety requirements, which can be produced profitably at 2000 units per year. The community creates the designs, in which highly qualified designers from everywhere get involved in improving design and introducing innovative elements fitting the chassis selected. Suppliers supply the Local Motors micro-factory just-in-time with the necessary parts and subsystems. The Local Motors micro-factory supposedly requires only 20 people for assembly, test, and distribution of cars. Using new lightweight material combinations, achieves this efficiency allowing the producibility in small volumes at distributed locations close to the customer. Implementing this process innovation enables to adapt and deploy the latest drive technologies. The "Rally Fighter" is the first car of Local Motors (http://www.rallyfighter.com/).

The core values of Local Motors are: **Must-Have-Products**. With a pursuit of both form and function, to build and license a distinctive, pleasing, and functional product for individual mobility. This differentiation will require a higher price. Building a true **community** of car owners, in which not only transport matters, but it is also about enjoying their freedom. A deeper relationship with the owner naturally increases the resale value and brand loyalty, which in turn results in **profit**. The reduction of particle and carbon emissions as well as noise protects the **environment**. Better impact protection and maneuverability when driving increases **safety**. **Seducing simplicity** with everything you dreamed of, but no more. **Customer first**—he is respected, to be delighted, and his expectations are exceeded with the operational efficiency of a local production, sales, and service model.

The company **Threadless** (http://www.threadless.com/) is a T-shirt manufacturer, where the community members contribute T-shirt designs. Threadless introduces and presents the designs, and the community votes on them. When a design is selected, the designer will participate in the proceeds with a lump sum as well as a percentage of the T-shirt revenues. Thus, Threadless reaches a steady inflow of new designs. Customers also participate directly in the product development process with their designs and their votes.

This results in a variety of community based e-business model approaches where the German Fraunhofer Institute for Industrial Engineering (IAO) distinguishes five different types based to their funding:

1. Business transactions are settled within the community (bazaar)
2. Community members are specifically addressed with advertisement
3. Membership fees (club)
4. Services of organizations are offered as additional incentive and to attract new customers (service) and
5. Organizations maintain their image (patronage).

Regardless of their funding, all e-business enterprises have in common that they need to deliver high-quality content and information to ensure the attractiveness of the community, which is often associated with significant costs. One will need qualified employees who develop, maintain, evaluate, and administer content. In addition, it must be ensured that community members can easily contribute. The community must be managed seriously and without "censorship" to create a foundation of trust, which is ultimately the essence for the loyalty of the community members. Then the community can trade specific content and/or products. Noncommercial communities and e-businesses may very well agreeably coexist and sometimes even complement each other. The implementation of a business model requires skill and care in selecting the application area and the target groups to be addressed, as well as a long breath in financial terms. Communities do not form overnight.

Based on human curiosity, readiness to communicate and to cooperate, which to live up to is only possibly applying modern information and communication technologies, opens up many new ways of working in an organization. For instance, the business division thermo-technology of Bosch has developed an application for a smartphone, which now makes it possible to control the heating from your smartphone. In itself, this is not a particularly spectacular development, but the interesting thing about this development is that every Bosch employee has been invited to participate in the development. They did not have to be thermo engineers, but they could also be experts from packaging machinery or diesel injection systems. The team has given themselves a structure and developed a new product within a short period of time, which is now also offered in the market[3].

What applies to cooperation in an organization, also applies "cum grano salis"—with a grain of salt—to cooperate between organizations.

4.2 Business Models: Concepts and Contexts

Against the background of the marketing of innovation, business models have gained fundamental importance—whoever is innovative today, has his business model aligned to it. A business model is, as the name suggests, a model, a description, and simplistic as such. Therefore, the model must not necessarily coincide with the reality encountered during analysis or introduction. But first, the concepts used are presented.

4.2.1 Value Creation

Value creation is a key concept that comes up repeatedly in connection with business models and forms the basis of its understanding. Value creation is the result

[3] Interview with Wolfgang Malchow, Human Resource Director at Bosch, Stuttgarter Zeitung, 14.10.2011.

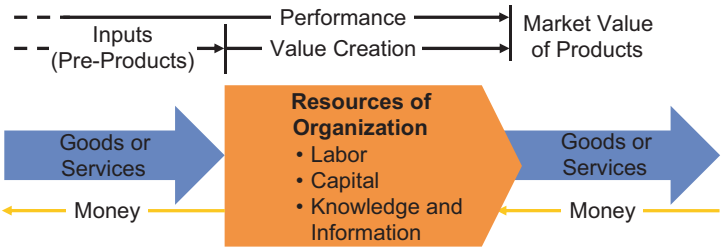

Fig. 4.7 Value creation. (Source: Bernd X. Weis)

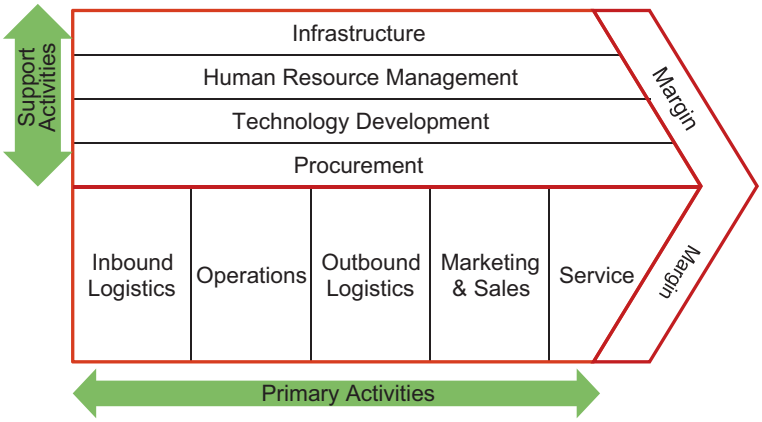

Fig. 4.8 Value creation chain according to M. Porter. (Source: Bernd X. Weis)

obtained by an organization using corporate resources such as labor, capital, knowledge, and information.

- **Value creation** is the market value of the product (good or service), called performance, less the value of the inputs (pre-products). Inputs are purchased goods and services consumed in the production process of goods or services as e.g. supplied materials and related services (see Fig. 4.7).

Michael Porter coined the concept of the value creation chain or value chain in his book "Competitive Advantage" (Porter 1985). Porter differentiates in his central model between primary activities and support activities. The primary activities contribute directly to value creation, support activities ensure that the primary activities are executed smoothly. Figure 4.8 shows the individual functions.

The functions listed are corporate resources and therefore associated with expenditures. The margin is the price realized for the product minus the resources used, and contributes to the organization's profit.

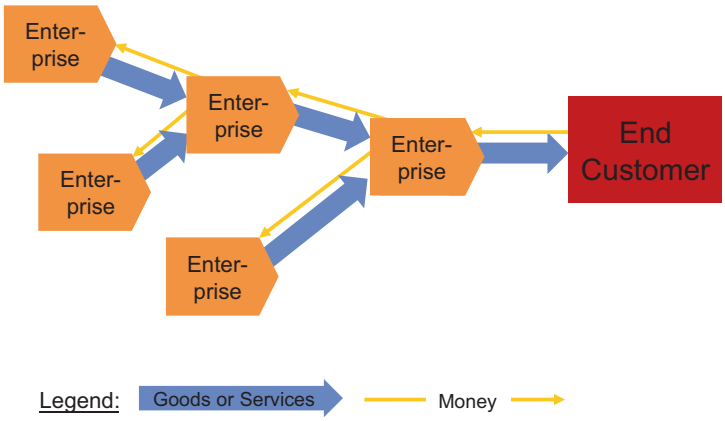

Fig. 4.9 Tree-like (arboreal) value creation structure. (Source: Bernd X. Weis)

In traditional industries, the value creation process is almost strictly tree-like (arboreal) (see Fig. 4.9). Raw materials, intermediate products, or other inputs are refined and offered to the customer for purchase, accompanied by marketing and sales activities. The roles of the individual business partners are clearly outlined and immediately obvious, the goods and money flows are straightforward and transparent. In these well-attuned industries, organizations differ very little in the way they do business.

These value creation chains mainly aim to support the analysis of the value-creating functions. They model the business processes and enable insights where improvement potentials are concealed and by which means these could be actuated.

However, the situation is different in the new economy. Here, the value creation is no longer structured arboreal and tree-like, but in a network of closely related and cooperating organizations. The organizations involved in value creation are then highly cross-linked and the flow of goods/services as well as cash are no longer linearly and clearly coupled, as shown in Fig. 4.10.

The example of the search engine illustrates this. Everyone uses the search engines. If in any arbitrary context a question that cannot be answered right away emerges, then the first impulse is to go and google and usually that will provide an answer to the question. If one looks for a new vehicle, property, a lawn mower, one googles the appropriate keywords and the suitable services appear. Search engines provide the requester a free benefit. This immense usefulness of search engines becomes also evident in that for this type of information acquisition a new verb has prevailed—"to google."

If services are provided free of charge, the question arises, how one can make money. Search engines like Google, Yahoo, and Microsoft (Bing) make their income with advertising, a very special kind of advertising that no longer has much in common with what advertising commonly implied. The customers—typically businesses—pay to make sure that the search engines place their offers favorably in

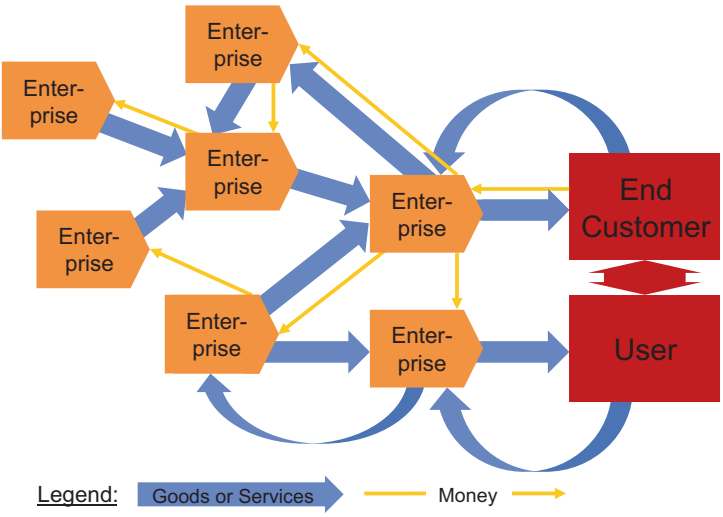

Fig. 4.10 Networked value creation structure. (Source: Bernd X. Weis)

the search results, from which one clicks to their websites. Many business models are based on this concept.

It is important that these business models distinguish customers and users. The user googles, the customer buys, where customer and user can be different persons but can also be one and the same person. It is obvious that buying decisions of customers largely depend on the googled results—and for that, businesses pay a contribution to the search engine provider. The success of these companies, especially of Google, shows that these business models can be viable and very successful.

4.2.2 What is a Business Model?

The example above shows that business processes can reach a level of complexity that makes an intuitive understanding of the relationships impossible. By appropriate abstractions and simplifications, business models pragmatically provide transparency and communicability and quickly allow an overview of the relevant information.

- A **business model** is a comprehensive *holistic* description, with whom, with what and how the organization earns or intends to earn an income. The purpose of the business model is to make the way the business is done or should be done, respectively, transparent and easy to communicate, so that outsiders can understand

it. Organizations can simultaneously implement and successfully operate multiple business models.

The applications of business models are manifold. For example, business models are mandatory when it comes to raising funds for the business. When it comes to innovation, investors, bankers, and venture capital groups usually want to see a business model so that they can assess the chances of success for their credit or investment funds.

In the above definition of a business model, the issues that it should address, are not explicitly listed. A typical business model comprises three elements:

- The value proposition for customers and business partners (answer to the questions "with whom," "with what" and "why")
- The description of the architecture of value creation, i.e., how the proposed utility is created (answer to the question "how"), and
- The description of the income model, i.e., whereby the income is achieved (response to the question "whereby").

The **value proposition** is the key element of a business model. With the value proposition, the organization communicates to its customers and business partners, what benefits and values it generates and with which activities and services these are provided. The value proposition includes a description of what is useful and beneficial as well as of what is of value and meaning to the customer. According to Neil Rackham (Rackham 1988; Rackham and De Vincentis 1999) a value proposition contains

- The possible applications, who benefits how and on what occasions
- The effects, how the benefit or value is experienced, i.e., how the benefit concretely manifests, how and where differences are observed and noticed, also to differentiate from competing offers
- The evidence that promises are kept by offering references that support the above, such as already successfully completed projects
- The costs incurred when experiencing the benefits and/or utility.

It is easily noticed that the value proposition makes only little reference to the corresponding products of the organization—and this is so intended. For the end customer, the product offered does not define the value proposition, but only—customer centered—the value of the benefits and utility, the satisfaction of needs, desires and aspirations. For business partners being part of the value creation, e.g., suppliers, buyers, and customers the value proposition contains the benefits and utility for an organization as a business partner. The reference to customers' or partners' benefits and utility focuses the business value creation processes on what is really necessary in accordance with the value proposition.

Because of this focus, the value proposition is of highest strategic importance for the organization and determines largely the processes the organization implements. However, the organization does not need to communicate the value proposition as described here to the outside world.

The **architecture of value creation** outlines the means generating the benefits and utility. As mentioned previously, the business models of today go far beyond what is usual in the traditional enterprise. By networking the contributing organizations, by in a sense decoupling the provision of goods and/or services from the cash flow and by including customers in value creation, a complex system of relationships—the value system—emerges that is no longer obvious and easily comprehensible. This underlines how important it is to describe the value creation system on a high level of abstraction—namely its architecture.

The architecture of value creation includes a

- Description of the final product and the network in which the final product is produced and in which the organization contributes to the final product
- Description of how the customer will acquire the benefits and utility, i.e., the way in which they purchase and make use of the benefits and utility
- Description of the corresponding product of the organization with the relevant facets such as prices, competitive products
- Description of pre-products and services, and how and by which network partner they are sourced and provided
- Description of the required in-house resources (capital, labor, knowledge, and information)

In contrast to the value proposition, the value creation architecture refers specifically to the product and to its production. The final product yields the specific benefits and utility. The organization under consideration contributes with its own product that can be the final product itself or a pre-product needed to produce the final product.

The **income model** outlines the way to earn the income. The company expects an adequate income for providing the goods and/or services. Ultimately, the description of how and from which sources the income is earned is the reversal of what the value creation architecture describes above, and it is important to note that cash flows and flows of goods and/or services are not necessarily collinear.

Apart from the classical process—customer buys product and pays for it—more opportunities for organizations supported by e-commerce technologies arise to tap additional revenue sources such as subscription fees, advertising revenues, sponsor contributions, and income from transactions (direct sales, transaction fees, commissions, sales commission, (Stähler 2001)). These income sources are not new and actually already known in the traditional economy. The fundamental differences are that customer approach and addressing are targeted directly, and that the scope, the number of persons addressed, is very large and the costs are comparatively low.

A fundamental distinction between the income models according to Wirtz (Wirtz 2011) is shown in Fig. 4.11 with examples of modern new economy enterprises. Always from the enterprises' perspective, the model differentiates direct or indirect, transaction-dependent or transaction-independent income generation.

Of these generic income models, the one the organization has implemented can be composed. The income model and the cost determine the enterprise's value creation.

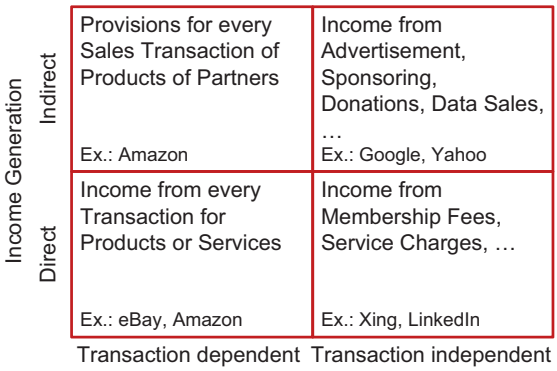

Fig. 4.11 Generic income models. (Source: Bernd X. Weis)

The income model includes:

- Description of the cash flows in the network of partners involved
- For each enterprise in the network, a description of the shares of the cash flows that remain to cover costs and for margins.

In addition to the cash flows for goods and/or services provided, cash flows from financing activities of the organization (equity, loan capital, bank loans, support services) can optionally be considered.

4.2.3 Limiting the Business Model

From the previous arguments, it is clear that there is huge leeway when developing a business model. If one pursues the question of what the final product really is, one discovers that it is possible to define the boundaries of the value creation system in different ways.

As it is often the case when describing not-evident relationships the motto "less is more" applies also to the description of business models. This hint is to be taken seriously, because, as it was already explicated previously, a business model can eventually show a considerable degree of complexity with its variety of relationships, option, and possibilities. Therefore, abstractions and reductions are absolutely necessary and they help developing a holistic understanding of the processes and relationships and not getting lost in the details.

However, abstracting too much, the knowledge and insights gained are limited and remind, when explicitly formulated, more of platitudes and superficial arbitrariness. Reducing too much, essential factors are not regarded and thus not included in the considerations. In both cases, there is a danger that changes in the environment are not sufficiently perceived, be it with respect to impact or time. Therefore, Einstein's bon mot is more than appropriate here: "*as simple as possible, but not simpler*."

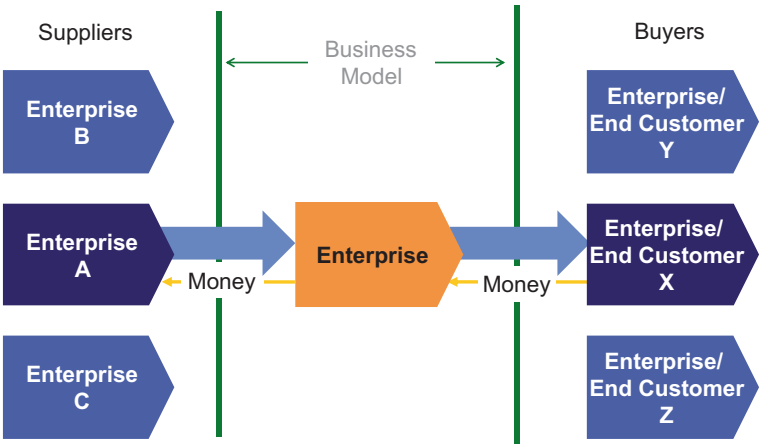

Fig. 4.12 Boundaries of business model according to interchangeability criterion. (Source: Bernd X. Weis)

The factors affecting the business model are partners, customers, suppliers, and buyers. It is a task of strategic importance for the organization to decide which factors are to be included directly in the business model due to their relevance and which are likely to be only peripherally involved. When too many are considered, it is no longer tractable because too many intensive relationships need to be managed. Considering too few, one might lose influence on a relevant business partner by not giving enough attention and not attributing the significance necessary. Pragmatically, fulfilling the intended purpose defines the boundaries of the business model. Additionally, it should be ensured that the business model offers the possibility to adapt by simple means.

A criterion for determining the organizations or relationships essential for the business model is interchangeability.

- **Interchangeability:** Is a business relationship in a business model designed in such a way that other organizations could take over this business relationship quickly, easily, economically and without much effort, the business partner is interchangeable.

This means that the interface—i.e., the processes for deliveries and payments, the communication relationships—between organizations is exactly defined, or at least can be described exactly. According to the interchangeability criterion, this organization must not be explicitly itemized in the business model (see Fig. 4.12); a description of the interface suffices. These interfaces between companies thus form the almost "natural" boundaries of the business model.

When defining a business model it can be helpful to typify the various factors. A typology could be a distinction between partners, customers, suppliers, or buyers.

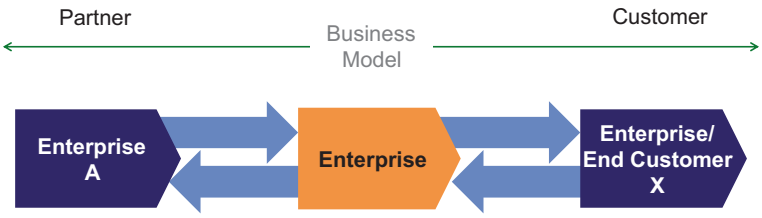

Fig. 4.13 Partner relations. (Source: Bernd X. Weis)

Here, those that are interchangeable in the business process in the sense mentioned above are called **suppliers and buyers** (see Fig. 4.12). These are on the one hand, e.g., suppliers of pre-products with low differentiation and which are also available on the market from other companies, or on the other hand traders who sell the products in addition to a variety of other products.

The relations with **partners and customers** shape and determine the course of business. For, if one takes partnership seriously and considers it a closer business relationship in which each partnering organization influences also the internal business processes, then these corporate partnerships need to be directly included in the business model. With them, the business models are coordinated, e.g., through joint developments and harmonized development and marketing plans. Financial risks are often shared through mutual shareholdings. The same holds true when customers become actively involved in the business process. The customers can, for example, directly participate in the design process of a product and thus secure a share of the exploitation rights of the product for themselves. Hence, the parties are tied to each other, they expose themselves to a certain dependence, and interchangeability is no longer given. Figure 4.13 depicts these relationships.

From these arguments follows that—just as with innovations—closed and open business models can be distinguished.

► **Closed business models** are business models in which the relationships are largely built on interchangeability, i.e., the relationships are supplier and buyer relationships. In contrast, the relationships in *open business models* are largely built on partnerships, i.e., the relationships are business partner and customer relationships.

Closed business models have the advantage that the organization itself generates the key differentiators for the organization's products in the environment where processes and procedures are defined and attuned. Thus, the organization can actively place innovation as well as initiate and bring about market changes. Their disadvantage is that they can possibly react rather sluggishly to outside changes.

Flexibility and adaptability characterize open business models (Chesbrough 2006a). Networks have an inherent dynamic that firstly encourages innovation and secondly allows a quick response to the changes. The disadvantages, however, are

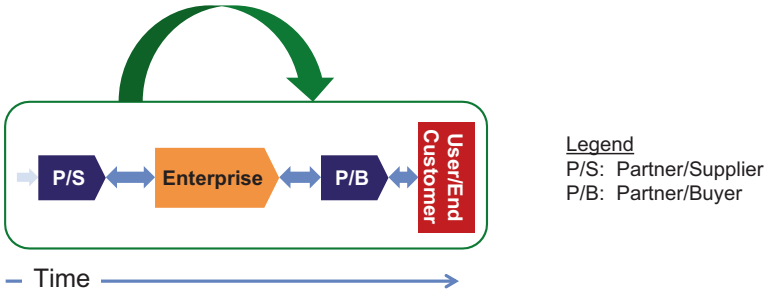

Fig. 4.14 Business model for increase in efficiency. (Source: Bernd X. Weis)

the mutual dependencies based on trusting relations and the resulting transaction costs.

4.2.4 Target and Time References of the Business Model

For business models, there are three basic references in goal and time:

1. The business model **refers to the present** and describes how the business operates, with the goal to uncover optimization potential and to identify potential weaknesses in process efficiency.
2. The business model is **future oriented** and describes how, based on an established business model, the business should **transform**, with the objective to improve customer relationship and process effectiveness, and/or a concentration on the core business.
3. The business model is **future oriented** and describes how a new business should **look like**, with the goal to place an innovation or an existing product new in the market with efficient and effective processes. The business model is designed new on the "green field."

The first case leaves little scope for design; structure and conditions just are as they are (see Fig. 4.14).

Nevertheless, the relations in the given structure can be evaluated in different ways that can lead to quite meaningful and interesting questions:

- What happens if we integrate supplier A more in our processes?
- What would happen if we terminate the close relationship with supply partner B and procure on the free market?

Just from raising these issues, already many extensions of the options for action result for the organizations involved.

In the second case, a modified business model evolves from an existing business model. Figure 4.15 outlines two strategic options. In the first option, the organization opens up and coalesces in a partnership with other organizations aiming to

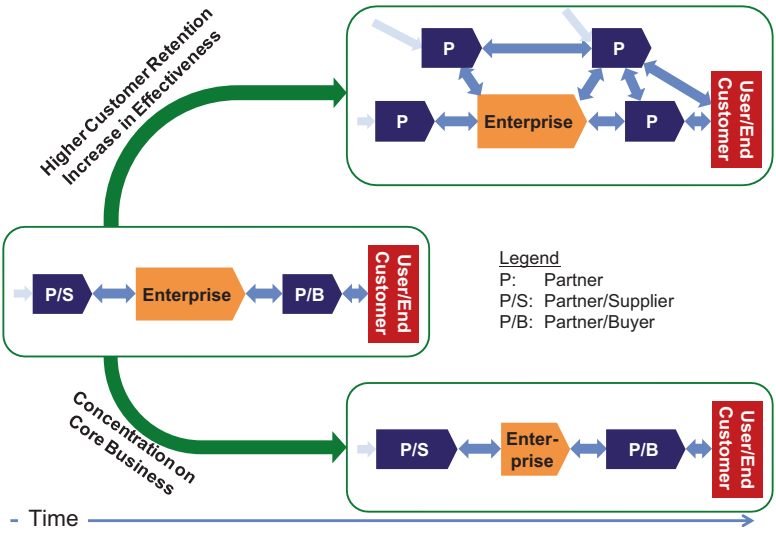

Fig. 4.15 Transformation of a business model. (Source: Bernd X. Weis)

serve the customers better and to align the processes more effectively. In the other, the organization focuses on its core business, reduces the dependencies on other organizations, thereby optimizing its own value chain. In both cases, the existing business model sets more or less extensive limits to the design options for the new business model.

Many reasons and causes make a transformation of existing business models necessary. For example, new strategic decisions in the organization require greater involvement of partners. The availability of new technologies that would bring great benefits to the organization often enforces a partnership with organizations that master this technology. Similarly, changes in the environment, for example, by changes in regulations or legislation may require an adjustment of the business model.

The third case is the most exciting one; if the business model can be designed on the "green field" so to speak, then the term architecture is really appropriate because the designer is quite free to design the structure and relationships, which determine the business (see Fig. 4.16).

This case is examined in more detail further.

4.2.5 Innovation Potential

With a business model, either brand new or not previously deployed in the considered industry, one may surprise customers, market, and competitors alike. An

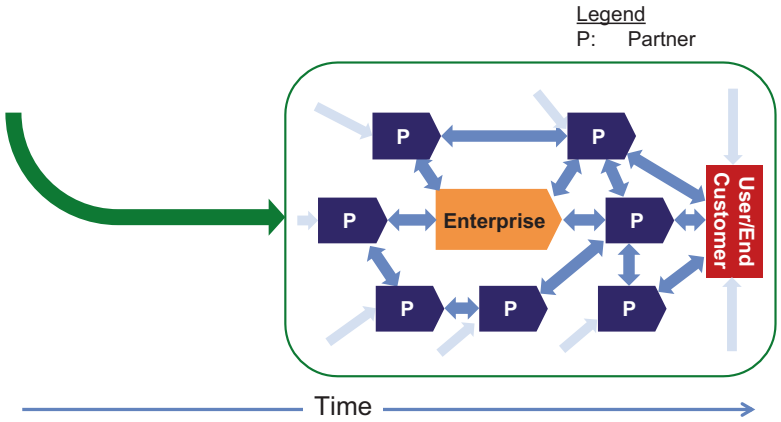

Fig. 4.16 An entirely new business model. (Source: Bernd X. Weis)

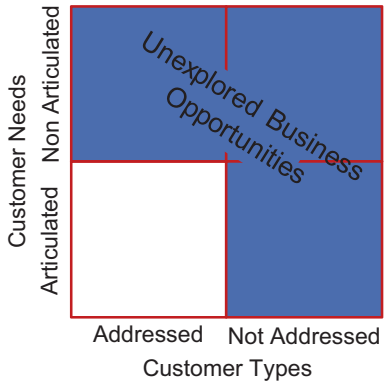

Fig. 4.17 Unexplored business opportunities (according to Hamel and Prahalad). (Source: Bernd X. Weis)

unorthodox and skilful combination of products and marketing addresses up to now untapped needs, approaches and opens up new avenues to customers (see Fig. 4.17). Gary Hamel and C.K. Prahalad (Hamel and Prahalad 1994) have discussed this at length, and they have put a strong focus on the core competencies of an organization from which new markets are developed. With their Blue Ocean strategy, W. Chan Kim and Renée Mauborgne explore a similar approach (Kim and Mauborgne 2005; Kotler and Keller 2009).

However, to develop such an innovative business model can also be very tricky. Since it is brand new, there are no experiences, whether it is at all viable and feasible. However, if it is viable as hoped and expected, then there is a good chance to generate substantial revenues and high profits.

The starting point are the customers and their benefits and utility. Benefit innovations or utility innovations produce a previously unattainable benefit and/or utility for customers. Benefit innovations not only aim at the satisfaction of needs, which

up to now could not be satisfied, e.g., at the desired price, but especially they also pertain to satisfy latent needs. This effects those new markets.

The next step is to develop ideas and concepts, how the expectations raised in the value proposition are to be met. This will identify what basic tasks are included in the business model and how these tasks are assigned to the various participating partners. This is the architecture of the business model. Innovations of business model architecture comprise innovative communication and distribution channels, payment models, or the commercialization of customers' designs and proposals. Skillful use of modern information and communication technologies enables innovations in coordination. In this process, the organization has to clarify what competences and abilities it has to offer, and what contributions and performance levels it wants to provide. This then results in the competences and abilities as well as the performances and contributions that partners need to render.

To complete the architecture, it is demonstrated what customers have to pay, how this money flows in the network and how the organizations involved incur their share of revenues. The novel combination of innovative sources of revenue characterizes income model innovations.

In the first draft of a business model, these interfaces cannot be clarified in all the details necessary. Nevertheless, one should not be deterred from this. It is sufficient and often unavoidable to operate with assumptions and estimates in the early stages of business model development. The important thing is that with these questions, aspects of the business model are addressed, which otherwise easily escape attention. Even in this early stage, some plausibility considerations can be added.

In this process, three aspects should not be neglected: growth, competition, political and societal conditions.

Growth: Especially in the initial phase, the business must grow, and the business model must be aligned to this. In particular, the business model should also function and remain valid if more customers are served and the addressed customer groups become more heterogeneous.

Competition: Even a new business model does not mean that the customer need is not satisfied otherwise. Lucky those, who have awakened a latent need of customers and therefore do not have to deal with competitors, at least not in the initial phase. Otherwise, one has to face competitors and their reactions, adding an extra level of complexity.

Political and Social Environment: The business should fit in and comply with the given political and social environment.

In Fig. 4.18, the topics to be addressed are outlined. During the process in which these questions are clarified and eventually answered, the architecture, the structure of the business model, develops. It is important to realize that changes on a small scale always entail changes on the large scale due to the holistic nature of the business model.

Now, based on these considerations, the business model can specified with greater accuracy.

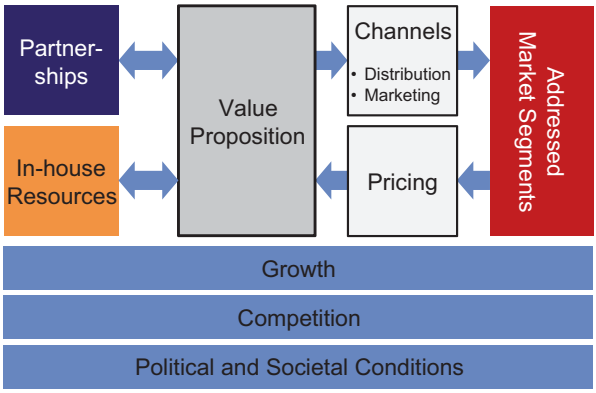

Fig. 4.18 Business model changes: topics to address. (Source: Bernd X. Weis)

4.2.6 Develop the Business Model

In the first step of developing a business model, performance (and later on, the motivation to perform) of your organization in terms of this specific business is determined in more detail. In a first shot the most obvious and also the easiest to determine boundary of the business model is the one that is directly related to the organization itself, as shown in Fig. 4.19.

For the evaluation of the organization's internal information, the designer of the business model has easy, mostly immediate access to the relevant corporate data, the organization and the processes implemented, and the decision-makers in the organization are generally known.

Depending on the nature of the business relations to other organizations in terms of interchangeability, other organizations have to be included in the business model. In the architecture exercise, the structure and the required competences and abilities have already been determined. Now these need to be substantiated and put in real terms how potential partnerships should be designed. These terms are clarified in cooperation and dialogue with potential partners. This is to make sure that the partners really perform as envisaged and have the appropriate resources available.

Usually there is one protagonist, who is convinced of the idea and wants to implement the business model, and a number of potential partners, who support him, and for whom roles in the business model are foreseen. Because of the necessary arrangements, the clarification of issues and inconsistencies, this is an iterative process which often has to be performed several times. In this process, both the structure of the network and the content of the interfaces may change and eventually converge or adapt to the needs of the organization's partners.

Once the performance requirements of the own organization and those to be provided by this network of partners are determined in sufficient accuracy, an implementation of the business model as shown in Fig. 4.20 can be attempted. For this, the partners negotiate binding agreements secured by contract.

A characteristic of a networked business model is that it relies on the integrity of all parties involved. The partners have to encounter each other with mutual

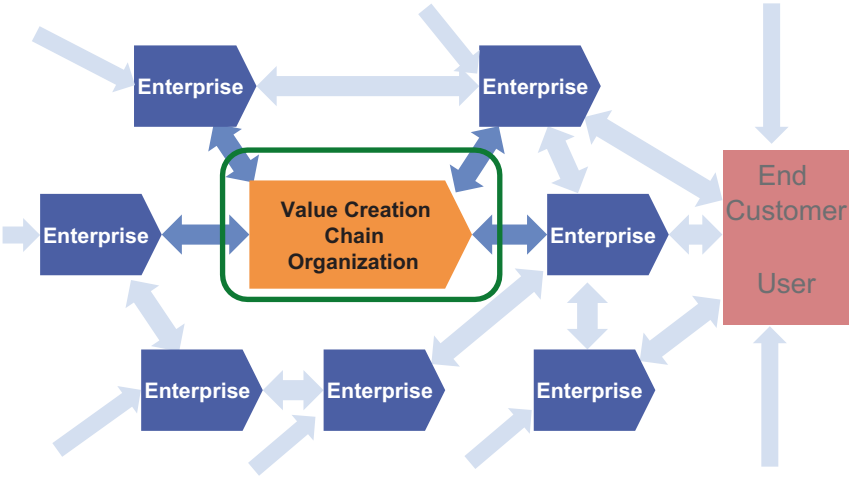

Fig. 4.19 Boundary: own organization. (Source: Bernd X. Weis)

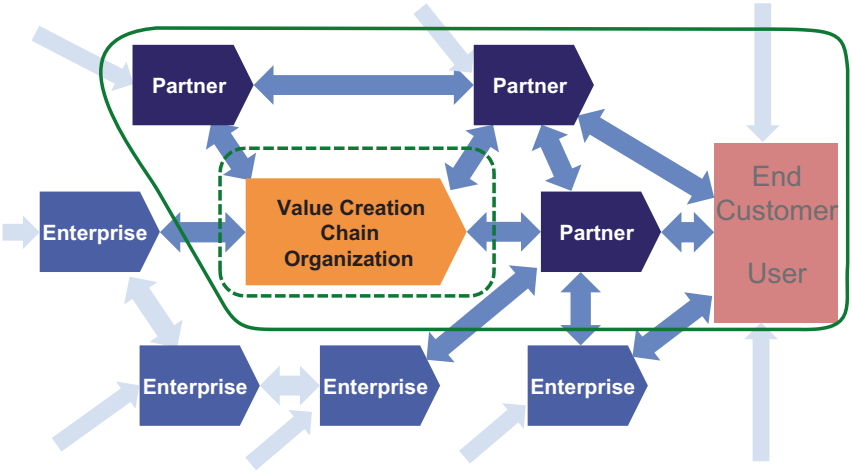

Fig. 4.20 System boundary of business relations. (Source: Bernd X. Weis)

trust, and this in many ways. Disclosing ideas, concepts, and technologies require respecting the intellectual property of others. Strategy and planning documents as well as structures to value creation and costs are strictly confidential.

At first glance, this concept of an open business model appears contourless and in a continuous flow. In return, however, the organization can embed itself in a network of relationships, in which it has invested a lot to build and which is therefore highly valued—these are precious relationships. While it is comparably easy for a competitor to replicate the value chain of a single company with investments

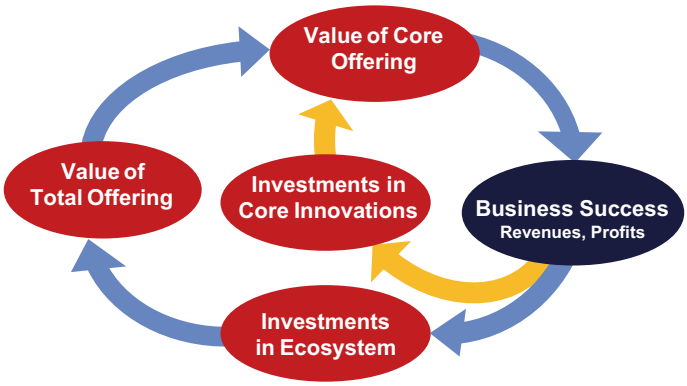

Fig. 4.21 Inner and outer investment circle. (Source: Bernd X. Weis)

in technologies, production facilities, and personnel, it is much more difficult to compete with such an ecosystem that has formed and evolved over time. Members of a performing ecosystem that is nourished and cherished are reluctant to abandon this for another. These considerations result in an inner and an outer investment circle as shown in Fig. 4.21. The inner circle ensures and preserves the individual competitiveness of the organization through innovation, keeping an attractive core offering. The external investment circle increases the attractiveness of the total offering of the ecosystem, and thus—in a kind of feedback—the attractiveness of the organization's core offering (Moore 1996).

Within the network, there is a continuous flow of data, information, goods, and services between the parties. In the ecosystem, results are controlled rather than processes, which has advantages in management, particularly in relation to the management effort required (Davidow and Malone 1993).

4.2.7 Intellectual Property (IP)

The design of the networked business model in dialogue with potential partners requires openness about own strategies and plans. Many creative ideas, designs, technologies, and concepts are disclosed unprotected in these dialogues, whether in presentations, videos, e-mails, or other forms of communication. The danger here is that one's own ideas and concepts are copied and are possibly implemented somewhere else. For the organizations involved, it is therefore always a balancing act between openness and reticence. If the organizations divulge too much, the protection of their own interests is jeopardized, which is very dangerous, especially for a small organization that builds its existence mainly on one single concept. If they disclose too little, meaningful work is hampered and the realization of the business model is at risk, which may be just as dangerous for small businesses.

The conventional procedures with which companies secure IP are:

- Registration of patents or, if appropriate, industrial designs, trademarks
- Deposit of evidence to secure copyright
- Non-disclosure agreements and contracts.

The importance of patents is primarily to protect innovative products and processes from unwanted copying. Patents reward their applicants through the grant of a temporary and spatially limited monopoly of use. At the same time with the disclosure of the invention, it assumes an important information function as a kind of incentive for further innovation. The patent owner can exploit the invention himself and secure an exclusive positioning in the market, or he can sell the patent or grant licenses. The patent portfolio of an organization is an important asset. Patents also play an important role in technology transfer. They can attract partners for further development and entrepreneurial cooperation, or even be expedient to raise funds (Patent- und Markenamt 2011, http://www.dpma.de/patent/patentschutz/index.html).

Copyrighted works must be personal intellectual creations. Contrary to patent or trademark, a copyright cannot be registered officially. In order to prove objectively the authorship in case of legal disputes, proof in form of documents, models, samples, etc., is deposited with a lawyer or notary, so that authorship from the filing date onward can be verified. Moreover, this can be done via the Internet through depositing files in digital form with a suitable provider. The deposition and the issue of certificates usually incur some cost.

Non-disclosure agreements bind the parties not to disclose to third parties the issues defined in the agreement, the negotiations and their results, and accordingly to handle and store sensitive and confidential documents. When closing a non-disclosure agreement, typically no charges apply.

This list does not claim to be exhaustive. In the specific case, it is absolutely necessary to seek competent legal advice.

4.2.8 More on Business Model Innovation

If one has developed an innovative business model, there is a chance, to generate a good income and good profits with it. But there are also dissenting opinions that claim that fast imitators have a better chance. This is essentially justified as follows: smaller organizations often develop innovative business models. However, they eventually run prematurely out of resources to lead the innovation to success. Fast imitators can dwell on prepared ground and thus, be at an advantage if the innovator due to insufficient resources shows weaknesses. Peter F. Drucker (Drucker 1992) brought attention to the fact that liquidity constraints often cause more damage than limited profits. Often with limited profits, unprofitable or outdated business areas are disposed of. In a liquidity crisis, however, it is the “family silver”—the most viable, seminal and promising areas—that is sold because this way financial resources can be restored fastest and easiest.

4.3 *Business Models: Tools*

4.3.1 Purpose of a Business Model

The description of a business model should closely follow two questions:

- What purposes should the business model serve?
- In which context is it used?

It makes in fact a difference whether the business model is communicated internally or externally and whether it is intended

- To reveal improvement potential for individual processes and relationships with the business model
- To check the business model whether it is still adequate for the business or whether a different business model would fit better in the changing economic structures
- To persuade an investor or a bank for financing the business
- …

First, the purpose of the business model and the benefits one intends to draw therefrom are defined. Then it becomes clear at what depth and in what detail the business model needs to be described. Table 4.1 and 4.2 list a few important applications for business models and the required level of detail of description.

Table 4.1 Details of a business model for internal communication

Internal communication				
Purpose	Benefit	Business model detail		
Existing business model		*Value propo.*	*Architecture*	*Income*
Uncover potentials for improvement	Resources for the implementation of improved value creation	Sketch	Sketch	Sketch
Uncover renewal potential of the business model	Resources for the implementation of renewed business model	Sketch	Sketch	Sketch
Improve/renew business model	Implemented improved/renewed business model	Elaboration	Elaboration	Elaboration
New business model		*Value prop.*	*Architecture*	*Income*
Present first ideas	Resources for further investigations	Sketch	Plausibility	Plausibility
Design new business model	Resources for the implementation of new business model	Elaboration	Sketch	Sketch
Implement new business model	New business model	Elaboration	Elaboration	Elaboration

Table 4.2 Details of a business model for external communication

External communication				
Purpose	Benefit	Business model detail		
		Value proposition	*Architecture*	*Income*
Build network of corporate partners and customers	Partner network	Elaboration	Elaboration	Elaboration
Acquire funds for implementation	Financing	Elaboration	Elaboration	Elaboration

If potential improvements are revealed, a closer examination of the areas in which they are suspected is certainly indicated. In the other cases the structure of the business model and the interaction of the participants are important.

4.3.2 Questionnaires Business Models

Need for renewal of an existing business model (Table 4.3) according to Johnson, Christensen and Kagermann (Johnson et al. 2008).

Changing a business model is awkward, and yet it is necessary to review now and again the business model with respect to its usability, particularly if the market shows imminent signs such as new competitors.

Value Proposition (Table 4.4)
The value proposition describes the offer to the customer as well as how and why the offer addresses his needs or fulfils his task.

Value Creation Architecture (Table 4.5)
The value architecture describes how the value proposition is fulfilled with own and partner contributions, i.e., how the benefits will be generated as well as communicated and provided to the customer.

Table 4.3 Need for renewal of an existing business model

What made the current business model successful? Which customer benefits are generated? Were profits made based on the model?
What evidence is there to check the validity of the business model?
How can the customer benefit can be improved by re-orientation of services?
Are there opportunities coming up to address new customer groups?
Which of the technologies deployed can conveniently be used in other markets? Which new technologies make sense? Can they be used effectively?
Are there new aggressive competitors emerging?
How are new competitive constellations reacted to?
What benefit would it have to revise the business model fundamentally? It is only worthwhile if a significant competitive advantage is created

Table 4.4 Value proposition

How would the customers themselves describe their benefits?
How much does the customer value this benefit?
Which features, which do not provide the customer with the appropriate benefit, can be eliminated or simplified?
Which features can be improved or newly introduced, providing the customer with a corresponding benefit?
Which products—i.e., products or services—are offered to customers, if appropriate, first as an idea, a concept, a model or a prototype?
Which customer groups are addressed?
What are the sizes of the target groups and how will they develop?
How are customers addressed?
Should customers ever be involved in the product development process, and if so, how?
Points to ponder
Which parts of the offer can be omitted without reducing the customer benefit?
Which "specialties" can be replaced by standard elements and used for the offer?
Can the offer be placed more quickly on the market? Would the customers reward this?
What other groups of customers with similar needs are there?
Which sub-group of passionate potential first-time users of the offer are there which can be addressed at the outset?

A graphical representation of value creation architecture is always quite handy (see Fig. 4.22).

Generating Income (Table 4.6)
Fulfilling the value proposition generates an income.

Growth, Competition, Political and Societal Conditions (Table 4.7, 4.8, and 4.9)
The business needs to grow, especially in the initial phase of a new business model. Almost all the time the organization operates in a competitive environment. The business should fit in the given political and societal environment.

Relationship Between Organizations (Table 4.10)
The organization has relationships with other organizations in various functions such as suppliers, customers, partners, and licensees.

Relationship Between Organization and Customers (Table 4.11)
The organization has relationships with customers.

4.3.3 Plausibility Check of Business Model

Whether the business model is plausible, is easily checked with the following formula.

$$\textbf{Profits} = \textbf{Revenues} - \textbf{Costs}$$

Table 4.5 Value creation architecture

What competencies and capabilities does the organization have to offer?
What other skills and capabilities, missing or complementary to the own, are necessary to successfully place the products?
What efforts and contributions to the products does the organization provide with the existing competences?
What efforts and contributions to the products, the organization considers as core competence and wants to learn itself or acquire from outside?
What efforts and contributions to the products do partners deliver?
Through which channels will the customer be addressed?
Through which channels will the customer receive the products?
With which partnerships can the channels be served optimally?
How could the network look like, which accommodates the business relations?
How does the organization want to shape possible partnerships?
Through which channels are the products/services of the partners acquired?
Who are the potential partners that have the necessary skills, capabilities and resources?
Are these potential partners interested in cooperating?
What is the cost for the organization to be in the network?
Points to ponder
What are the costs for the initial development of the products and what for marketing and distribution?
What are the options to finance these costs from the current revenues?
What options of risk sharing are viable with the partners? Eventually for a share in future profits
What opportunities are there to serve the market as quickly as possible with a minimum offer that already provides real benefits, to learn more early on?
Does the organization have the abilities for rapid action and fast track learning?
What other partnerships could accelerate product development?
Are multiple distribution channels available? Are there viable alternatives to these?
What groups with great influence are there among the target customers? Would they use their influence for this?
How could customers be animated e.g. through prices discounts, other benefits, etc. to develop the brand?

i.e., in more detail

$$\begin{aligned}\textbf{Profits} = {} & \textbf{Number of Products Sold} \times \textbf{Price per Product} \\ & + \textbf{Other Income} \\ & - \textbf{Number of Products Sold} \times \textbf{Cost per Product} \\ & - \textbf{Fixed Cost}\end{aligned}$$

With some rough considerations, the **Number of Products Sold** is estimated based on customer segments and number of purchases per customer. The **PriceperProduct** is determined from the competitive situation and product positioning. Similarly,

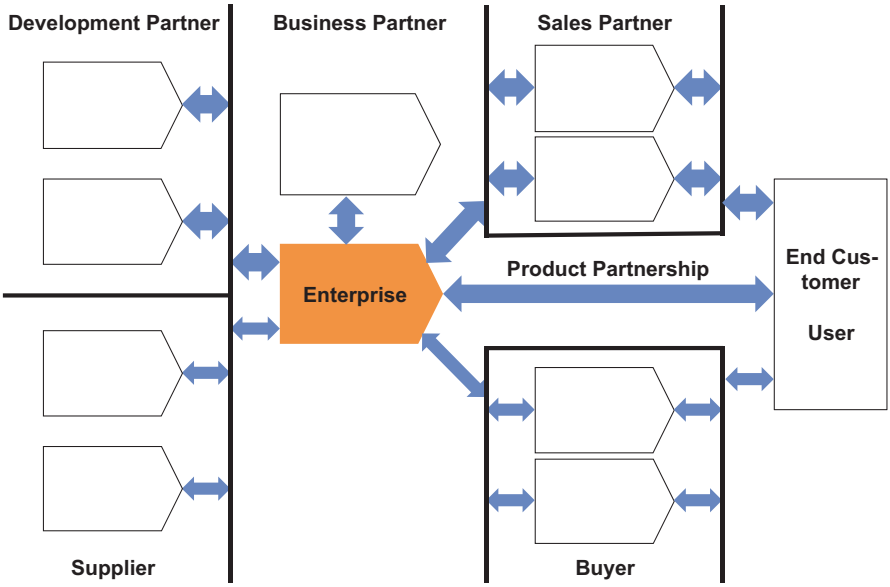

Fig. 4.22 Graphical representation of value creation architecture. (Source: Bernd X. Weis)

Table 4.6 Generating income

How are the prices of the products determined? Are there fixed rates, variable rates, project-based prices or subscriptions?
What prices can be obtained for the products?
How often per unit of time does the same customer buy the products?
How do customers pay for the products?
Which brokerage functions are foreseen for payment?
What alternative sources of revenue are there assuming that the customer does not pay for the products?
What revenue per unit of time is achieved overall with all customers?
How does money flow in the network? Who gets what share to cover costs and make margin?
What income per unit of time is expected for the organization?
Points to ponder
Which subscription elements can be added to the prices in order to obtain continuous revenue?
What could be a base product that can be made available for free to then generate revenues with up-market products?
Which pricing models can be introduced, in which customers pay more for greater benefits?

Table 4.7 Growth

How should the business grow?
How will the business model look like in five years?
Is the "business" to be sold later? If so, when would be a good time and who would be potential buyers?
Points to ponder
Which concepts and capabilities that play a role in the business model can be applied to other business opportunities?
What other customer segments with similar needs are present?

Table 4.8 Competition

Who are the competitors with these customers? What market share do they have? What are their particular strengths? What are their weaknesses?
How does the organization react to this?
What other organizations are entering in this market?
Is the own market positioning good enough?
Could the benefit of the product be easily substituted or even eliminated by competition?
Points to ponder
Which products can be offered free or much more economical to quickly build up a critical mass and then make use of network effects?
Who of the potential competitors may be brought on board as partners?

Table 4.9 Political and societal conditions

Which aspects of the business model are politically or socially advantageous?
Which aspects of the business model are politically or socially unfavorable?

Table 4.10 Relationship between organizations

What if supplier A were more involved in the own processes?
What is the benefit–faster, more economic, more flexible, higher quality?
What are the disadvantages–greater uncertainty, greater dependencies?
What dependencies arise? Could these become dangerous if A should run into financial difficulties?
How much effort is needed?
What technical and business secrets must be disclosed?
Does A also supply to competitors? Would competitors be kept at a distance better?
Will A also participate in business risks?
Is A trustworthy? Is it important whether A is trustworthy?
What if the close relationship with partner B is terminated, and one supplies from the free market?
What is the benefit–faster, more economic, more flexible, higher quality?
What are the disadvantages–greater uncertainties? Which?
How much effort is necessary? Is some additional engineering necessary?
Does B have sufficient competitors? Are they interchangeable?
How could it hurt if B is now more closely cooperating with competitors? How can the competitive advantage still be maintained?

Table 4.11 Relationship between organization and customers

What if the customers are more involved in the own processes?
What is the benefit–faster, more economic, more flexible, higher quality, increasing customer loyalty?
What are the disadvantages–greater uncertainty, greater dependencies?
What dependencies arise?
What technical and business secrets must be disclosed?
Does customer loyalty increase? Does this lead to new forms of customer loyalty?
What if the customers are less involved in the own processes?
What is the benefit–faster, more economic, more flexible, higher quality?
What are the disadvantages–greater uncertainty, diminishing customer loyalty?
How much effort is it necessary?

the **Cost per Product** is estimated. Thus, **Margin per Product = Price per Product − Costs per Product**. Depending on the business model, **Other Income** and **Fixed Costs** are initially estimated. Thus, this allows an estimation of the values at least of the order magnitude for a first analysis. The analysis is compellingly easy because of the simplicity of the formula.

With these simple considerations, one develops a feeling for the orders of magnitude that are to be dealt with in order to generate some profits.

Business Model: Summary

Innovative business models are based on the interaction and networking of many participants, thus requiring considerations that go far beyond the own organization. They are complex systems that often seem to escape a controlled approach. There are broadly three possible ways to deal with them: one can try to dominate, to embrace, or shape.

A business model models a social system; behind the model elements, there are always people. The willingness to cooperate is a fundamental element. Cooperation is lived and can be found in all areas of life. Studies indicate that in general about 30 % generally pursue rational selfish motives, 50 % present themselves cooperatively, and 20 % behave this way or that way depending on the situation.

Business processes can reach a level of complexity, which does not allow any more an intuitive understanding of the relationships. By appropriate abstractions and simplifications, business models provide very pragmatically transparency and communicability as well as a quick overview of the relevant information. A business model is generally composed of three elements: the value proposition, the architecture of value creation and the income model.

With the value proposition, the organization declares to its customers and business partners, the benefits and utility it generates as well as by which means these are provided.

The architecture of value creation outlines the way the organization generates the benefits and utility, and the income model how income is incurred.

Apart from the classical process—customer buys product and pays for it—more opportunities for organizations supported by e-commerce technologies arise to tap additional revenue sources such as subscription fees, advertising revenues, sponsor contributions, and income from transactions (direct sales, transaction fees, commissions, sales commission).

Closed business models are business models in which the relationships are mainly built on interchangeability. In contrast, in open business models the relationships are largely built on partnerships. Defining the boundaries, i.e., what factors—partners, customers, suppliers, or customers—are to be included in the business model, is a task of strategic importance for the organization.

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Innovation Culture and Innovation Management

5

The drama "Being Innovative"—Act 1, Scene 4

The board member of POLYM Inc. Alexander H. and decision-maker John G. sit in the Alexander H.'s office.

POLYM Inc. Alexander H.: The concept that you develop in your department, I like it a lot. This is exactly what our company needs now—new ideas so that we can continue to develop and grow. This idea has potential, I can feel it. I always keep wondering how some people come up with such ideas. Anyway, we seem to get quite a few thing right in our organization. It fascinates me to see again and again how something is created virtually from scratch, from nothing. It hasn't been Thomas E.'s job to come up with this idea. Do you have an idea what exactly makes them invent?

Decision-Maker John G.: He's one of the sort who always wants to know more, to get to the bottom of things, a lateral thinker. If he comes up with something new, I always give him some time to think it over and scrutinize it in more depth. Even in his spare time he is always busy, he plays chess in a club and is active with Greenpeace.

POLYM Inc. Alexander H.: Lateral thinking is good, we need to get out of the silo thinking, that's the only way we'll be able to uphold our position in the market. I hear that we even have to think about our business model. In today's business world, everything has become much more complex.

Decision-Maker John G.: You are absolutely right. What we need now is a decision of the organization, so that we can properly pursue this issue.

POLYM Inc. Alexander H.: Hmm, for me there are still too many unknowns in this game before we can decide. The risks we need to take are a bit scary. I guess, we have to look a little more closely.

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Decision-Maker John G.: I have a suggestion. You know the CEO of YLMOP. Do you think that they could be interested in a cooperation? That would benefit us and give a decent push to things. They're always good for a few ideas; something could develop out of this that we haven't thought of up to now.

POLYM Inc. Alexander H.: That's a good idea; I will call him right away. With respect to the decision: Walter K. should see to it that we get more information.

Decision-Maker John G.: By the way, I keep thinking about this issue. Do you think that we have the organizational structures to accommodate this or—come to speak of it—any other similar innovation? We have never done something like this. It could very well be that on the one hand our structures don't fit to this innovation and that we can't adequately develop and market it, and on the other hand, that this innovation is so disturbing in our established processes that we lose efficiency in the normal course of business. Then, we wouldn't have won much. Would it not make sense to spin off this project into some separate organization?

POLYM Inc. Alexander H.: Now you go for the nuts and bolts. Such a step is not easy to go. There are quite a number of legal issues to consider. And what will we do if the project fails? Starting a company is much easier than closing. But you're right with your line of thought. This is certainly an option that we have to keep in our mind. But at the moment, I think this is still somewhat premature. Now we let's wait and see, what the engineers come up with. New product plus new business model equal to new company—that has something to it.

5.1 Innovation Culture and Innovation Management: Selected Topics

Organizations always want to be innovative. They invest in new products, optimize and streamline their processes—that is their daily business. But do organizations escape the increasing competitive pressure by this? Maybe, but since all organizations in the industry are doing likewise, in the end none of the organizations has gained a clear competitive advantage. Despite great efforts, the customer will not necessarily recognize a clear distinctive feature between the individual organizations.

Clayton Christensen (2000) found that organizations might fail even though they have outstanding products, have been managed well and the right decisions were taken. He even goes so far to argue that organizations fail because the executives have actually made the right decisions.

Motivation and decision-making are essential elements of innovation culture and innovation management. Especially here, light and shadow lie very closely together and may perhaps not even be distinguishable. Therefore, these two topics are covered here in more detail.

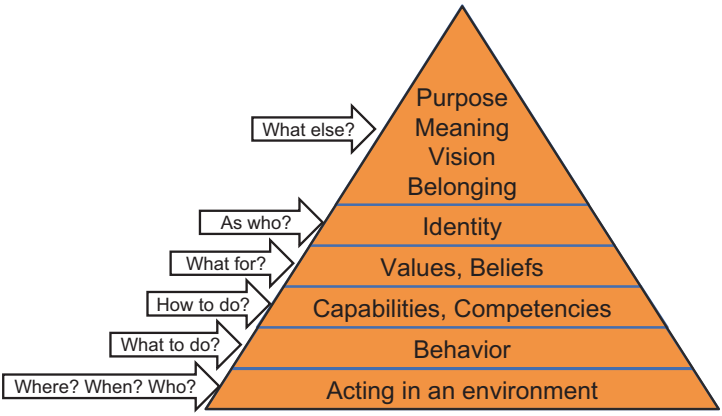

Fig. 5.1 Levels of personality. (O'Connor (1998), Source: Bernd X. Weis)

5.1.1 Motivation

Motivation determines action. Culture provides the normative context—Heidegger's "Man[1]" so to speak, which summarizes cultural, historical, and societal background of human existence (Heidegger 1927). Culture thus engages in all levels of the personality. Conversely, of course, any person engages in the facets of the culture (see Fig. 5.1).

This creates an interplay between the individual and the culture with diverse feedback loops and cross-references. The references of individuals to a variety of other individuals then form the system, in which culture finds its place. Therefore, it is obvious to turn at first to the single individual.

The American psychologist Abraham Maslow (Maslow 1943) developed a theory in which the active striving of a person for a fulfilling life, for recognition, and self-actualization is central. For Maslow, motivation is a holistic phenomenon of a person. He is motivated when he feels a desire, a need, a longing, a wish, or a defect, and only he himself can feel it—motivation is subjective. As part of his studies on motivation, Maslow developed a hierarchy of needs, which is usually depicted as a pyramid as shown in Fig. 5.2.

According to this, hierarchically structured needs determine the behavior of a person. The base of the pyramid are the basic physiological needs, while at the top one finds the need for self-actualization. Self-actualization is based on personal growth, which in turn underlies very personal reasons such as the development of one's creativity or the selfless dedication to a just cause. The needs in the corresponding hierarchical sequence are:

[1] "Man" in German is everyone, but at the same time no one to be pointed to. "Man" defines average behavior and takes responsibility for it. The more pronounced "Man" is, the less noticeable. In its unobtrusiveness, "Man" unfolds its true dictatorship.

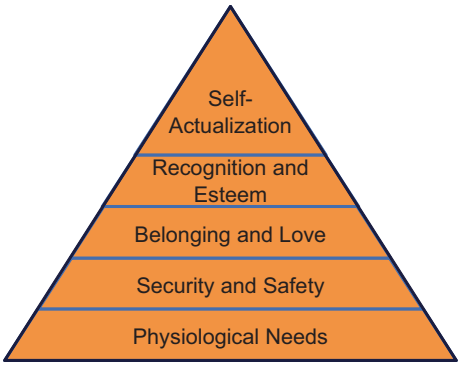

Fig. 5.2 Maslow's hierarchy of needs. (Source: Bernd X. Weis)

1. **Physiological needs:** These include breathing, sleep, food, warmth, health, clothing, movement, hunger, thirst, and sex. If these are constantly satisfied, they lose their importance.
2. **Security and safety needs:** These include the need for security, stability, order, protection, freedom from fear and chaos, structure, law and order, shelter, and accommodation. When the physiological needs are met, but the security and safety needs are not, this will largely determine behavior. People want a predictable world, they become unsettled by inconsistency and injustice (see also the remarks on Black Swans).
3. **Belonging and love needs:** These include family, friends, partnership, love, intimacy, communication, ultimately everything that relates to socialization.
4. **Recognition and esteem needs:** Firstly, the need includes the desire for mental and physical strength, performance and competence, personal and professional success, prosperity, and secondly, the need for recognition, prestige, status, respect, influence, fame, and power. On this, a person bases self-esteem.
5. **Need for self-actualization** (growth needs)**:** People strive in a very individual way to develop their own personality, live up to their individuality, develop their talents, achieve personal perfection, and perhaps even attain enlightenment. It shows itself as a "forward slant" in human nature. The human pushes for "full being": cheerfulness, kindness, courage, honesty, love, and kindness.

Maslow assumes that a need motivates and affects action only as long as it remains unsatisfied. As long as a more fundamental need is not satisfied, other needs are not really addressed—Maslow calls this the principle of relative prepotency. Although this hierarchy is not rigid as the pyramid representation suggests, the boundaries are blurred. Therefore, this representation should be understood rather as a comprehensive structuring and not as a descriptive oppression for every person.

Back to Motivation: Motivation therefore represents an urge for activity to satisfy needs. At first, it does not matter as to whether this motivation is useful or not. Motivation has in itself no positive connotation, but is basically neutral; high (low) motivation is neither good nor bad in itself and implies no judgment. Motivation sets in motion behavior and controls activities for a particular goal. As a rule, it

will remain until the goal is reached or until another motive becomes predominant. Furthermore, the intensity of motivation also depends on how highly the goal is subjectively valued and how the prospect of success is estimated.

Motivation research distinguishes between **intrinsic and extrinsic motivation**. One acts intrinsically motivated if one does something for its own sake, because it is challenging, because one pursues an interest or simply because it is fun and gives pleasure. In contrast, in the foreground, extrinsic motivation is to provide a certain performance, because it promises a reward or a benefit or it avoids punishment or disadvantages. The areas of intrinsic and extrinsic motivations are not as isolated as it seems—conscious experience and reflection often link both.

Motives induce motivation; they are the direction-giving, guiding, driving psychological background; and they determine the principle of human action. They are innate or can be inculcated only in the first years of life and are considered largely immutable over time for a person during his life. Motives enable them to experience an emotional arousal through perception, then to act in a certain way or to feel at least an impulse to act. Generally speaking, emotions play an important role, because living things repeat actions in which they have felt pleasure, and avoid those where discomfort occurs (Goleman 1996). By themselves, motives do not initiate an elaborate cognitive process, but are mainly active in the subconscious. However, in terms of a phenomenology, one can talk about them.

Values are ideas about what is "right." They are individual, but have a very strong societal–social conditioning, because values constitute a culture. They define the meaning and significance within a social system (e.g., group, society). In contrast to motives, individual values are variable in the course of a life; the change process is rather slow, but in extreme situations, values can also be turned upside down in a very short period of time. Values parenthesize—according to the current view—"person," "culture," and "society" thus making them accessible for analysis.

Goals are defined, targeted, potential, and achievable endpoints of processes, and generally refer to future states, which are compared with the current changes and can and should be reached within a certain time frame. In comparison to motives and values, goals can therefore be considered to alter easier and thus faster.

Now all terms are very briefly explained. Figure 5.3 presents a cybernetic representation of how they interrelate and mutually influence each other. In this cybernetic system, a consistent balance is sought whenever possible.

The urge for satisfying needs, achieving goals or fulfilling values triggers impulses to act. The congenital or very early-in-life-acquired individual motives give these impulses to act in a deeply personal direction and quality, the motivation. Actual behavior from this motivation is adapted to the possiblility that the particular, actual situation and the environment allow at this point in time. With this behavior, a need is eventually satisfied. On the other hand, the motivation for a particular behavior may also lead to the need to adjust corresponding values. The given possibilities influence the goals in the sense that in addition to the possible, the feasible is also considered. These adaptations depend on external factors such as social and societal realities.

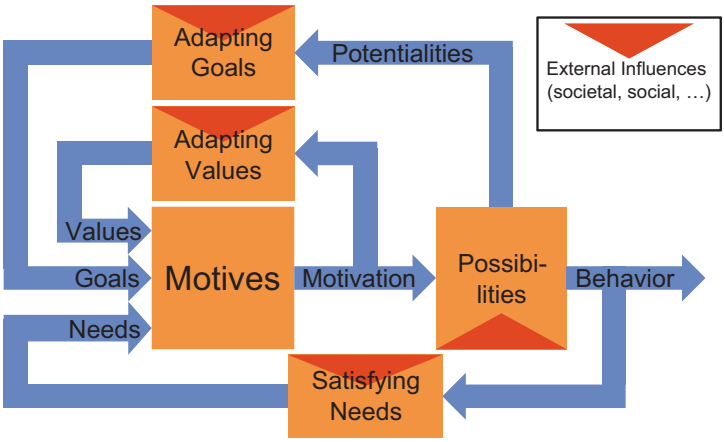

Fig. 5.3 Needs, motives, values, and goals—interrelations. (Source: Bernd X. Weis)

Motives can be ordered in many different ways and divided into classes. Professor Steven Reiss has condensed in his studies 16 motives that motivate people (Brand and Ion 1996).

MotivStrukturAnalyse MSA®[2] adopts a similar approach. It was developed in cooperation with several German universities as part of a scientific study. In this approach, each of the motives is considered as bipolar, the poles being two complementary drives. Thus, for example, the personal manifestation of motive "relationship" is somewhere between the two fundamentally different poles "sociable" and "distant." The drive sociability as the pursuit of close contact complements the opposite drive of distancing as a quest for solitude and distance to a holistic relationship motive. People differ in the individual distribution of the two drives of one motive—both are always present in everybody, every person lives them depending on the personal history. In the following, the 18 basic motives of MSA® and their complementary drives are listed.

1. **Knowledge**
   - Intellectual: pleasure in reflection, collecting knowledge, intellectuality, being curious, going to the bottom of things, seeking ideas/models
   - Pragmatic: "being practical," application-oriented, timely "act now," utility-oriented thinking and acting
2. **Principled**
   - Principle-oriented: conduct orientation, appreciating and maintaining loyalty, moral integrity, tradition, values, norms, principles
   - Utility-oriented: goal orientation, loyalty not an end in itself, situational flexibility more important than values, norms, principles

[2] http://www.msaprofil.com/de/.

3. **Power**
   - Leading: would like to get and exercise influence and take over leadership, control over others, want to determine the direction
   - Being led: not exercising power, being free of responsibility for others, accepting leadership, being subordinate, service-oriented
4. **Status**
   - Elitist: aiming at "standing," "standing out" through wealth or title, searching public attention and reputation, focusing on brands and trends, feeling to belong to the elite
   - Down to earth: concerned with equality, little interest in public perception, does not value titles or status symbols
5. **Order**
   - Structured: searching for stability, clarity, and detail in the processes and structures, valuing defined processes, true constancy, often cherishing rituals
   - Flexible: appreciating spontaneity, avoiding or bypassing rules, trying to break out of structures, seeking and allowing for "FREIRAEUME[3]", creative flexibility, being able to cope with disorder
6. **Material security**
   - Holding on: wanting to keep and conserve material things, collecting goods and accumulating possessions and property, saving money and holding it together
   - Generous: little interest in collecting and saving, little interest in hanging on to material things, parting from things or lending them with ease
7. **Freedom**
   - Independent: searching for self-sufficiency, emotional self-direction, autarky, independence
   - Team-oriented: striving for integration and commonalities; seeking and appreciating emotional support, sometimes depended on others
8. **Relationship**
   - Sociable: very communicative, search and maintain friendships, appreciate joy, humor, sociability
   - Distant: seeking communicative depth—mostly with himself, withdrawn, rather introvert, needing distance, liking to seriously delimit
9. **Care/help**
   - Caring: helping others selflessly and paying attention to their feelings and sensitivities, their BEFINDLICHKEITEN[4]; supporting others in their activities, benevolent, caring attitude; acting for the good of others without own benefit
   - Selfish: focusing on oneself and own tasks, searching objectives, own needs at the forefront, preferring to rely on themselves

[3] The German noun FREIRAEUME refers to what is ordinarily called "free space," and also what is called "room for ideas", "room for self-actualization" and the likes. FREIRAEUME refers to the kind of opportunities given, that allow to pursue activities that are not on the specified agenda e.g. to create and follow up with new ideas. Translations coming near are "latitude" or "leeway" (see page 135).

[4] For the definition of BEFINDLICHKEITEN see page 14.

10. **Family**
    - Family-oriented: appreciating active family life, pursuing to have own family or children, seeking and giving family closeness and affection
    - Self-focused: being rather free of parental responsibilities or one's own family, not willing to take responsibilities for all and everything in the family
11. **Idealism**
    - Idealistic: making the world a better place, striving for social justice, getting involved, "social romantic," "do-gooder"
    - Realistic: being responsible for oneself, accepting circumstances, also that one alone cannot improve the world, striving for personal benefit
12. **Recognition**
    - Sensitive: searching social acceptance and approval of others, praise as driver, reacting sensitively to criticism and objections
    - Self-confident: motivating oneself, being able to withstand and even self-assuredly looking for criticism
13. **Contest**
    - Combative: engaging in things, looking for competition, contest-/competition-oriented, wanting to compete, to fight and to succeed/to win, sometimes looking for retribution
    - Balancing: looking for cooperation and consensus, avoiding conflicts, seeking harmony, settling disputes, acting diplomatically
14. **Risk**
    - Risk taking: challenges, courage to change, appreciating the pleasures with the new, the open, the risky, liking stress, taking risks
    - Risk conscious: seeking emotional stability and reliability, appreciating and caring for own comfort zone, avoiding changes
15. **Nourishment**
    - Savoring: liking to eat much and/or well, to deal with "food," often aligning thought and action to eating
    - Frugal: regarding eating as food intake, little pleasure-oriented, eating to alleviate hunger
16. **Physical activity**
    - Joyfully exercising: moving often and enjoying to keep fit, often sporting
    - Comfortable: avoiding physical exercise, couch potato, little body-oriented
17. **Sensuality**
    - Sensual: enjoying lustful and erotic life, beauty, art, aesthetics or design
    - Demure: not considering sensuality as the elixir of life, appreciating sobriety and purism
18. **Spirituality**
    - Spiritual: seeking and questioning the (deeper) meaning of life, openness to the existence of a higher (divine) authority, believing in an intangible, nonmaterial, spiritual world/creation
    - Rational: focusing on the "here and now," orientation to rational thought models; "materialistic" attitude

Fig. 5.4 Drive distribution for the motive "recognition," (Source: Bernd X. Weis)

In the MSA® the motive structure of a person is determined using a questionnaire. The results are quantified according to a normal distribution (in fact a truncated Gaussian distribution because of the limited range of values) with a drive characteristics 50 %/50 % as mean and about 20 % as the standard deviation. The quantified values are to be understood as the ratio to a total population, namely the corresponding control group. As mentioned above, both drives of a subject are always present.

This means, for example, for a value of 75 %/25 % for motive "recognition", that the drive "sensitive" "self-confident" is smaller in about 90 % (10 %) of the total population (see Fig. 5.4). The drive distribution over all motives under consideration results in a profile of the motive structure, which can be and usually is different for each person. In addition, there are plausible claims that the three basic psychological motives recognition, contest, and risk act always and everywhere and influence the intensity (degree of living up to) and the emotionality (degree of satisfaction) of the other basic motives.

Furthermore, it is claimed that the above-mentioned motives are complete and mutually independent, i.e., mutually exclusive collectively exhaustive (MECE see Sect. 6.1.4). However, it is possible that conflicting situations occur in behavior, when two motives cannot be served simultaneously. An example: An applicant for an executive position has in the motive "power" a strong drive to lead, and in the motive "contest" a low drive to be combative. He is now competing with other aspirants for the position. This situation may lead to inner conflicts with the candidate, because he may have no clear behavior in his repertoire, which is fair to both of his motives.

When talking about motivation, other terms are often mentioned: One speaks of the achievement motive, if the motivation is increased by achieving self-set targets. The competence motive manifests itself in a desire for fulfillment, and the opportunity for personal initiative. The socializing motive terms a person's need for social connection. If money is the most important motive to work, one speaks of the money motive. Money can satisfy material desires, but also represents emotional values when it is used as a benchmark for the assessment of one's own performance. One speaks of the security motive when action is based on the need for protection from dangers, hazards, or obstacles. Striving to be different from others is called the prestige motive. However, these terms—as opposed to the motives above—also have a judgmental connotation. Who would be happy if he is attributed a low achievement motive?

Values can be modeled similarly. The Israeli psychologist Shalom Schwartz was able to map a—as alleged—universally valid semantic order of content of values to a continuous value circle based on several international conducted studies (see Fig. 5.5; Schwartz 1992).

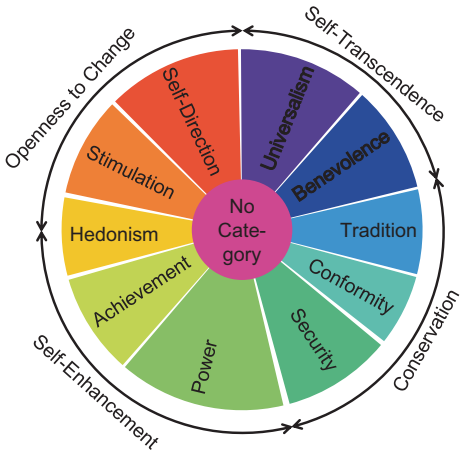

Fig. 5.5 Circle of universal values according to Schwartz. (Source: Bernd X. Weis)

Schwartz's approach goes beyond nominally distinguishing and listing values. He claims that the values are organized dynamically according to their mutual compatibility or incompatibility, respectively (see above for the motives). The resulting structure (see Fig. 5.5) has two fundamental dimensions with the pairs of opposites "openness to change" vs. "conservation" and "self-enhancement" vs. "self-transcendence" (Bilsky and Koch 2000).

With his studies, Schwartz was able to demonstrate that certain sets of values exist in every culture:

- **Self-direction:** curiosity, choosing own goals, independence, creativity, freedom
- **Stimulation:** boldness, innovation, exciting life
- **Hedonism:** learning, enjoyment, aesthetics, desire, passion
- **Achievement:** success, skills, influence, ambition
- **Power:** authority, power, social power, image preservation
- **Security:** safety of family and friends, national security, reciprocity, social security, social order, cleanliness
- **Conformity:** respect for tradition, modesty, humility, acceptance of one's own role, loyalty
- **Tradition:** politeness, self-discipline, respect for elders, sense of duty and professionalism
- **Benevolence:** loyalty, honesty, helpfulness, responsibility, forgiveness
- **Universalism:** equality, peace, unity with nature, wisdom, social justice, environmental protection
- **Without category:** intelligence, health, true friendship, recognition, private sphere, self-esteem, meaningful life, belonging, spirituality, inner harmony, tolerance, intimacy

These values relate to different cultures and social groups. It should be noted that at the best trends could be derived from it. The single individual can always have other values. Assessing, feeling, and sensing of a value are highly subjective.

A chapter on motivation cannot do without a brief excursus to the virtues, because when the personal values are lived in practice they manifest themselves as virtues. The classic four cardinal virtues, which appear throughout the whole history of philosophy, are:

- Wisdom or prudence
- Justice
- Fortitude or courage
- Temperance

To these cardinal virtues, Aristotle,[5] in his Nicomachean ethics adds others that were important to him: generosity, helpfulness, magnanimity, gentleness, truthfulness, kindness, and empathy. He also provides a practical aid when he defines virtue as "*the art striving for the middle,*" namely the "*middle in relation to us, a middle, which is determined by reflection and how it would be defined by a man of understanding.*" However, this middle does by no means imply mediocrity, but a "right mean," and has three attributes:

- Behavior may be exaggerated in two directions. Thus, fortitude is the middle, the right mean, between daredevilry and cowardice.
- The behavior is adequate to the case.
- What is adequate to the case does not derive only from the case itself, but also from its importance for the good, that is, for the fulfilling and at the same time decent life.

Thus, wisdom and prudence are of outstanding importance as they assist—as a kind of guide to act—in finding the right mean. According to Aristotle, a virtuous life leads to a felicitous life whenever man realizes the possibilities inherent in himself. What exactly a virtue is generally depends on the circumstances. However, virtues have a fundamental concern, namely, to facilitate the perfection of human nature and the inner harmony of man with himself. In contrast to hedonism, man acts willingly and joyfully for the sake of virtue; pleasure, however, is not the goal, but emerges along the way. Thus, in contrast to the motives above, virtues have a normative character. The Aristotelian teachings of virtue have left significant impressions in the Western culture. Based on this, the philosopher Tom Morris[6] consults organizations in management and motivation (Morris 1997).

After these preliminary investigations on needs, motives, values, goals, and virtues terms such as "personal mastery," which is detailed in more depth below, can now be positioned in a correspondingly larger context. Knowing one's own values and beliefs, one's goals one really aspires to, and the motives that guide, is fundamental for a successful and fulfilling life. It is the result of continuously reflecting one's own actions and is basis for a self-confidence offering orientation and "grounding" when external uncertainties increase. Wittgenstein puts it this way: "*I act with complete certainty. But this certainty is my own*" (Wittgenstein 1951).

[5] Aristotle: *Nikomachian Ethics*.

[6] www.morrisinstitute.com.

What drives a "digital native"[7] like the 16-year-old Philip Riederle, who regularly tinkers with the code of his iPhone and shares his knowledge via a podcast ("My iPhone and I …") with about a million listeners per year? "*I'm not motivated by money or the company name on the business card, but self-actualization and the chance to change something,*" he says. "*If I'm not interested in a task at work, how can I be good in it? (...) If you give a painter a chisel in his hand, he is probably only able to cut a mediocre sculpture from the stone. But if you let him use his canvas and his brush, he can become an artist.*"[8]

Here, the three most important aspects of motivation are discussed: **autonomy, personal mastery,** and **meaning**. Autonomy is self-direction, self-determination that one can do what one really wants to do, or rather—to include the shades of grey in between—that one does not have to do what one does not want to do, what is not compliant with one's own character. Autonomy and meaning will be implicitly elucidated in the explanations on personal mastery. For Peter M. Senge (Senge 2011) the following principles and practices address personal mastery.

The **personal vision** articulates the needs and values of a person. It describes what really is important to the person. What really is important one can often unveil when further "Why" questions do not make sense, when one seems to have arrived at the end of a chain of reasoning so to say. Note that the motives due to their forming property are thereby influencing the vision (see Fig. 5.3). The vision describes a state that is intended to be reached, it is the or at least a part of what Aristotle called felicitous life and what Senge calls the meaning of life. Visions must be equilibrated in a continuous process over and over again, because when needs and values as the constituents of the vision bow to the course of time, so must the vision. A vision does not have to be a personal utopia (Morus 1516) in order to actuate its effectiveness.

The vision describes a state in the future to be reached from the state of current reality. Since these conditions are generally not congruent, a gap evolves that produces a **creative tension,** which releases the appropriate creative energies. This creative tension generates an impulse to act to establish a congruence of the two states, either from vision to reality or from reality to vision. For the first case, every so often the former German Chancellor Helmut Schmidt is quoted, "*Who has visions should go to see a doctor.*"[9] Also, Gunter Dueck's Topimization (Dueck 2002) as an adaptation of the vision to a reality "made perfect" is a good example of this. The creative tension often triggers an emotional tension that brings negative feelings along with it. Failures result in uncomfortable, negative feelings, which will take care that the vision is regulated in such a way that the creative tension is reduced. In plain language, this means that the vision is adapted to the reality—Topimization. In the other case—to change the reality in the direction of vision—a failure is simply a learning effect along the way—an "aha, not this way" or in the words of Thomas

[7] A "digital native" is a person grown up with modern digital technologies.

[8] http://blogs.t-systems.de/automotive/2011/09/16/wie-digital-natives-die-automotive-industrie-verandern-siebter-t-systems-automotive-summit-auf-der-iaa/.

[9] Helmut Schmidt im Bundestagswahlkampf 1980.

Edison: "*I have not failed. I've just found 10,000 ways that won't work.*"[10] Now, a failure does not mean that the vision needs to be rethought. Eventually, a simple clarification and a check of the strategies might suffice.

The creative tension has—besides Topimization—yet another opponent. With **structural conflict,** Senge refers to doubts about his own abilities, feelings of one's own worth and powerlessness to achieve one's vision. This conflict usually takes place in the unconscious and ensures that as long as one remains in the structural conflict, systemic forces are at work that prevent the success of any vision—self-sabotage. Senge offers a way out of this, which is to commit oneself to the unmasked truth (see the Aristotelian virtues above). This does not mean an "absolute truth," but the willingness to break out of self-deception and constraints and to accept an "it could as well be something completely different." Important is to perceive and recognize the recurring patterns that appear in failure. With the process of perception and recognition, one engages in the structures, and sets in motion a structural change. These changes are sometimes quick and easy, sometimes difficult, tedious, and lengthy.

Senge calls the last principle the **use of the subconscious**. People with a high level of personal mastery fulfil even the most complex tasks with ease and grace. That, to which attention is directed, attains a special significance in the subconscious. Thus, one focuses on the desired outcome rather than the means to the end, the problems, obstacles, and pitfalls that are inevitably paving the path towards the goal. This is all the easier the deeper the quintessential real interest in the outcome, the deeper the conviction to strive for the right destination.

As further systemic aspects of personal mastery, Senge states the integration of reason and intuition, the realization of connectedness with the world, compassion, and commitment for the greater whole. Reason and intuition are not opposites, but complementary skills, both of which are needed to get a grip on a possibly complex task. Connectedness with the world reflects in the fact that actions always trigger effect in the environment, that is feedback. The human being is part of a system. All people are in its structures for which one develops a deeper understanding of the interrelations through empathy, compassion, and commitment for others.

In summary, personal mastery is the ability to reflect one's own actions and interactions with others with the honesty and depth necessary, and to act with confident consequence. "Because the access, and herein the bow masters through the ages agree, is only granted to those who are of a 'pure' heart unconcerned with ulterior motives" (Herrigel 1951).

People with a high level of personal mastery like Steve Jobs (Apple) and Jeff Bezos (Amazon)

- Know how to pursue and achieve their real goals,
- Are in contact with their greatest resource: their own desire, their own passion, their "Herzblut"[11],
- Have the ability for self-reflection and for real dialogue,
- Feel responsible in a broader and deeper sense.

[10] http://www.quotedb.com/quotes/1351.

[11] "Herzblut"—Heart and Soul: From a job description of the company Trumpf, Ditzingen; Germany.

Thus, it should be possible to come up with good decisions even in a very complex context with many uncertainties and imponderabilities.

5.1.2 Decisions

A decision is a choice between options by one or more decision-makers. One can decide spontaneously and emotionally or even randomly, but mostly, this involves a rational, more or less deliberate, pondering, and goal-oriented action, conscious of potential conflicts.

To approach the topic "decisions," it is useful to clarify some terms first.

- **Options** are objects such as computer, actions such as buying computers, strategies such as expandable computer networks or rules such as computer only with XY operating system.
- **Events** are all facts and occurrences that the decision-maker does not know or cannot influence, but which may have an influence on the decision, such as an aggressive computer virus. Events add uncertainty in a decision process.
- **Consequences**, implications, or results are those states, which can occur as a result of the choice of an option such as good profit.
- **Goals** restrict the options possible to those that are relevant for a decision.
- **Reasons** explain why it has been so decided, and may influence the decision in particular in cases where moral issues play a role, or where a decision must be "justified."
- **Utility** is an absolute rating of a consequence.
- **Preferences** allow to determine an order.
- In making a **choice,** one decides for a specific option.

Some decisions are **routine** like in the same situations, the same decision is made every time; the mental work is to recognize the situation and then to execute the appropriate decision scheme. The options, which are more or less holistic and appear intuitive, trigger **stereotyped** decisions. Other decisions have to be **reflected,** because even though the options are indeed clear the preferences need to be clarified or because some information is missing. The cognitively most elaborate decisions are those, where both, options and preferences, are not sufficiently clear and for which at first a decision task must be **constructed** and formulated.

A piece of information that can make the right decisions really difficult is found in the following example. A study of Joachim Schuez from the Institute of Cancer Epidemiology of the Danish Cancer Society conducted in Copenhagen summarizes in a "provisional risk assessment" the recent findings from more than 30 different studies on the correlation between cancer in the head area and the use of mobile telephones with the conclusion: "*An increase in risk can't yet be scientifically verified nor excluded…*" Should a company invest on such a basis in innovations that reduce the electromagnetic radiation into the head area caused by mobile phones?

One often makes decisions that are independent of events and where the objectives, options, and consequences seem clear. Then, decisions are made based on the information available. This can be easy—or difficult especially when attributes of options are in conflict with the goals or with each other.

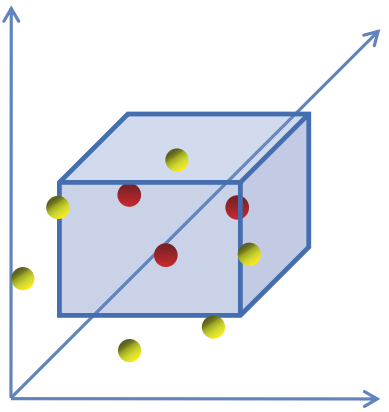

Fig. 5.6 Noncompensatory decision rules. (Source: Bernd X. Weis)

Example

One wants to buy a bike that should cost less than 500 €, have at least 21 gears and a carbon frame because of the weight. Here, at least the target price and the carbon frame are in conflict with each other and one has to decide which attribute is more important than the other, whether there are opportunities of additional financial injections or something similar. Everyone has their own decision-making strategies for these cases.

There are essentially two types of decision-making rules—compensatory and noncompensatory. With the noncompensatory decision rules, an attribute has either an accepted value or not. If there are several options that meet the conditions, either the most important or a randomly picked attribute is chosen (see Fig. 5.6).

With compensatory decision rules attributes can be counterbalanced against each other, i.e., if an attribute falls out of scope, another particularly high-valued attribute may compensate for it. Hence, each option is assigned a value, so that the options can be placed in an order and the one with the highest value is selected (see Fig. 5.7).

Example

For illustration, the bicycle example is taken up again. The bicycle's cost should not exceed 1000 €, have at least 21 gears and weigh at most 15 kg. There are now three bicycles on offer—one for 750 €, 21-speed, 15 kg, one for 900 €, 21-speed, 12 kg, and one for 1100 €, 21-speed, 10 kg. With noncompensatory decision rules, one of the first two is selected; the third does not satisfy the price condition. With compensatory decision rules, a value is calculated from the weight and price. When price and weight are of equal importance, we obtain with the formula $50\% \cdot \text{Price savings/Target price} + 50\% \cdot \text{Weight savings/Target weight}$ for the three bicycles the values 0.125, 0.15, and 0.117 respectively. Thus, one will choose the second bike for 900 €. Since all bikes have 21 gears, this attribute is irrelevant for the assessment.

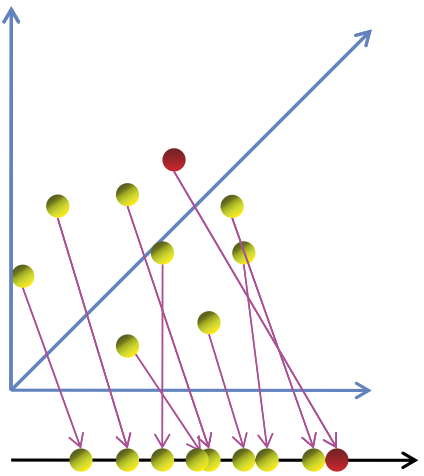

Fig. 5.7 Compensatory decision rules. (Source: Bernd X. Weis)

A very complex process for evaluating various options is the analytic hierarchy process, a method developed by Thomas L. Saaty to support this type of decision-making[12]. The method is based on an analysis of the pairwise comparisons of goals and attributes, and its math is relatively demanding.

Another type of decisions are those in which events that are by definition uncertain play a crucial role.

Example

Entrepreneur Werner S. faces the decision of whether to continue to develop its electric motor with existing technology (option O_1) or to leave this product unchanged and develop a new electric motor with a new technology in parallel (option O_2). The new motor will have even better characteristics and will be ready for market in about a year. He has—from whatever source—learned that a new competitor will appear on the market with an electric motor with similarly good, if not better features, but has still huge problems with the technology, which he has not yet controlled (event E_1). However, if the competitor gets to grips with these problems, the market will become highly competitive (event E_2). The corresponding consequences K_{11} to K_{22} are outlined in Table 5.1 and in Fig. 5.8. The entrepreneur figures how the individual consequences are to be assessed, and estimates the utility $u(K_{nm})$ of consequence K_{nm} over the next 2 years e.g., as the additional revenue generated. As a benchmark (100 %), he takes the situation "Develop product with current technology (O_1)" and "No new competitor (E_1)."

Werner S. determines for each option, O_m, the expectation $E(u(O_m))$ of the value of the option as a function of the probability $p(E_k)$ of the event E_k and the

[12] http://de.wikipedia.org/wiki/Analytic_Hierarchy_Process.

Table 5.1 Options, events, and consequences

	No new competitor (E_1)	New competitor (E_2)
Develop product with current technology (O_1)	Steadily increasing market share $u(K_{11})=100\%$	At best, maintaining market share, $u(K_{12})=80\%$
Leave product unchanged, develop new product with new technology (O_2)	Maintaining market share of old product, strong growth with a new product, $u(K_{21})=120\%$	Decreasing market share, then strong growth with new product, $u(K_{22})=50\%$

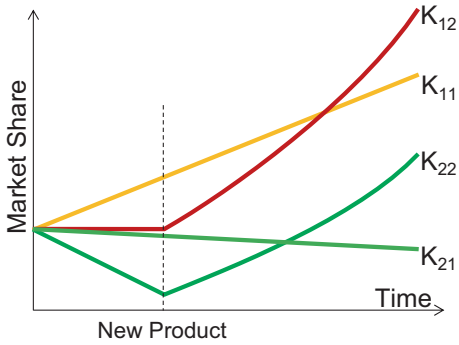

Fig. 5.8 Consequences—development on time line. (Source: Bernd X. Weis)

corresponding value of the consequences, i.e., as certainly one of the events E_1 or E_2 occurs, $p(E_2)=1-p(E_1)$

$$E\left(u\left(O_1\right)\right)=p\left(E_1\right)u\left(K_{11}\right)+\left(1-p\left(E_1\right)\right)u\left(K_{12}\right) \text{ and}$$
$$E\left(u\left(O_2\right)\right)=p\left(E_1\right)u\left(K_{21}\right)+\left(1-p\left(E_1\right)\right)u\left(K_{22}\right)$$

He finds out that option O_1 is then better than O_2 option, if the probability is less than 60% that no new competitor emerges, otherwise vice versa (see Fig. 5.9). Therefore, Werner S. will contemplate how he estimates the probability that the competitor gets to grips with the technology, and acts accordingly.

Werner S. estimates the consequences and considers the probabilities, i.e., they both have objective (such as information, knowledge, experience, skills) as well as subjective components (such as assessment of competitor, assessment of customer behavior). In general, both the probability and the consequences can be viewed from a subjective and objective perspective.

The underlying model of this example is called "Subjective Expected Utility" (SEU). For this von Neumann and Morgenstern have developed basic approaches in their research on game theory (Von Neumann and Morgenstern 1944). They require that this model is applicable only if four axioms are satisfied:

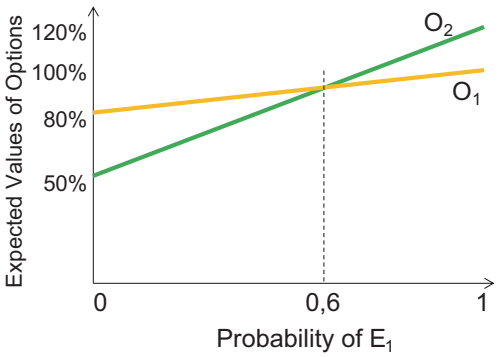

Fig. 5.9 Expected values of options. (Source: Bernd X. Weis)

Comparability: A decision-maker can compare the options with each other, i.e., he prefers option O_1 to option O_2 or vice versa, or he is indifferent.

1. **Transitivity:** If a decision-maker prefers option O_1 to option O_2 and option O_2 to option O_3, then he prefers option O_1 to option O_3.
2. **Independence:** If two options comprise identical consequences of equal probability, then these do not affect the choice.
3. **Continuity:** Option O_1 has a best and a worst consequence, occurring with probability p and $(1-p)$, respectively. Option O_2 has a medium consequence, but occurs with certainty. For the probability p of option O_1, there is now one value of p such that the decision between the options O_1 and O_2 is indifferent.

If people are sure of the consequences, they want more rather than less of something and the added utility becomes less, the higher the utility is per se. Thus, the utility functions u in the example above are monotonically increasing with however decreasing slope. If the consequences are uncertain, another feature comes into the equation, namely the inclination of the decision-maker towards risk. To illustrate this, the following experiment is performed. Suppose there is a choice between two options. Option O_1 has as consequence of the payment of a sum of money e.g., 1000 € with probability p and 0 € with probability $(1-p)$. With $p=50\,\%$ the expected value would be $50\,\% \cdot 1000\,€ + 50\,\% \cdot 0\,€ = 500\,€$. In option O_2, always the amount x € is paid. At which amount x is the decision-maker indifferent? This guaranteed amount that is worth to the decision-maker as much as the option with uncertain outcome is called the certainty equivalent. For risk-inclined persons who are convinced of their good fortune, the certainty equivalent is higher than the expected value, such as e.g., 700 €. For risk-averse persons who are not so confident in their good fortune, the certainty equivalent is lower than the expected value, e.g., 300 €. When people are risk neutral it matches the expected value. Figure 5.10 shows the utility function u(x) plotted against the certainty equivalent x for these cases.

In game theory, which is nothing else but a special branch of decision theory, the first two axioms suffice (Riechmann 2008). However, exactly these axioms cause the criticism of the SEU model and limit its applicability. Although these axioms seem natural and intuitive, they are often at odds with the results from experiments and from practice.

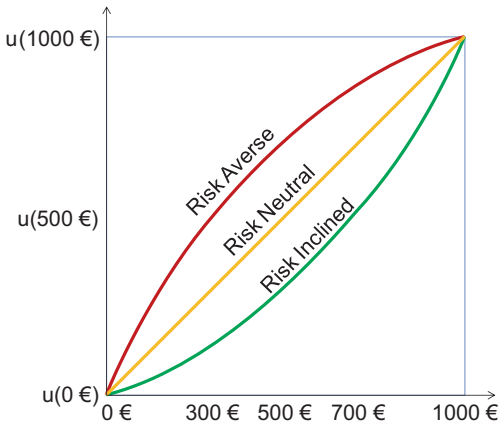

Fig. 5.10 Utility function for different risk propensities . (Source: Bernd X. Weis)

With the Prospect Theory (Kahneman and Tversky 1979) and Cumulative Prospect Theory—an important extension of the SEU model—Daniel Kahneman and Amos Tversky were able to resolve these contradictions to a large extent (Jungermann et al. 2005). They conducted a series of experiments and observed some systematic patterns in the preferential structure, which differed from those axioms. To illustrate the subjective nature, they do not speak of a utility function (u), but a value function (v). The consequences are evaluated not absolutely, but relatively to a reference point, so it becomes possible that the same consequence is assessed differently depending on the reference point. It is typical that consequences above the reference point are considered as profit and those below as loss.

According to Prospect Theory, the decision process proceeds in two phases—the editing phase and the evaluation phase. The problem is first edited, i.e., it is processed for the evaluation according to particular rules. Typical editing mechanisms are:

1. **Coding:** A reference point is chosen, and the results are correspondingly coded as gains and losses.
2. **Combination/Simplification:** Probabilities of identical or similar results are combined.
3. **Separation:** The risk-free component can be separated from the high-risk components.
4. **Deletion:** Components that are common to all alternatives are excluded.

In the evaluation phase, a subjective value is determined for each edited option according to which it is chosen. In Prospect Theory, it is assumed that the consequences and their probabilities determine the decision. However, the following is assumed to meet the results of empirical surveys.

Asymmetric risk propensity: The subjects have shown an asymmetric attitude to gains and losses. They tend to behave risk averse for gains and risk inclined for losses as results from the following experiment show.

1. Decide whether to:
   a. Win 240 € with certainty.
   b. Win 1000 € with a probability of 25 %, nothing otherwise.

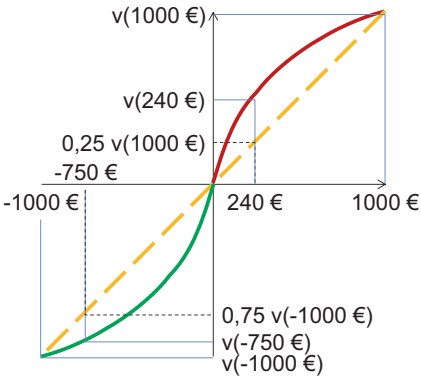

Fig. 5.11 Asymmetry of risk propensity. (Source: Bernd X. Weis)

2. Decide whether to:
   c. Lose 750 € with certainty.
   d. Lose 1000 € with a 75 % probability, nothing otherwise.

A large majority of the subjects selected in case 1 Option A and in case 2 option D. The subjective value of a prize of 1000 € with probability 25 % is lower than the subjective value of the safe income of 240 €. On the other hand, the subjective value of a loss of 1000 € with a probability of 75 % is greater ("less negative") than the subjective value of the safe loss of 750 € as shown in Fig. 5.11. In this figure, the straight line corresponds to the case that the subjective value corresponds exactly to the factual value. If for example, as in the positive quadrant top right the arched curve is above the straight line, the subjective value of the gain is higher than the actual gain, were it below, the subjective value would be smaller than the actual gain. If in the negative quadrant bottom left the arched curve passes below the straight line, the value of the subjective loss is greater than the actual loss, if it passes above, it is smaller.

Additional experiment:

3. Decide whether to:
   A. Win 240 € with a 25 % chance, or to lose 760 € otherwise,
   B. Win 250 € with a 25 % chance, or to lose 750 € otherwise.

All subjects opt for option F, which is immediately clear: win more and lose less. The interesting thing is now that option E corresponds to the combination of Options A and D—the combination chosen by most, and Option F to the combination of options B and C, which were the least preferred. According to their presentation, the mental representation of the options is different.

Overestimation of small probabilities: Very small probabilities are in general overestimated. To manage this effect, a subjective decision weight is introduced for the probability of occurrence of an event. Small probabilities (0←) are weighted relatively higher and large probabilities (→1) relatively smaller as shown in Fig. 5.12. On the straight line, the decision weight corresponds to the probability. If the arched curve is above the straight line, the corresponding probability is given

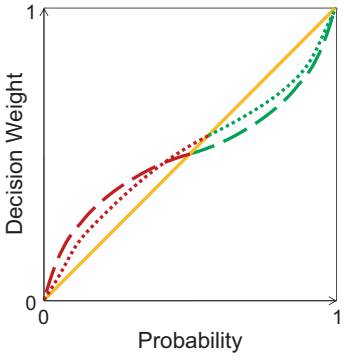

Fig. 5.12 Decision weight. (Source: Bernd X. Weis)

a larger weight, if it runs below, a smaller one. The figure shows typical graphs of decision weights.

Framing effect: An example of the framing effect pertains to the presentation of consequences. The following experiment was performed:

1. You receive 1000 €. In addition, you choose between:
   A. Win 1000 € with a 50 % chance,
   B. Win 500 € with certainty.
2. You receive 2000 €. In addition, you choose between:
   A. Lose 1000 € with a probability of 50 %,
   B. Lose 500 € with certainty.

The same people have now been questioned. In case 1, most people prefer the safe option B, in case 2, the risky option C, although in both cases the final wealth is the same.

Decision-making processes are often not as simple as the ones discussed above. Sometimes a lot of factors are to be considered, many of which are subject to uncertainties and ambiguities, so the decision models can become somewhat confusing and very complex. Therefore, complexity reduction is to be discussed in this context, a theme that is called upon often and repeatedly in decision-making processes. In 1956, the British psychiatrist and systems theorist William Ross Ashby[13] formulated the law of requisite variety, which is also called Ashby's law (Ashby 1956). Ashby defines variety as the number of mutually independent opportunities of action, interaction, and communication of a system; thus, variety serves as a metric of system complexity. Ashby's law states that a control system which controls another system, can compensate the more disturbances with the control process, the greater its variety to act is. Alternatively, to put it the other way around: the variety of a control system is an upper limit to the variety that can be controlled in another system.

What is one talking about when speaking of complexity reduction? As a rule, one frees the model of reality that one has mentally designed as control system, of

[13] http://www.rossashby.info/.

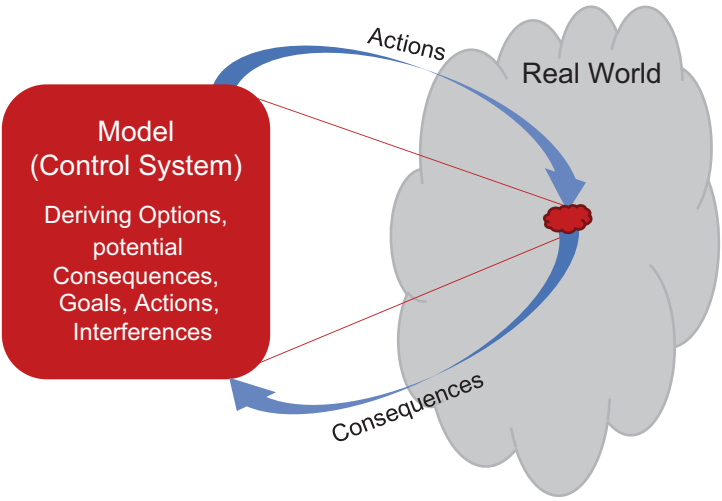

Fig. 5.13 Model and reality, Ashby's Law. (Source: Bernd X. Weis)

the supposedly superfluous. (Unless one does like the Great Alexander, when he cut the Gordian knot and so solved a complex problem with a punch—and thereby treated himself to the rule over Asia that created very different contexts, and perhaps unveiled even more complex problems.) If the complexity of the model is reduced, the model gains simplicity and clarity, i.e., decisions based on the reduced model are easier to make and also to communicate. Complexity reduction helps if one runs out of reasons for a decision. However, the reality remains in its perceived—and obviously too high—complexity, just as complex as it is, and according to Ashby's law can only be controlled and influenced in as far as the variety of the model allows (see Fig. 5.13).

If this fundamental difference between model and reality is not consciously perceived as such, complexity reduction is a chimera, a mirage, a dangerous source of self-deception (Gerken 1991). This happens even in the reality, which is accessible for measurements, which is pragmatically oriented towards the objectively measurably perceived. The psychiatrist and constructivist Paul Watzlawick calls this first-order reality (Watzlawick 1976). The second-order reality emerges when meaning and value are assigned to the perceived first-order reality in a to a highest-degree subjective, individual process. If it is considered that we relate to other people, then one even has to deal with second-order realities of others, which potentiates the space of possibilities. As long as the realities of first and second order in oneself are consistent, everything may still be all right (Vollmer 1990). However, if inconsistencies occur here, then antinomies and paradoxes are up to mischief and begin to wreak havoc (see treatment of Russell's barber paradox; Russell 1903).

► **The Barber Paradox:** Bertrand Russell formulated an interesting paradox as follows: *One can define a barber as the one who shaves all those and only those who*

do not shave themselves. The question is: Does the barber shave himself? The barber paradox is a classic of the paradoxes. For dealing with this paradox, there are two possibilities. One is a treatment of the problem in the second-order reality. In a formal logical deduction, Russell has shown that such a barber cannot exist. The other is a—admittedly rather pragmatic—treatment of the problem in the first-order reality. One just waits and sees if the barber grows a beard, and if not, then you ask him who shaved him.

Again, it happens to be that in meeting with other people one can indeed agree on a common first-order reality (Wittgenstein 1921), but also different subjective second-order realities come together for which a common understanding is not so easy and simple. For a successful encounter at least the consistency of that section of reality that is relevant for the encounter, is helpful.

Inconsistencies between the realities occur repeatedly and everywhere. It seems plausible that a quest to find all the reasons in the measurable first-order reality will be doomed to failure. Only in the second-order reality, some of these inconsistencies can be resolved when different meanings are assigned or conditions are changed, which then allow a resolution (see Zen master).

► **The Zen master:** The master holds a stick over the pupil's head and says, "If you say this stick is real, I'll beat you with it. If you say this stick is not real, I'll also beat you." The student takes the stick away from him. The Master smiles. In the first-order reality, the student cannot escape the blows—*tertium non datur,* there is no third. In the second-order reality, the student can simply take the stick away from the master. Thus, it turns the overall context of the question upside down.

Clearly, decisions must always be made. However, what would happen if the advice of Heinz von Foerster would be heeded (see also Chap. 4 on business models)—namely, always to act so that more opportunities arise (Von Förster 1985). One would enlarge the space of options; even inspect options, which at the first glance might not seem particularly relevant. Most likely associated with it are further consequences and additional potential goals as outlined in Fig. 5.14.

One can now choose between more options, and most likely, that choice will differ from the above-indicated way to choose. In general, it will not be possible, to evaluate the variety of options that develop by a thinking liberated from possibly unfounded restrictions, according to the mechanisms of decision theory. It will more likely be a choice that also relies on feeling and intuition rather than objectified reasons only. These possibly will fall by the wayside because of their complexity. The urge for omnimetry, i.e., to measure all and everything, is shown limits here.

If one has made a choice, if one has decided for an option and a goal, and is willing to bear the consequences, the next steps are planning tasks, which are described in detail elsewhere, such as in Ansoff and McDonnell (1990): *Implanting Strategic Management* (Ansoff and McDonnell 1990).

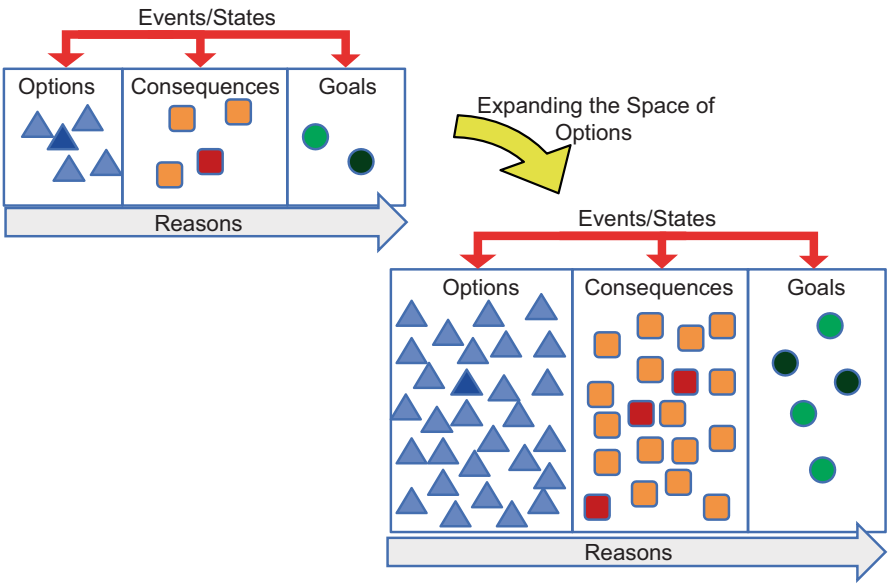

Fig. 5.14 Expanding the space of options. (Source: Bernd X. Weis)

5.2 Innovation Culture and Innovation Management: Concepts and Contexts

Innovation culture is an organizational culture in which creativity and innovations can prosper and thrive. Innovation management is the systematic planning, management, and control of innovation in organizations. Innovation culture is more than just innovation management. It has to be conceived a transdisciplinary culture with the imperative to pragmatically integrate anything desirable, necessary, useful, feasible, and appropriate. In innovative organization, there are typical behaviors, communication, and interaction patterns, and the people in it have the appropriate attitude (see Fig. 5.15). These issues are discussed thoroughly in the following.

5.2.1 Culture, Organizational Culture, Innovation Culture

5.2.1.1 Culture

Culture in the widest sense is everything humankind creatively brought and brings forth, in contrast to the neither created nor changed nature. Cultural achievements are all forming transformations of a given material, as in technologies and visual arts, and also mental structures such as in law, morality, religion, economy, and science[14]. Furthermore, culture is the ability to learn and to pass on knowledge to future

[14] Wikipedia: http://de.wikipedia.org/wiki/Kultur, 08.11.2011.

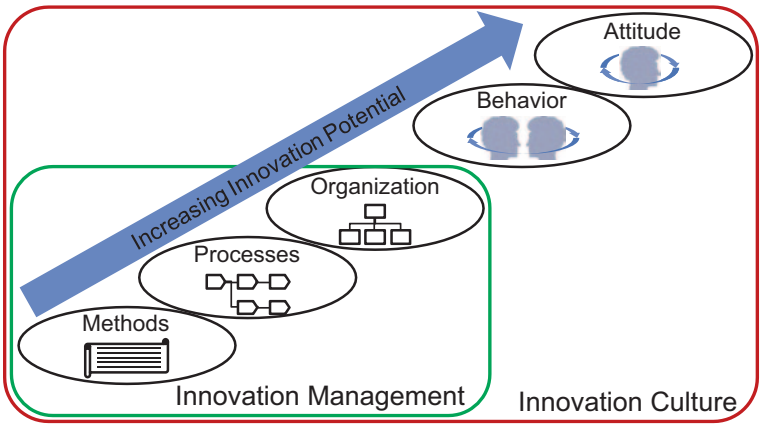

Fig. 5.15 Innovation culture and innovation management. (Source: Bernd X. Weis)

generations. Organizations and companies form an organizational or corporate culture, respectively, that in international businesses needs to harmonize with the various societal (ambient) cultures. Not only in the corporate/organizational, but also the societal environment, an innovation culture emerges as outlined in Fig. 5.16.

In the research project GLOBE (Global Leadership and Organizational Behavior Effectiveness) (House 2004), scientists around the world explore the relationships and dependencies between societal culture, organizational culture, and leadership in organizations. For delineation, nine cultural dimensions were defined. In the study, certain countries and national cultures that have sufficient commonalities form so-called cluster regions. Thus, as an example, Germany, Austria, German-speaking Switzerland, and the Netherlands form the Germanic cluster region.

In the respective cultures, the actual ("as is," descriptive, practices) and the "target" ("should be," normative, values) state of the dominant concepts of values and ideas in a society were studied in companies/organizations:

- The **actual state** describes the observable behavior, actions and customs in this culture.
- The **target state** describes the values on which behavior and the expectations of society to respect these values is based.

The investigated cultural dimensions have been rated on a 7-point scale. The results of the study have their validity in relation to these groups, and are not to be seen as stereotypes for the individuals of these cultures and societies. Table 5.2 shows the results for Germany, where P indicates practices (actual state, descriptive) and V values (target state, normative).

The spider diagram in Fig. 5.17 presents the indicators that have been determined for Germany. It shows that the normative ratios (target state) do not match the ones encountered in reality (actual state), and that there are, in some aspects, significant discrepancies which may eventually pose potential for conflict.

A fundamental result of the GLOBE study is that a societal culture has a significant impact on the corporate, organizational, and management culture. Because it is

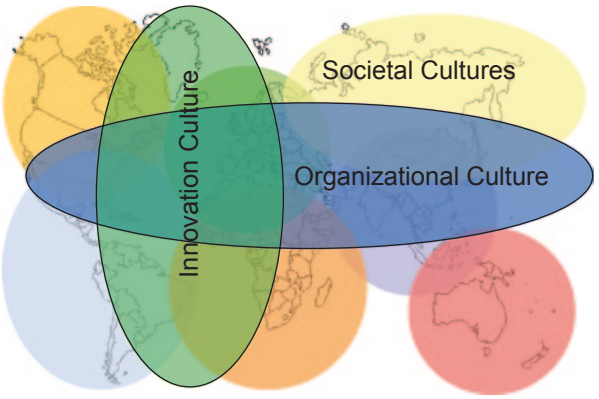

Fig. 5.16 Societal cultures, organizational culture, innovation culture. (Source: Bernd X. Weis)

not always superior technologies or more efficient structures that make companies succeed. Also, success is based on the—sometimes unspoken—rules and implicit norms that provide the framework for action in organizations, additionally in businesses, with the proviso to be profitable as well—corporate culture also gives a meaning to wins and gains (Peters and Waterman 1982).

Organizational Culture, Corporate Culture

The MIT professor Edgar H. Schein is one of the founders of organizational psychology and organizational development. He defines culture as *"a pattern of shared basic assumptions that was learned by a group as it solved its problems of external adaptation and internal integration that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to those problems"* (Schein 1985). Organizational culture is a subculture of the respective society in which macro culture the organization is embedded. It is a common foundation of values of the company, but may be interpreted and implemented differently. Schein structures the cultural phenomena in organizations with three levels (see Fig. 5.18).

Level 1: On the surface are the visible behaviors and other physical manifestations, artifacts, and products. This includes the communication behavior, the gen-

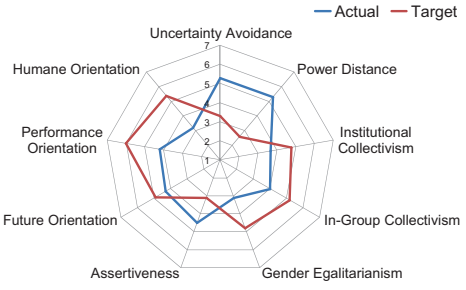

Fig. 5.17 Cultural dimensions of Germany according to GLOBE. (Source: Bernd X. Weis)

Table 5.2 Cultural dimensions according to GLOBE

Cultural dimensions	Description	Germany
Uncertainty avoidance	The extent to which a society, organization, or group relies on social norms, rules, and procedures to alleviate unpredictability of future events	P: 5,3 V: 3,3
Power distance	The degree to which members of a collective expect power to be distributed equally	P: 5,3 V: 2,6
Institutional collectivism	The degree to which organizational and societal institutional practices encourage and reward collective distribution of resources and collective action	P: 3,7 V: 4,8
In-group collectivism	The degree to which individuals express pride, loyalty, and cohesiveness in their organizations or families	P: 4,0 V: 5,2
Gender egalitarianism	The degree to which a collective minimizes gender inequality	P: 3,1 V: 4,8
Assertiveness	The degree to which individuals are assertive, confrontational, and aggressive in their relationships with others	P: 4,5 V: 3,1
Future orientation	The extent to which individuals engage in future-oriented behaviors such as delaying gratification, planning, and investing in the future	P: 4,3 V: 4,9
Performance orientation	The degree to which a collective encourages and rewards group members for performance improvement and excellence	P: 4,2 V: 6,0
Humane orientation	The degree to which a collective encourages and rewards individuals for being fair, altruistic, generous, caring, and kind to others	P: 3,2 V: 5,4

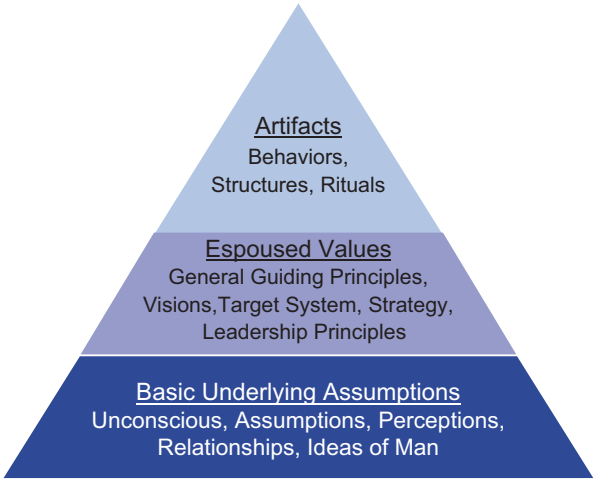

Fig. 5.18 The three levels of organizational culture according to Schein. (Source: Bernd X. Weis)

eral manners of the people in the organization, the organizational structures, and operational processes, but also the mission statement, the rituals, and myths of the organization. Further elements are the clothes, logo, parking lots, office design, technologies used, or the architecture and decor of the office building. They are visible, but in need of interpretation.

Level 2: Below is a sense of how things should be. Collective values and norms are, for example, "honest," "friendly," "technology-loving," "playful," "conservative." These are the attitudes that control the behavior of employees, define the specific instructions to act in certain situations, or even the expectations of the quality of performance. They significantly influence the perception, thinking, acting, and feeling of executives and employees; they are also manifested in their actions and artifacts. They are not visible, often even unconscious, but can be articulated.

Level 3: At the deepest level are the things that are taken for granted for the way one reacts to the environment. These basic assumptions are not questioned or discussed. They are so deeply rooted in thinking that members of the organization do not consciously perceive them. They symbolize self-evident truths that are based on experiences and customs, on convictions and beliefs with respect to the priorities and assumptions concerning the causes of success. The basic assumptions have developed from the experience of the group and have evolved in the group. They are more or less consciously passed on to new members of the group. They are invisible and self-evident.

The individual levels are in a reciprocal relationship to each other. Espoused values and artifacts emerge in the development of an organizational culture from the basic assumptions of the organization. The espoused values and artifacts in turn influence basic assumptions.

Schein identifies this pattern of basic assumptions as core of a culture. In order to approach this more specifically, the dimensions of culture are discussed in more detail. Cultural dimensions are defined characteristics of a culture. They reflect major areas of potential cultural differences and are thus thinking, perceiving, and emotional patterns that characterize a culture and allow comparing two cultures. They are aspects of a culture, not of individuals; the ratings are averages and by no means apply to all individuals of a culture. However, cultural dimensions make it possible to compare cultures with respect to these dimensions, to reflect on the own culture, to become sensitized to cultural differences and similarities.

Just as there are different societal cultures, each organization has a specific organizational culture, regardless of how consciously or unconsciously it is designed, and, as with the societal culture, different dimensions can be identified in the organizational culture. Of course, these cultural dimensions are different, and in particular, those dimensions are of interest, which have a meaning for the company's success (BMAS 2008):

- Customer orientation
- Quality orientation
- Performance orientation
- People orientation
- Adaptability

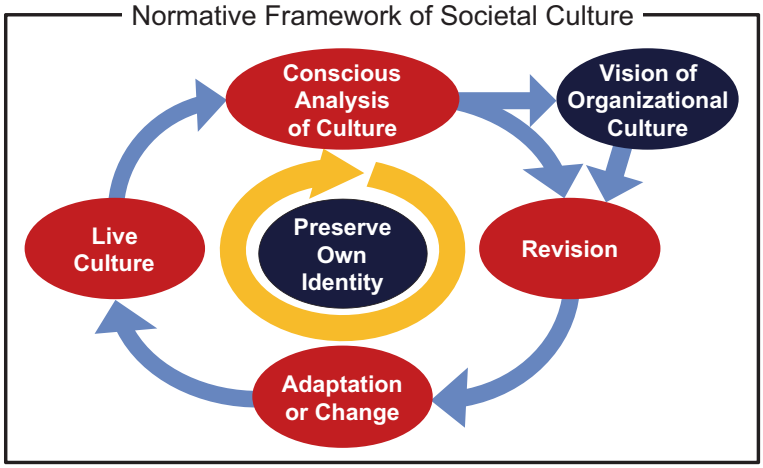

Fig. 5.19 Development of organizational culture. (Source: Bernd X. Weis)

For the analysis of people orientation, the Great Place to Work® Institute developed a concept whereby a Great Workplace is a workplace "*in which you trust the people you work for, have pride in what you do, and enjoy the people you work with.*"

Organizational culture gives the behavior and attitudes of the members of the organization a common and binding framework of values—e.g., as above: trust, pride, and joy. It has an implicit coordination, integration, and motivation function and provides the "guard rails" within which a member of the organization acts to fulfill his responsibilities and upon which one can rely in the broadest sense. Because of the deep anchoring, organizational culture cannot simply change, has an inertia, and is therefore structurally conservative.

A change in the organizational culture shows itself in changed expressed values and artifacts, because only those can really be observed. For the organization's leadership, the question arises whether and how organizational culture can be consciously influenced and designed. Organizations are cultural systems that undergo a continuous development with their own idealistic and material realities. Thus, the influence of the organizational culture is possible only through a culture-conscious management in the sense of offering certain "realities," a "vision" of the desired organizational culture. The development of an organizational culture—be it a simple adjustment or fundamental change—is an ongoing task for the entire organization (see Fig. 5.19).

The development begins and ends with the deliberate confrontation with the existing organizational culture, as manifested in the values, beliefs, behaviors, and artifacts. The crosscheck against a vision of the organizational culture—a wanted and targeted organizational culture—can trigger a simpler adjustment or a deliberate transformation process, in which aspects of the existing culture are changed or refocused. Then this results in an impulse to act towards implementation, so that change can eventually be accomplished. Positive changes in the expressed values

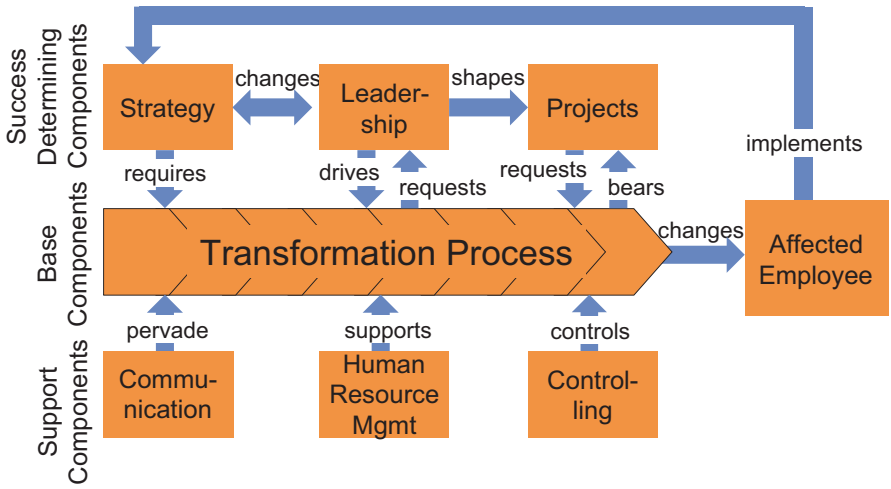

Fig. 5.20 Model of transformation management. (Source: Bernd X. Weis)

and artifacts with respect to and in the sense of the vision confirm the successful culture change.

Cultural development can never be considered separated from its societal context. The respective societal culture sets a normative framework of laws, regulations and cultural and traditional practices that need to be considered and taken into account. Thus, this is in particular very demanding for organizations, which are internationally active. Such an organization must develop a culture that on the one hand reflects the character of the company and on the other, is not dissenting the prevailing cultures in the societies, in which the organization is active. In addition, the entire development process, in which always people are at the center, can only be successful if the particular identity of the individual is respected.

The transformation of an organization's culture is based on (1) need for change, (2) readiness to change and (3) ability to change. The starting point is the **need for change,** i.e., the extent of objectively necessary changes. The **readiness to change** describes the attitudes of the interested and affected persons and organizational unit(s) towards the goals and measures of the transformation. **Ability to change** comprises to be able to successfully perform transformation processes. This implementation is the task of change management (see Fig. 5.20).

The transformation process is the basic focus of the model in Fig. 5.20. The components strategy, leadership, and projects determine the success of the transformation process. Factually, transformation is an expression of strategy. Perceived transformation needs lead to new or changing strategic objectives, which appropriate programs and projects achieve. Clearly, the organization's management significantly influences the transformation process. Transformation can only be successful if sustainable management support throughout the hierarchies is ensured. The accomplishment of a profound transformation process requires the appropriate structures of transformation. It is often advantageous to set up a project organization just for this.

The components communication, human resource management, and controlling are supportive to the transformation process. A variety of personnel challenges always accompanies profound transformation. Even the best transformation concept will fail, if the persons involved and affected are in disagreement and likely to refuse or subvert implementation. Thus, to arrive at a common understanding about the transformation process, intensive communication is essential. For planning, management, and control of the process, a developed, prudent controlling is also necessary.

In summary, it can be stated:

- Every organization has an organizational culture. The organizational culture creates a solid framework, within which the organization's members assume their responsibilities.
- Organizational culture is not the result of a design, but of a continuous, collective, and time-intensive development process. Organizational culture should harmonize with the societal culture.
- Organizational culture has an inertia and is therefore structurally conservative.
- Goals of a transformation in organizational culture need to reach and motivate the people and should not dissent the respective individual identities. In this, managers are leading figures.
- Cultural transformation is reflected in the change of values, attitudes, skills, and behaviors. In the short term, often only superficial changes succeed that may however be heralds of deeper changes.

Culture is what you do without questioning it. Culture is consciously or unconsciously known; it provides certitude to act appropriately. Innovations open something unknown, something new. Culture of innovation is thus: to consider and accept as known, familiar, and normal to venture into unknown territory.

Innovation Culture

Innovation culture is a transdisciplinary culture with the imperative to pragmatically integrate anything desirable, necessary, useful, feasible, and appropriate. In the following, innovation culture is mainly considered as an aspect of organizational culture, where the respective societal innovation culture always sets the context. Innovation culture is that aspect of the entire organizational culture that aims to design structures and behaviors such that innovations are generated. Jaworski and Zurlino (Jaworski and Zurlino 2009) explicate five characteristics of an innovation culture:

- Vision
- Network of knowledge
- Inspiration and leadership
- Freiraeume[15] and
- Creativity and risk-taking

The topic vision has already been discussed in terms of a personal vision under motivation (see Sect. 5.1.1). The vision for an organization goes one step further. The **vision** describes a state in the future to be reached from the state of current reality,

[15] For the definition of Freiraeume see page 135.

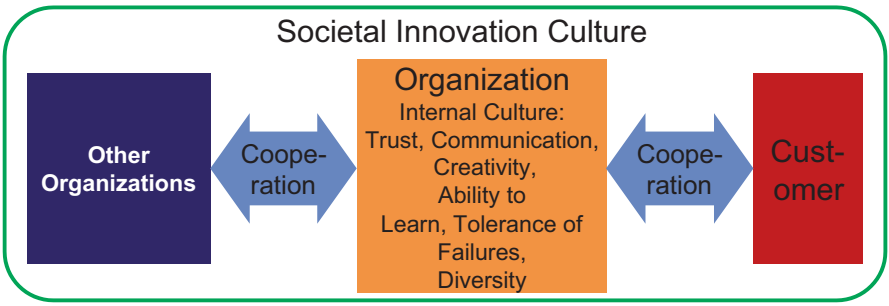

Fig. 5.21 Innovation culture and networking . (Source: Bernd X. Weis)

creating a creative tension that causes a momentum for change. The vision formulates and articulates the values and overall goals of the organization, gives meaning to the organization, and describes what really is important for the organization. It sets common goals and enables identification with the organization. The vision needs to be communicated and embedded throughout the organization, thus making it the objective and the justification for the strategic direction simultaneously. Although a vision for an organization has to sustain a longer period of time, it should be synchronized and adjusted if necessary, all over again in a continuous process.

Openness and network of knowledge have been discussed under open innovation (see Sect. 3.2.4) and open business models (see Sect. 4.2.3). In an innovation culture, openness and network of knowledge are an integral part of the organizational culture. Organizations can no longer afford to rely solely on their own internal innovativeness. Considering for instance the funding for innovation of the European Union, an international and to some degree also interdisciplinary approach is supported. One can and should go one step further and understand innovation culture as a transdisciplinary culture whose imperative is to pragmatically integrate anything desirable, necessary, useful, practical, and reasonable regardless of the discipline to which it originally stems. The transdisciplinary idea urges the inclusion of partners in value creation chain, customers, and society (Fit für Innovation 2011). Primarily, this corresponds to the developed system concept in Chap. 4. The societal innovation culture is of particular importance as it defines a cultural basis for the networks and enables a generally accepted way of acting, e.g., when cooperating: what is right, what is appropriate, how to negotiate,… (see Fig. 5.21).

It is characteristic for innovations that with and through them one will enter new uncharted territory. Thus, connected to this are corresponding requirements on **leadership**—leadership no longer means to establish rules, to require, and to monitor compliance therewith. Leadership in times of innovation means now to specify the direction with challenging and achievable goals, to **inspire** others, to create the preconditions for facing the uncertainties of the process and the result with ingenuity, to embody the values of the organization—last but not least to achieve results. Innovation is to be perceived as a task of leadership. The creativity of the decision-makers is required not only for direction setting, for the

"object of desire," for the process of innovation and the achievement of goals, but also for leading creative teams—leading means to constantly redetermine the boundaries between sub-challenge, challenge, and strain and to skilfully act in between them. Leadership in times of innovation means to take responsibility for the uncertain and insecure—with no proven rules and processes, without safety net.[16]

Freiraeume[17] for the individual are characteristic for innovation cultures, the creation of Freiraeume is a leadership task. Who is always busy with the daily business completely lacks the time and possibly the leisure to develop new ideas and impulses on own initiative, let alone implement them. On the other hand, it happens that—even as a creative—one does not always have an idea that one wants to pursue. Freiraeume are those times/spaces that are available if and when one wants and needs them—and here the leadership task links in. Innovation culture manifests itself especially in the concept of Freiraeume: the organization trusts its members to act responsibly in accordance with the organization, to divide one's own time how it deems appropriate for oneself and useful for the interests of the organization; and the organization grants the freedom to act in turn. The knowledge to be able to pursue one's own project when one wants to, encourages the members' creativity and initiative at all hierarchical levels in the organization. Then, in these Freiraeume "flow" can arise, a state in which attention, motivation, and environment coincide in productive harmony.

All human beings are **creative**. The very fact that they find their way in an uncertain, complex, and above all nondeterministic—contingent—world with its ever-new challenges is a strong indication: "No problem can be solved from the same level of consciousness that created it."[18] Tasks or problems that may come from the inside or from the outside initiate creative processes in humans which eventually, using one's knowledge and abilities after a series of loops of reflection, rejection, and again rethinking, lead to a first sketch of a solution. Often, in the loops of reflection and contemplation, neither the task nor the solution are specifically formulated and communicable.

Once the task and the outline of the solution are formulated, the innovation process is started (see Fig. 5.22). Especially for the loops of reflection and contemplation Freiraeume are needed. And for this, the organization must trust their members. In the organization, creativity is highly valued, it is appreciated, is deeply rooted in the symbol and value system, and designed for the people to be seen and experienced.

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[16] Gräser: *Führen – Lernen.*

[17] The German noun Freiraeume refers to what is ordinarily called "free space," and also what is called "room for ideas", "room for self-actualization" and the likes. Freiraeume refers to the kind of opportunities given, that allow to pursue activities that are not on the specified agenda, e.g., to create and follow up with new ideas. Translations coming near are "latitude" or "leeway".

[18] Bon mot of Albert Einstein http://www.brainyquote.com/quotes/quotes/a/alberteins130982.html.

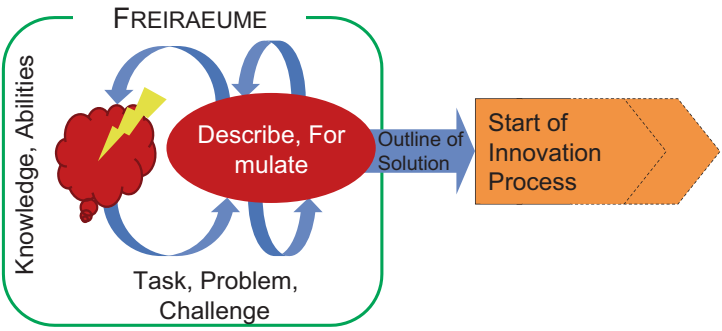

Fig. 5.22 FREIRAEUME for creativity. (Source: Bernd X. Weis)

It falls short when innovation is limited only to the areas traditionally regarded as creative such as research and development or marketing; profound innovation can happen anywhere and in many different areas. All organizational members are involved no matter what tasks they perform at the moment—innovation can be big or small, they are to be appreciated in every case.

The **diversity** of people—for example, age, national origin, sex—with their different perspectives positively affects creativity and innovativeness. Diversity is the source of the variety of perspectives that can break up and open the confines and limits of imagination and thought (business myopia), thus releasing creativity and innovation—too little diversity constricts and hence has a negative effect. However, the opposite also is observed—diversity can lead to irrelevance and the dilution of goals, and then has a negative effect (Perry-Smith and Shalley 2003). How organizations handle diversity is subject of diversity-management (Krell et al. 2007; Stuber 2009).

Interesting for the question, where typically ideas come up, is an empirical study of the author (Weis 2012). According to this, ideas for sustainable innovations are conceived in equal proportion at work and in spare time. However, ideas for disruptive innovations are conceived only 35 % at work, but 65 % in spare time—a more detailed breakdown of where ideas are conceived is found in Fig. 5.23. This study supports the findings Professor Urs Füglistaller reported (Füglistaller 2002).

Some work and all spare time situations are considered typical off-topic situations—in contrast to on-topic situations. Then, to a large extent ideas for innovation are conceived in off-topic situations (71 % for sustainable, 83 % for disruptive innovations). Only 29 % of the ideas for sustainable and 17 % for disruptive innovations are born in on-topic situations.

This makes it clear that FREIRAEUME[19] are not only limited to the organization, but that other contexts significantly affect creativity and innovativeness. Innovation culture does not stop at the gates of the organization!

[19] For the definition of FREIRAEUME see page 135.

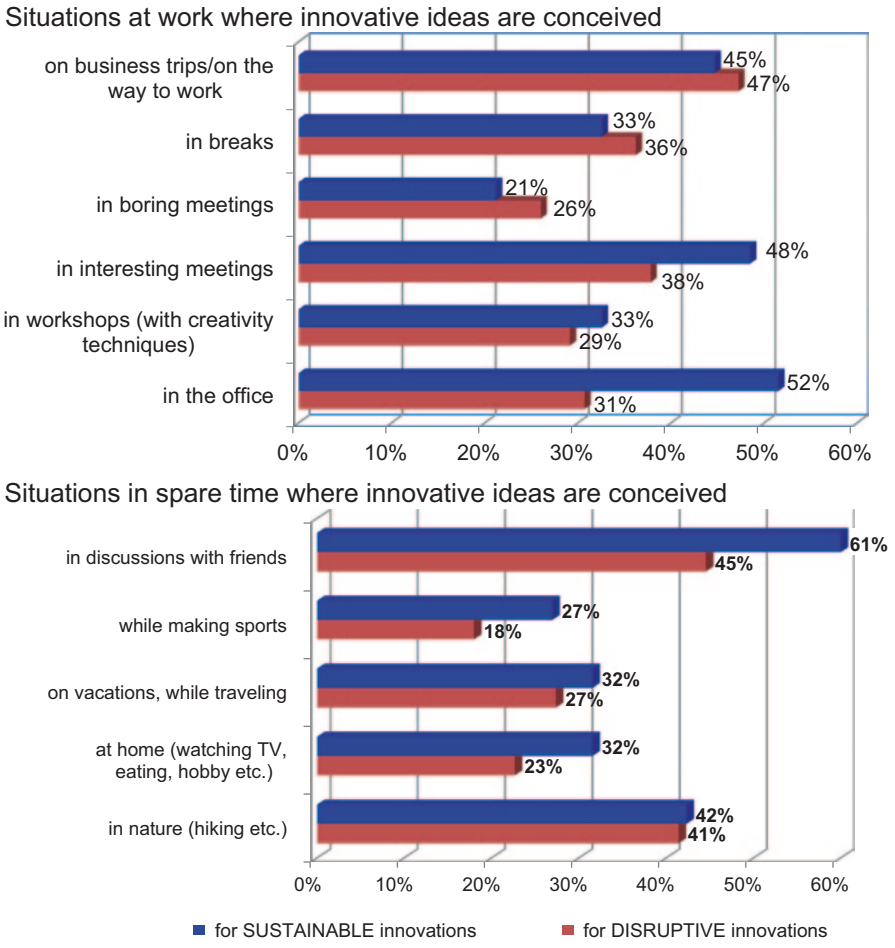

Fig. 5.23 Where ideas are conceived. (Source: Bernd X. Weis)

The results of the creative processes are neither predictable nor can they be planned, their success even less. If one wants creative processes in the organization, one has to expect that some—perhaps even many—do not meet the expectations; this is the **risk** if one wants to be innovative, and it is inevitably and inherent in the process itself. Innovation projects are always subject to risks, and therefore occasional failures are unavoidable. This a priori uncertainty has to be accepted. Thus, it can be deduced that in an innovation culture the creative individual is willing to summon up the courage and to take the risk of wasting time and resources on a perhaps not such a good idea. Similarly, the organization is willing to take the risk and tolerate **errors and failures**. Errors, mistakes, and failures are not sanctioned, but seen as opportunities to learn for the future. "The day belongs to error and failure,

the course of time to success and achievement,"[20] as Goethe had already noted. The respective characteristics of the willingness to take risks are entrenched on the one hand in the individual and on the other in the innovation culture of the organization.

To the above-mentioned features of an innovation culture, three basic features are to be added, namely, communication, recognition, and learning abilities. In innovative organizations, a **communication culture** of benevolent, trusting, respectful, and mindful interaction with each other, of open-mindedness, team spirit, and honest feedback and of **recognition** of performance prevails. This is reflected among others in the fact that important and useful information is made available to the parties in good time and to a sufficient degree, and that innovation projects are visible across the organization (Jaworski and Zurlino 2009). However, honest and transparent communication also means that not only the successes, but also the failures and mistakes are openly communicated—and with them the associated frustrations and disappointments (Delhees 1994).

For Peter Senge (Senge 2011) the **learning ability** of the organization is the "discipline," which accounts for an innovative organization. The individual—and with him the organization—learn from successes, failures, and mistakes, from trial and error, from others, and from acting together with others.

How these characteristics are actually expressed may differ in different work areas within an organization—and in most cases, these differences may be stimulating. It is essential that these differences are not necessarily eliminated at the corporate level, but integrated as a feature of the specific corporate culture (Handy 1976).

These characteristics have to be mapped accordingly in effective **labor, management, and participation processes** and to be lived there, such that the individual work–life balance is harmonized for each individual.

5.2.2 Innovation Management

Innovation management is the systematic planning, management, and control of innovation in organizations. Innovation management is geared to the exploitation of ideas, i.e., their implementation into commercially successful products and services. Innovation management is part of the implementation of the corporate strategy.

Innovation Processes

The Canadian Robert G. Cooper developed the **Stage-Gate® process** (Cooper 2001)[21] for innovation and product development, which is supposed to accelerate development and to lead to a successful outcome (see Fig. 5.24).

The process is divided into stages and gates. The outline of the general process depicted in Fig. 5.24 is typical and can be adapted to each specific project tasks. Each section has to reach the milestone predefined in the project plan within the specified time and with the given resources. It is important that gates be defined at the end of each stage, in which a decision is made on whether the project is to be

[20] Johann Wolfgang von Goethe: *Maximen und Reflektionen*, http://www.wissen-im-netz.info/.

[21] http://www.stage-gate.de/.

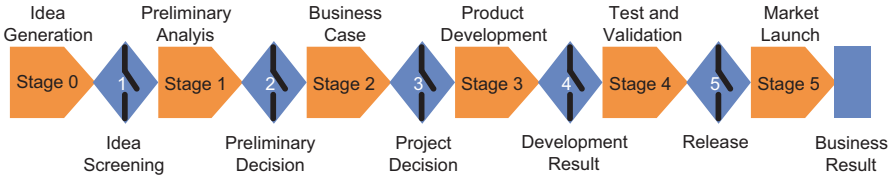

Fig. 5.24 Generic Stage-Gate® process according to Cooper. (Source: Bernd X. Weis)

continued or terminated. The management team, who on the one hand has control over the resources and the other has the overview of other projects, which possibly compete for these resources, takes the decision.

The success factors for this process are listed below:

- Development of products with unique benefits and advantages for the user
- Strong market orientation during the entire development process
- Thorough groundwork before beginning the actual development phase
- Precise product definition at an early stage of the project
- Strict hop or top decisions in the development process
- Reliable provision of adequate resources for the current project and
- Bestowment of the project managers and development teams of the different organizations with sufficient authority and powers

The application of these success factors must be checked for each development project to ensure that the appropriate procedures are integrated into the formal process, and that those measures are implemented, which can change behavior and work patterns.

The stage-gate process appears with its strict sequence of stages and decision gates somewhat rigid. Nevertheless, it all depends on how the process is lived in the organization.

The St. Gallen scientist Oliver Gassmann and Philipp Sutter (Gassmann and Sutter 2011) described a process that allows more flexibility (see Fig. 5.25). The **innovation process according to Gassmann and Sutter** is divided into two main phases: the first phase—the cloud phase—in which Freiraeume[22] exist for creative approaches, and the second phase—the module phase—in which structure and process management are required.

The first phase begins with a **search field analysis**, in which potential areas of innovation are surveyed by investigating market and technology trends and competition, as well as suggestions and feedback of customers. In the **product portfolio** the current products and projects with their schedules and resource requirements are represented, which compete for the resources available. Possible gaps with respect to the organization's strategy reveal needs for action and ignite ideas for possible new business opportunities. Clearly defined **core competencies** narrow the possible projects down. These activities are always fueled from the creative ideas of the

[22] For the definition of Freiraeume see page 135.

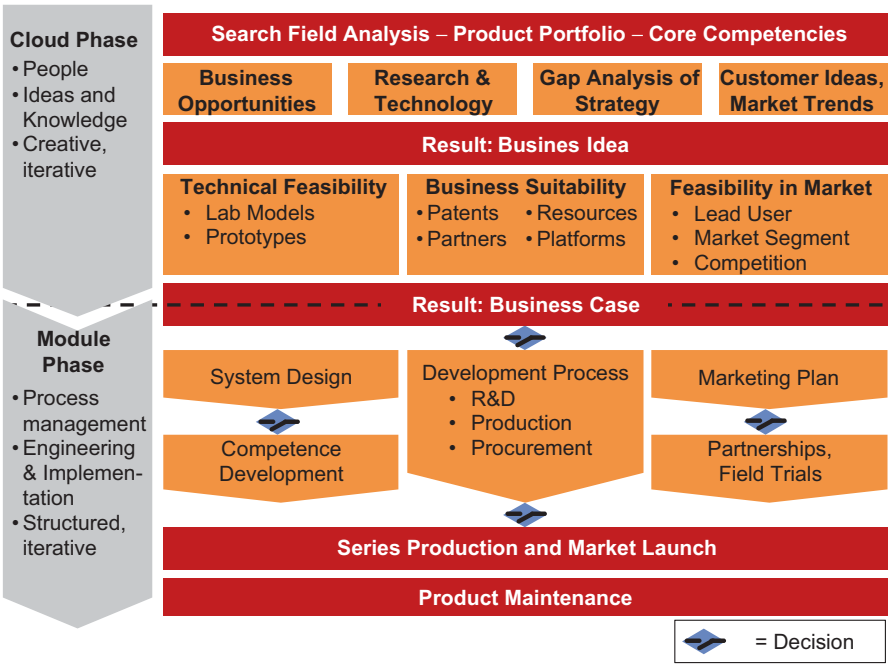

Fig. 5.25 Innovation process according to Gassmann und Sutter. (Source: Bernd X. Weis)

people and the leadership team, whether something new is being tackled, something already existing is being fundamentally improved or something successful is being imitated. The result of this step of the process is the **business idea**, with which the original idea is embedded in the organizational context.

First of all, an idea is an idea. From a business perspective, some questions for the assessment of the opportunity are to be clarified: Are there any protective rights such as patents, etc. which can interfere restrictively? Are possible partners already envisaged? What about the resources? Are sufficient resources available or can or must they be provided, respectively? Are established or wanted platforms to be considered? In addition, the business idea is tested to check whether it is at all technically feasible. For example, quick and easy laboratory models and prototypes can often help. Assessing the feasibility in the market is a somewhat complicated matter especially when neither the company nor the partners have experience in the targeted market segment. Here one can actively involve "lead users"[23] in the process. All these activities contribute essential information and at the end of this phase, a **business case**[24] is compiled. Based on the business case, it will be decided whether the project will be continued or terminated and, if continued, how. This phase will be discussed in detail in the following chapter.

[23] "Lead User" are users who express or appreciate a need and want to have it satisfied earlier than the mass market.

[24] "Business Case" describes a business scenario for evaluating the consequences of business decisions (see Chap. 6).

The second phase of this process is much more structured and strictly aligned in sequence and procedures. It requires more planning and a more intensive project management. The **system design** includes the specification of the functionality, the system architecture with functional partition into components, such as hardware and software, the definition of the technologies and materials to be deployed. If no insurmountable obstacles and problems are to be expected, the project is tested against the key conceptual risks using functional models or simulations. In the **development process**, research and development work closely with procurement/suppliers, production, and service. At this stage, quite accurate estimates of development and production costs are possible. In parallel, a **marketing plan** for the development result is created, in which, among others, a marketable price policy and a market entry strategy are determined. Especially in the functional specifications that map market demands to functionalities and in determining costs and prices, the three sub-processes, i.e., system design, development, marketing, and the partners must cooperate closely to ensure that the product is optimally developed from a technology, customer, and economic perspective. For example, no functionality should be developed, however beautiful and useful, but for which in the end no one wants to pay. In field tests, the fitness of the development outcome for series production is checked and, ultimately after development completion, **series production, market launch**, and **product maintenance** follows.

In Chap. 3, sustainable innovations—"do it better!"—and disruptive innovations—"do it differently!" or "do something different!" were distinguished. In the context of this distinction, this type of innovation process as part of the business processes is optimally suitable to control sustainable innovations in the organization if they are adapted to the organization's specifics. It is also known by "continuous improvement process" (CIP). The continuous improvement process is an essential part of the standard ISO 9001:2008. It requires companies to ensure with organizational means that the process followed in all areas of the organization including the management.

However, these type of processes are less suitable for innovations that show a disruptive character already from the start. Why this is the case will be justified in the following. However, how does this disruptive character show up? Disruptive innovations are Black Swans (Taleb 2010), which have already been discussed in Chap. 3, because:

1. A priori the chances for success cannot be stated.
2. If the innovation is successful, substantial profits can be made and
3. In retrospect, it is obvious that and why it had to happen exactly as it did.

An innovative project renders a disruptive innovation only if it successfully prevails in the market. That a disruptive innovation has been developed can only be assessed a posteriori, i.e., when it is a market success, or at least reveals reliable indicators of a potential market success. Then joy and delight are great when the organization has helped to give birth to a disruptive innovation and can draw the corresponding profits from its parenthood.

First, however, these potential black swans lead one straight into the decision dilemma: should one invest in the project or not.

Strategy and Organization for Disruptive Innovations

So how can one tell whether an idea, an invention becomes a disruptive innovation? How does the beginning of a disruptive innovation look like? Gunter Dueck tells the story (Dueck 2002) that he has proposed to the management of IBM, but to create a catalogue of the Internet similar to a phonebook such that information can be looked up easily and quickly. He was rebuffed. Where is the business? Who pays for that? Who wants that anyway, with only a handful of people having Internet at home? Some time later Yahoo came, who created a directory of the Internet financed by advertising. Dueck admits to have perceived this venture initially as joke, but then concedes that his idea has been somewhat more "stupid" than that of Yahoo, namely to conceive something new into something existing, rather than—like Yahoo—to reconceive the whole in total. All in all, this was not a great moment for IBM. The competitor of Yahoo and today's market leader Google has—as of the end of 2011—a market capitalization of more than US $ 207 billion against IBM with nearly US $ 217 billion,[25] an enormous success with a product that allegedly "nobody wants."

According to Christensen (Christensen 2000), disruptive innovations have some special characteristics, which can be summarized as follows. Disruptive innovation, if successful, generally create new markets. Organizations that engage early in these emerging markets, have significant advantages over those that spot these markets later. In turn, organizations that have grown in these emerging markets have difficulties to adapt to even newer markets. Therefore, for large organizations emerging markets are not necessarily drivers for growth, because they are simply not large enough to contribute significantly to the growth of the organization. **Small markets do not meet the growth needs of large companies.**

In addition, the new markets—if they actually materialize—are fraught with fundamental uncertainties. There is no experience; there are no customers that could be consulted. Ultimately, these new markets escape the classical processes and techniques of business planning. How could business management then make decisions using the classic decision-making methods and tools—using forecasts of market, market share, costs, prices, profits? **Markets that do not exist (yet), cannot be analyzed.**

So what happens when an organization launches a product in the market that the majority of customers does not want and that does not sell well, a product that gives answers to problems, of which the customers do not even know that they have? It will not survive for long, because it is ultimately the customer, who supplies the financial resources for the company when buying products. If this is not the case, then investors will withdraw from the organization. Many organizations hesitate to allocate resources to projects to pursue business opportunities with products producing low margins, for which initially there is only a small market and which customer not (yet) want—and when demand for the products picks up, it is often too late. **Businesses need customers for their new products and investors for their resources.**

Established businesses refine and improve their products with sustainable innovations—and this is often bread-and-butter business. In addition, the products

[25] Financial Times Global 500: *Die 100 größten Unternehmen der Welt*, Stand: 31. December 2011.

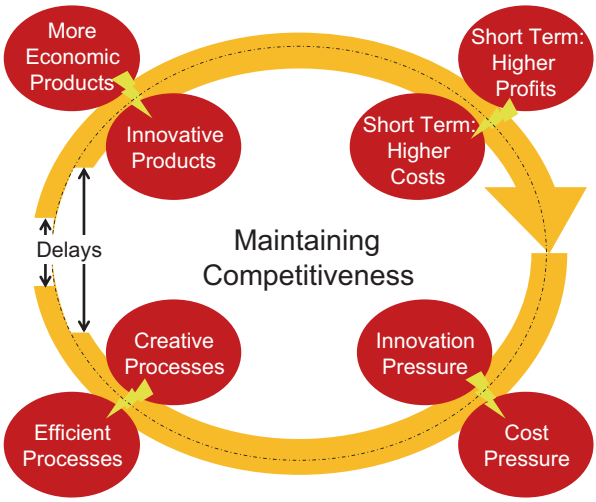

Fig. 5.26 Contradicting capability requirements of an organization. (Source: Bernd X. Weis)

usually offer sufficient room for improvement. In this process, products are often improved in such a way that these additional "improvements" are not perceived as such by the customer and therefore are no longer differentiators. This then would not allow a higher price in the market. **The technology supply may not meet the market demand.**

Because of price pressure that prevails in almost all established products and markets, organizations have designed their processes for high efficiency—and vice versa: Inefficient processes in organizations are a clear competitive disadvantage. Not only the processes, but also the entire organizational culture is focused on efficiency—and rightly so. Organizational culture has been discussed in detail above; since it is structurally conservative, it is tedious, though worthwhile to shape culture in organizations. Here, the fundamental paradox of innovation management is revealed—to act extremely flexible and creative in an organization that is in its very nature focused on being highly efficient (see Fig. 5.26). **The particular capabilities of an organization define their particular disabilities.**

Innovation processes almost inevitably generate the following conflicts, which must be dealt with:

Sustainability	vs.	short-term earnings expectations
Markets	vs.	resources
Competition	vs.	cooperation
Stability interest	vs.	need for flexibility
Cost pressure	vs.	pressure to innovate
Emergence	vs.	purpose
Efficiency	vs.	effectiveness
Control	vs.	commitment
FREIRAEUME[26] and learning time	vs.	efficient execution of processes

[26] For the definition of FREIRAEUME see page 135.

With these contradictions Aristotle's "right mean"[27] also would not really help—half-heartedly giving way to both cost pressure and the pressure to innovate, perhaps one time the one, then the other, results in a competitive environment in rather counter-productive solutions. On the one hand, an organization has to live with these conflicts—they are ultimately due to the customer and the competition, on the other hand, an organization can also take measures to keep the effects of these conflicts as small as possible.

In general, organizations can get their bearings using Taleb's winning strategy (Taleb 2004), which, although derived from the brokerage business, has enough similarities in order to be adapted to these situations. Taleb's credo is to invest in as many as possible small, but risky projects, which if successful yield above average profits. Thus, the losses of bad investments can be (over)compensated. The empirically verified knowledge that simply not all innovation projects are successful, creates with the organization's management and with the investors the necessary serenity and "failure tolerance," which have been claimed as traits of an innovation culture.

Organizational Measures

Most companies have a functional organization—innovative-creative functions such as research development, and marketing, and efficiency-oriented, such as production, logistics, and distribution. With this division, it is possible to design the organization with respect to the specific needs. However, it will also create domain-specific cultures that evolve independently and therefore eventually lead a life of their own. In small companies, this poses no real problem, because everyone knows everyone else and issues can be dealt with through "unofficial channels." In larger organizations, however, the complexity of the tasks increases, and domains tend to focus only on their own tasks and to optimize within the scope of their own activities. In this case, coordination and communication take place along the management hierarchy, and cross-domain coordination is typically done on appropriate management level. Thus, without additional measures opaque, impermeable silos emerge that hinder cross-domain collaborations, leading to delays and additional costs.

To soften these rigid structures, matrix organizations have developed (Torrington and Hall 1987). Michael Hammer and James Champy propagate in "Business Reengineering" (Hammer and Champy 1994) and in particular "Beyond Reengineering" (Hammer 1996), a change in perspective. It is not (only) about the vertical, hierarchical structure of the organization, but also about a horizontal, that focusses on the processes—and predominantly on those processes that are particularly well understood and implemented in the company. Most organizations more or less maintain their hierarchical structures in which the organizational strategy is implemented. Processes, however, are carried out in flexible teams, which are staffed as needed with people from different domains. This gains flexibility and speed and thus cost

[27] Aristotle: *Nikomachian Ethics.*

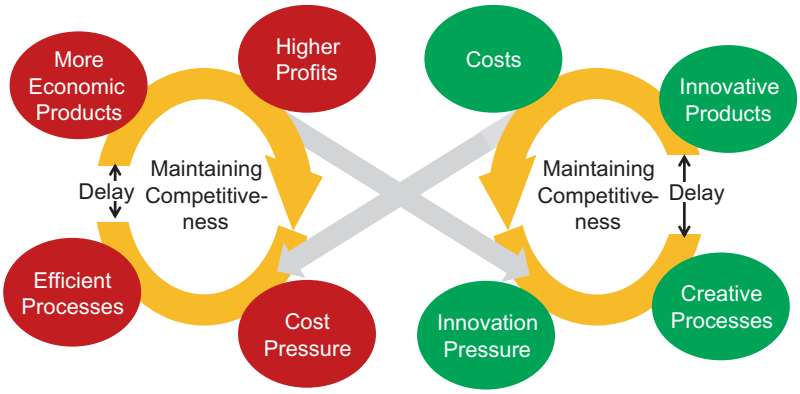

Fig. 5.27 Organizational separation. (Source: Bernd X. Weis)

advantages because on the one hand the parties involved have to take greater responsibility for the process, and on the other because of a flat vigorous process management. Nowadays this type of matrix organization is found in most organizations. Project management follows essentially the same lines.

Both organizational forms have in common that they are focused on efficiency, whereas the process- and project-oriented organization is granted a significant advantage in terms of innovativeness—particularly for sustainable innovation.

Organizations that also count on disruptive innovations create very specific structures dedicated to topics with disruptive potential (see Fig. 5.27). Thus, Deutsche Telekom (German Telecom) Innovation Laboratories (T-Labs), the central research and development unit of German Telecom, is a subsidiary unit. T-Labs focuses primarily on issues and new technologies, whose market introduction or market maturity is expected in up to 5 years[28]. The Bell Laboratories[29] are also very famous owing to their ground-breaking innovations such as transistors, mobile communications, the UNIX operating system and the C programming language, and its Nobel Prize laureates.

In consequence, own businesses are founded acting as independent organizations, but owned by the respective parent company. Examples are: BAYER INNOVATION GmbH (BIG) is part of the innovation strategy of Bayer. BIG aims to identify and to develop new growth areas for Bayer and thus to facilitate access to new growth markets. The areas explored by BIG match the Bayer model of "Science for a Better Life" and use competencies of the Bayer subgroups, often in conjunction with external partners such as universities, institutes, start-ups, or other companies. BIG develops innovative solutions beyond the subgroups' boundaries

[28] http://www.laboratories.telekom.com.

[29] http://www.bell-labs.com.

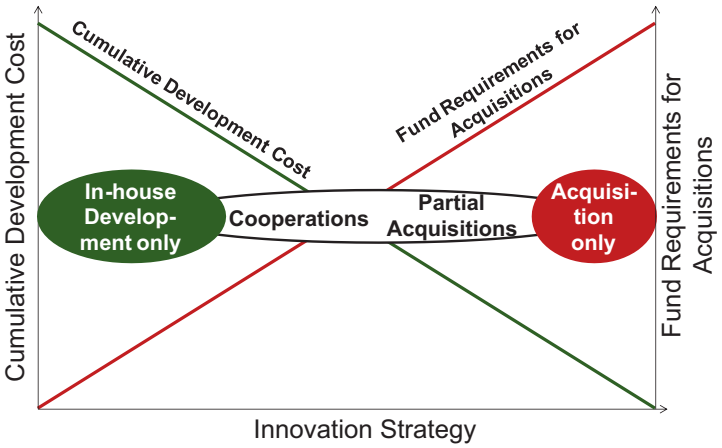

Fig. 5.28 Innovation strategy in-house development versus acquisition. (Source: Bernd X. Weis)

and new products and businesses opportunities together with external partners[30]. BASF Future Business GmbH, a corresponding company of the BASF Group, develops new business for BASF[31].

The strategy of spinning off independent organizations also simplifies collaboration with partners by founding joint ventures—companies that the partners own proportionately. An example of this is that Daimler AG and Robert Bosch GmbH expand their long-standing partnership and cooperate in the development and production of electric motors for electric vehicles in Europe in a 50:50 joint venture. On the one hand, competencies are concentrated and risks shared, on the other hand, this step requires mutual trust and experienced management.

In-House Development or Acquisition—or in Between

Potentially disruptive innovations can be developed and marketed in-house, in collaboration with other companies or by acquisition of the results from other companies or inventors. Here all intermediate levels are possible as shown in Fig. 5.28. Examples of in-house developments are abound, an example of the "acquisition only" strategy is Cisco[32]—a network equipment supplier—who buys promising small companies with interesting technologies and integrates them into one's own company.

Use of venture capital

A number of large companies has begun to invest in companies that want to market an innovation. Thus, the corporate venture capital arm of the BASF Group

[30] http://www.bayer.de/de/bayer-innovation-gmbh.aspx.

[31] http://www.basf-fb.de/.

[32] http://www.cisco.com.

invests in start-up companies and venture capital funds. Promising innovative, chemistry-based technologies and new materials with favorable market expectations are the focus of the investments. In addition, targeted interactions between the global expertise and research network of the BASF Group and its portfolio companies safeguard its venture capital investments. This aims to combine the strategic and operational interests of the BASF group with young companies with innovative technologies. Preferably, it already begins investing at a very early stage of a business, typically with a minority stake—usually in syndication with other venture capital funds[33].

Robert Bosch Venture Capital GmbH (RBVC) invests in start-up companies either participating directly or through venture capital funds. RBVC usually gets involved with a 10–20 % minority equity position in those companies[34].

Freudenberg Venture Capital GmbH (FVC) provides risk capital for innovative, technology-oriented companies, which engage in Freudenberg-related areas. They only acquire interests as minority investor, because experience has shown that the dynamics of young growing companies can be preserved best when the founders themselves and the management are kept in responsibility. The primary objective of FVC is to increase the value of the investments and to realize this through selling the interests. In addition, through the involvement in young technology companies, the so-called Window on Technology is opened a little further for Freudenberg[35].

According to Taleb's winning strategy—many small, albeit risky investments—equity capital is invested through venture capital interests in many small companies with good ideas. These investments are risky, but if successful, promise disproportionately large profits, so that the odds are very good when evaluated across the entire investment portfolio. Then the shares in companies that develop according to expectations are either sold at a profit or completely acquired if the products fit into the investor's product portfolio.

Innovation Management is Change Management

Innovations characterize that with and through them one will enter a new uncharted territory. Thus, innovation management is at the same time change management, which has to account for both, for the novelty of the innovation itself and for the continuous changes in the market as well as societal conditions, such as:

- Acceleration of technological change
- Growing dynamics of change and increasing uncertainty
- Globalization of production, innovation and sales processes
- Decentralization and networking
- Growing reliance on competence and knowledge
- Increasing importance of the service economy
- Transformation from customer orientation to customer innovation

[33] http://www.basf-vc.de.

[34] http://www.rbvc.com.

[35] http://www.freudenberg-venture.de/.

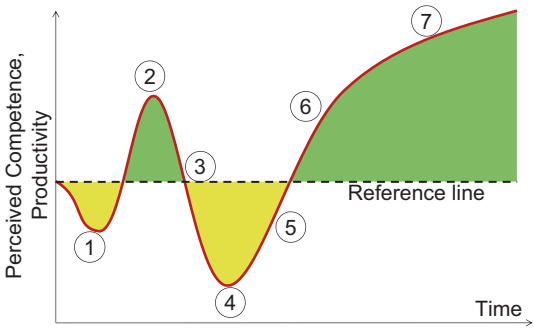

Fig. 5.29 Seven-phases-model of change. (Source: Bernd X. Weis)

- Demographic change
- Blend of work and learning
- Changes in work and learning biographies

That these issues entail changes and transformations is generally undisputed. However, the options that arise and the consequences that are to be drawn provide matters for many worthwhile debates. Usually the possible options come with desirable as well as undesirable consequences, which are often even contingent, i.e., it may be this way or quite as well some other. In processes of change, usually four camps are observed:

- The protagonists who drive the process
- The supporters
- The skeptics who first want to see successes, and
- The opponents who do not want this change at all

This makes change management difficult, the protagonists have the structural disadvantage that they first need to explain the desired outcome with all the shortcomings, while the opponents have the ready state their desired one already there and tested—which is in fact the actual state.

Change processes often proceeds in phases (Carnall 1990). In the model, "seven phases of change" these are (see Fig. 5.29):

1. Shock
2. Denial
3. Rational Acceptance, Frustration
4. Emotional Acceptance, Grief
5. Opening, Curiosity
6. Insight
7. Integration

1. **Shock, surprise, and fear**
   The confrontation with change leads to a period of shock, surprise, fear, confusion, and rigidity when expectations on the situation are not met. One is "paralyzed," the own competence and ability to act are perceived as weak. The symptoms are confusion, repression, and stress. Productivity decreases. In this

phase, it is advantageous to stimulate a change of perspective to illuminate the other, the nonthreatening side of change.

2. **Denial, defensiveness, and anger**
   The need for change is not accepted. One convinces oneself that the new state is hardly any different from the old or that the intended changes are impossible to come about. These rationalizations are used for self-protection, all the while denying reality. The symptoms include denial, defensiveness, anger, fear, confusion, resistance to the unknown, and frustration. The anger mobilize forces and the feeling of being competent and able to cope with the situation, that one will be successful repeating old practices, which ultimately rests on perceptual distortions and euphemisms. Nevertheless, productivity increases again. It is precisely this effect that is referred to in Sect. 3.2.6 as the sailing ship effect. In this phase, perceptual distortions have to be resolved through direct dialogue and communication specifying the planned change in detail. This is the most difficult phase in the change process.
3. **Rational acceptance, frustration, and understanding**
   The rational insight is available, but it is not yet fully clear what actually and specifically has to be changed—"there must be change." Perception is now more problem-oriented, more objective and but still directed to the past. That something has to change is not yet emotionally accepted, and solutions are quickly dismissed as not viable—"that is plausible, but with us it does not work that way." The mood fluctuates between skepticism and hope. Productivity and the assessment of the own competence decline. In this phase, the benefits of the pending change must be communicated.
4. **Emotional acceptance and grief**
   Often emotional acceptance will only be achieved if the changes are in full swing. There are abundant feelings of helplessness, anger, and fear. Productivity as well as the assessment of the own competence are rock bottom. One is in what is called the "valley of tears" and one knows that one wants to get out there, but does not know how. In this phase, the past is appreciated.
5. **Opening and curiosity**
   Once the change is emotionally accepted, the view forward is open for new behaviors and for testing new skills. One experiments with and despite the knowledge that errors and mistakes are also possible. In this phase of trial and error, a supporting framework is very important; otherwise, a throwback to one of the earlier phases is easily possible. Ideas are developed how to deal with the new situation, and the opportunities and possibilities of a new beginning discovered. Thus, productivity and the appreciation of the own competence rise again. In this phase, perspectives are developed and skills and abilities are enhanced.
6. **Insight and enthusiasm**
   Experimenting and learning create security about the effect of the change, and this feedback opens the view for further opportunities that arise from the change. Also, with a growing repertoire of behaviors the flexibility of the organization increases. The own competence is assessed to be higher now than at the begin-

ning of the process and the productivity continues to rise. This phase promotes learning and self-study.

7. **Integration and self-confidence**
   The perceived competence and productivity are now higher than before the beginning of the change process. New routines are developing which adapt better and better to the situation. The learned strategies for change can also be used for other change processes. Now this change process is completed with a review—what went well, what not so well? How could it be done better next time?… The focus is now on the future.

Premonition and Anxiety

Sometimes at the very beginning of such a change process, there is even a phase of premonition, anxiety, anticipation, and concern that induces some counterproductive effects. In the organization, it is "felt" when changes are imminent. Therefore upcoming changes should be as fast and as precisely as possible communicated within the organization, such that this phase becomes as short as possible, because the longer it lasts, the more it comes associated with an undesirable erosion of productivity.

In organizations with a strong innovation culture and distinctive innovation management, phases 1 (Shock) to 4 (Emotional Acceptance) are short—ultimately the organizations is used to permanent changes, has perhaps even initiated them itself and can deal with them with the necessary confidence and optimism as well as a dash of insouciance.

Barriers to Innovation

Many of the typical barriers that prevent innovation have already been mentioned above and are summarized here.

Markets

The uncertainties in demand for innovative products and services and, where applicable, a dominance of already established competitors in potential markets is of concern.

Uncertainty and costs

Because of the uncertainties, the potential costs and risks of innovation are perceived as too high. Often the internal resources are not sufficient, and access to external resources such as public funds or venture capital is cumbersome.

Know-How

The potential for innovation is often considered to be inadequate, e.g., because of insufficient knowledge of technologies and markets, inadequate staffing in innovation activities and not enough qualified personnel can be found in the organization itself and on the labor market, insufficient availability of suitable external services, and problems in finding suitable partners for product and process development and/or marketing.

Organization

Furthermore, organizational barriers are often referred to as e.g., attitude and behavior of management and staff towards change as well as the fundamental management structure of the organization.

Institutional Factors

Lack of infrastructure, legal uncertainties, as well as legislation, regulations, standards, and taxation can reduce innovation.

5.2.3 Metrics of Innovation Performance

The goal of innovation management is to improve the innovation performance of the company. What are the criteria and metrics with which innovation performance of an organization can be measured? Only then dependable statements can be made. Good sources of information for innovation performance are the publications of the Organization for Economic Cooperation and Development (OECD) and the European Union (EU) (EU, such as The Innovation Union Scoreboard (Hollanders and Tarantola 2011; Innometrics 2011) of the relevant year. Therefore it is only plausible to use the same metric for the own organization. Clearly, any metric of innovation performance is only then really useful if one can compare results and finds an answer to the question "Where do we stand?" The objective of this EU studies is to establish the comparability of the innovativeness of the individual countries and the EU as a whole vis-à-vis other economies like the USA, Japan, or Russia, respectively. There are three types of indicators: the enablers, the business activities, and the innovative and economic output.

Among others, the indicators of the **enablers** are the human resources such as the availability of an appropriately trained and competent workforce, an attractive and excellent educational and research system, and the availability of private and public financial resources for innovation projects.

Among the indicators of the organization's **business activities** are

- Expenditures for research and development (product and process innovation) as well as in other innovation projects (marketing, organizational and business model innovation)
- The shares of closed versus open innovation, i.e., of own entrepreneurial innovation activities against networked ones
- The intangible operating assets in the form of patents or utility models (IPR—Intellectual Property Rights)

To the indicators of **innovation output on a national scale** count the number of companies that have introduced innovations either in the market or in their own organization, the number of companies with high growth, the economic success of innovations in revenue, export, and number of employees.

Not all of these indicators is useful as a metric of the **innovation output of an organization,** but some of the indicators can easily be determined in the organiza-

tion. For example, the ratio of expenditures for research and development of the organization to sales is a common metric of the innovation intensity of an enterprise.

Revenue: For product innovation on the revenue side of the business, sales revenues, which are achieved with new products in terms of total sales, is a good metric of innovation performance, where again products are both, goods and services. According to the type of products are three cases are distinguished:

1. New or significantly improved products that were introduced during the period and at the same time were novelties on the market
2. New or significantly improved products that were introduced in the period, which were novelties for the company, but not for the market (generic products)
3. Standard products that have been not or only irrelevantly altered in the period

Together, these three components form the total sales revenue. This metric, however, is highly dependent on the observation period. Products have different life cycles and traverse the phases at different speeds. For instance a different observation period is needed when introducing a high volume USB flash drive in the market, than when introducing a new PC operating system, e.g., 1 year for the high-volume USB memory sticks, 4 years for the operating system.

The shorter the initial phases of the product life cycle, the greater are the corresponding metrics, based on the observation that in this case the market demands innovations more often. A distortion of the metrics can be counteracted, if per every newly introduced product or product group an appropriate observation period is considered taking into account the specifics of the product and/or technology life cycles.

Similarly, on the revenue side of the business the contributions of marketing innovations to sales are to be accounted for. These contributions are partly due to innovations related to the product, such as product design or packaging, and other innovations in marketing methods such as pricing, advertising, or placement.

Profits: Typically with process innovations cost reduction potentials are developed, which are reflected in higher profits. Process innovations are, for example, just-in-time processes in the production, reducing the cost of storage. A metric of the utilization of process innovations are the ratio of resulting savings to sales revenues.

Expenditures: Research and development (R&D) are usually the engines of innovation. Therefore, the ratio of R&D expenditures to sales revenues is a good metric of the innovativeness of the company. R&D can be carried out in-house or in cooperation with other companies through the acquisitions of R&D results of other organizations. If necessary, R&D efforts of the organization can be incorporated in R&D projects within a national and/or international framework. These public projects are usually open innovation projects, in which the parties join forming consortia in order to manage the R&D task. This has the advantage that a portion of R&D expenses will be reimbursed and that the organization has a share of the R&D results of the other partners. Another possibility is financing of R&D expenses through loans and/or venture capital. For loans, usually securities must be deposited; venture capital requires equity interests.

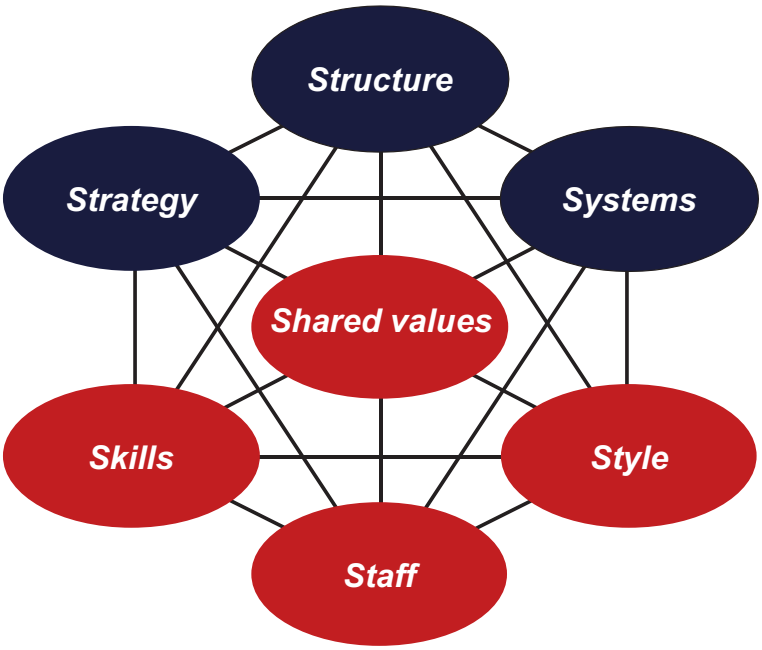

Fig. 5.30 McKinsey 7-S-Modell according to Peters und Waterman. (Source: Bernd X. Weis)

Innovation safeguard: Another common metric for the innovation performance of firms is the number of patent and utility model applications. They are very innovation specific and thus safeguard the intangible assets of the organization. Companies that are not able to protect their innovations against imitation have therefore, little propensity to innovate.

5.2.4 Innovation Management Must Fit

Many aspects of how to deal with innovation in organizations have been discussed above. For a summary, the following model comes in quite handy.

Thomas J. Peters and Robert H. Waterman (Peters and Waterman 1982) developed the 7-S model at McKinsey & Company, which is shown in Fig. 5.30. The central idea behind this model is that the effectiveness of an organization lies in the interaction of these different seven core variables[36]:

1. Strategy for a sustainable competitive advantage
2. Structure, that is, the organization of the company
3. System, which provide the framework for the processes
4. Style and corporate culture

[36] nach http://wirtschaftslexikon.gabler.de/Archiv/17887/sieben-s-modell-v4.html.

5. Staff, the organization's people
6. Shared values and vision
7. Skills, the characteristic abilities of the company

The hard-core variables strategy, structure and systems, are specifically and comprehensibly represented in strategic plans, organizational charts, process descriptions, etc. within the organization. The soft-core variables corporate culture, people, vision, and shared values as well as skills, however, can only be experienced. They cannot be stipulated; at best, they can be described and are also subject to continuous development.

The appeal of this model is that all core variables interact with each other, which corresponds to the systemic nature of the functioning of an organization. This means that changes in one core variable always cause other core variables to change—and a turbulent environment constantly demands changes, which is however not explicitly represented in the model. It is the task of leadership, of innovation management to keep these core variables despite the turbulence in a consistent harmony and balance.

It is not about predicting the future, but being prepared for it.[37]

5.3 Innovation Culture and Innovation Management: Tools

The questionnaires below are intended as stimulus for questioning the various subject areas (Tables 5.3, 5.4, 5.5).

5.3.1 Organizational Culture and Innovation Culture

Organizational culture dimensions of "Great Place to Work®-Model©". (Table 5.6)

The five broad dimensions with the 15 qualities of the "Great Place to Work model"[38]:

5.3.2 Innovation Management

The questionnaires in Table 5.7 to 5.10 support the assessment of the innovative capacity of the company.

Technological Competitive Position

The answers to the following questions will lay the groundwork for a series of further steps of the analysis of technologies and their development. With the results,

[37] Pericles, (approx. 500-429 BCE), Athenian politician and military leader, http://www.aphorismen.de/.

[38] http://www.greatplacetowork.de/great/modell.php.

Table 5.3 Leadership

Mentality	
Relative attention to internal and external problems	
Time orientation: past compared with future	
Propensity to take risks	
Worldview of leadership: which critical success factors and behaviors are considered important	
Values, norms, and goals of management	
Power	
Distribution of power within the organization	
Willingness of the leadership to use power	
Willingness of the leadership to delegate power	
Competence	
Talents and personalities in the leadership team	
Problem-solving abilities	
Management style and leadership skills	
Knowledge about the organization and the environment	
Resilience	
Work load	
Work habits	

Table 5.4 Organizational climate

Culture	
Attitude of the organization to change: hostile, passive, willing	
Inclination in the organization to take risks	
Time orientation: past compared with future	
Perspective of action: focusing attention and energies on internal processes or the environment	
Behavioral objectives: stability, efficiency, effectiveness, growth, innovation	
Impetus for change: crisis, failures, ongoing activity	
Common world view: perception of critical success factors	
Power	
Distribution of power between different cultural groups	
Stability of power structures	
Fighting spirit in power structures	

strategic options can be derived—possibly with a subsequent portfolio analysis for different business areas, if decisions on competing innovation projects are required.

The questions are grouped into five technology-related factors that influence business strategy:

1. Investment in research and development (the metric is the ratio of R&D expenditures to profit in this business area.)
2. Competitive position
3. Product dynamics
4. Technology dynamics and
5. Competitive dynamics

Table 5.5 Competence

Problem-solving capabilities of the organization, trial-and-error method, optimizing available alternatives, creating new alternatives	
Problem-solving process: hierarchical or problem-oriented	
Leadership processes: perpetuating the past, anticipating the expected future scenarios, developing new scenarios	
Management information: extrapolated or broad environmental monitoring	
Organizational structure: ability to handle complex tasks and problems	
Remuneration and incentive system: delivered performance, growth, initiative, creativity	
Tasks: narrow and exactly specified or open	
Technological support for decision-making	
Human resources in line and staff functions	

Table 5.6 Dimensions of "Great Place to Work-Model"

Credibility	Applicable	Partially applicable	Not applicable
Open and unrestricted communication			
Competent organization of human and material resources			
Integrity and consistency in the implementation of goals			
Respect			
Supporting professional development and recognizing achievements			
Cooperating with staff at relevant decisions			
Taking into account the individual circumstances of staff			
Fairness			
Balance—balanced treatment of all in terms of remuneration and recognition			
Neutrality—no favors in hiring and promotion			
Justice—no discrimination and opportunities for appeal			
Pride			
In personal work and individual contribution			
In the work of team or group			
In the products and services of the organization as well as its position in society			
Team orientation			
Opportunity to be oneself, to be authentic			
Socially friendly and welcoming atmosphere			
Team spirit, togetherness"			

Table 5.7 Innovativeness

Innovativeness	Assessment		
Observation of environment	Applicable	Partially applicable	Not applicable
We survey at least once a year our customers about the quality of our products and services			
We survey at least once a year our customers, about what products and services they need in the future			
We do a lot of in-house market research			
We quickly discover if our customers are changing their preferences			
We quickly discover if our industry environment changes (e.g., competition, technology, regulation)			
We regularly examine possible changes in our business environment			
We discuss at least once a year with external experts, what new technologies could be relevant for us			
We monitor and regularly examine new developments of our competitors and other external organizations			
Test of opportunities			
Our marketers discuss with other organizational functions future customer needs			
Our researchers and developers discuss with other organizational functions future technical possibilities and requirements			
Important information (customers, markets, competition) is quickly made public in the organization			
Customer satisfaction surveys are regularly published in the organization			
Idea generation			
We are actively trying to identify customer needs			
We are actively trying to find new solutions to already known problems			
Our employees have time to explore new ideas			
We regularly make creativity workshops to generate new product ideas			
We actively seek new ideas for new products outside the organization			

Table 5.7 (Continued)

Innovativeness	Assessment		
Idea evaluation	Applicable	Partially applicable	Not applicable
We use selection tools for idea evaluation (e.g., checklists)			
We have dedicated a specific person or a specific team to evaluate ideas			
We have a formal process for idea selection			
Concept, project and business planning			
We identify and communicate the unique selling proposition of the product prior to development			
We analyze patents prior to development			
We make a detailed market study prior to development			
We examine the technical feasibility prior to development			
Development decision			
We have dedicated a specific person or a specific team to assess development proposals			
We have a formal process for selection of development proposals			
We have selection criteria in the assessment of development proposals			
We choose only the proposals that meet the selection criteria			
Technology dynamics			
The technologies in our industry are changing very fast			
Technological progress offers great opportunities			
Changes in technology enable many new product ideas			
Breakthrough technology changes are rather rare in our industry			
Market dynamics			
Customers significantly change their preferences over time			
Our customers are always looking for new products			
We reach with our products entirely new customers			
New customers have different needs than our traditional customers			
We have maintained our customer base over time			

Table 5.7 (Continued)

Innovativeness	Assessment		
Marketing information	Applicable	Partially applicable	Not applicable
We collect the relevant marketing information prior to development			
We reduce marketing uncertainty prior to development with respect to			
External			
Customer needs/requirements			
Competition			
Market potential			
Purchasing behavior/price sensitivity of potential customers			
Internal			
Marketing strategy			
Required marketing resources			
Technical information			
We collect the relevant technical information prior to development			
We reduce the technical uncertainty prior to development with respect to			
Product design, technology selection, features and properties			
R&D strategy			
Required R&D resources			
Customer satisfaction			
Our portfolio is competitive			
Our portfolio leverages the best available technology			
Our portfolio fits our skills and capabilities			
Our process is well organized			
Our process is cost- and time-efficient			
We systematically prioritize our project proposals			
Intellectual property rights			
How many patents were filed in the last 12 months			
In comparison to competition			
We have more patents			
We have more patents on fundamental inventions			

For each of these factors, specific questions are listed which ultimately determine the intensity of the factor.

Additionally, technological turbulence and the aggressiveness of the own strategy is assessed. Technological turbulence is an indicator of the stability of a tech-

Table 5.8 Technological competitiveness

Technological competitiveness	Assessment				
Investment in research and development (R&D)					
R&D expenses as % of income	Low		Medium		High
Competitive position					
Development leader	Imitators		Follower		Innovator
Product leader	Imitators		Follower		Innovator
Process leader	Imitators		Follower		Innovator
Product dynamics					
Frequency of new products	Low		Medium		High
Length of the product life cycle	Long		Medium		Short
Technological progress between two successive product generations	Small		Medium		Large
Technology dynamics					
Frequency of new technologies	Low		Medium		High
Length of technology life cycle	Long		Medium		Short
Number of competing technologies	One		Some		Many
Competitive dynamics					
Technological product differentiation	None		Medium		High
Technology as competitive factor	Unimportant		Important		Key factor
Competitive intensity	Low				Intense
Forced product obsolescence	None				Often
Technological solution to regulatory requirements	Unimportant		Important		Key factor
Technological solution to customer requirements	Unimportant		Important		Key factor
General assessment					
Technological turbulence	Predictable				Unpredictable
Aggressiveness of strategy	Passive				Aggressive

nology in a business area. If there is little or no technology change over the product life cycle, the development is predictable, however, if there are many technology advances, i.e., turbulence, it becomes unpredictable.

This questionnaire can also be used for an actual/target comparison to identify any strategic gaps:

A. Evaluation of the factors now

B. Evaluation of the factors for the future

The individual factors are weighted to come up with a single metric of the technological competitive position (Table 5.8).

Growth Potential

The questions are designed to discover from the present perspective opportunities for, but also risks to growth. The questions are always related to a potential future development.

Table 5.9 Growth potential

Growth potential	Assessment of change		
Growth of the relevant economic sector	Falling	Constant	Rising
Growth of customer groups	Falling	Constant	Rising
Rate of geographic market expansion	Shrinking	Constant	Expanding
Rate of product obsolescence	Smaller	Constant	Greater
Rate of product innovation	Smaller	Constant	Greater
Rate of technological innovation	Smaller	Constant	Greater
Saturation of demand	Less	Constant	Greater
Social acceptability of product/service	Less	Constant	Greater
Regulation of cost	Greater	Constant	Less
Regulation of growth	Greater	Constant	Less
Opportunities for growth and profitability	Smaller	Constant	Greater
Risks for growth and profitability	Greater	Constant	Less
Other factors			

This questionnaire can also be used for a comparison of the expectations for the near and distant future to identify any relevant changes:

a. Evaluation the factors for the near future
b. Evaluation the factors for the distant future

Depending on the business area surveyed, the time horizons for a near and distant future are to be defined (Table 5.9).

Profit Potential

These questions are designed to discover from the present perspective potential for but also risks to profit. The questions are always related to a development in the future.

This questionnaire can also be used for a comparison of the expectations for the near and distant future to identify any relevant changes:

a. Evaluation the factors for the near future
b. Evaluation the factors for the distant future

Depending on the business area surveyed, the time horizons for a near and distant future are to be defined (Table 5.10).

Table 5.10 Profit potential

Profit potential	Assessment	
Changes in profitability	Variable	Stable
Changes in the turnover	Variable	Stable
Price changes	Variable	Stable
Demand cycle	Variable	Stable
Utilization of production	Low	Very high
Market share	Distributed	Concentrated
Stability of the market share	Unstable	Stable
Rate of introduction of new products	Often	Rare

Table 5.10 (Continued)

Profit potential	Assessment	
Length of the product life cycle	Short	Long
Phase-in time of product development	Short	Long
R&D costs	High	Low
Costs of market access	Low	High
Costs for market exit	High	Low
Aggressiveness of leading competitor	Aggressive	Passive
Competition from abroad	Strong	Weak
Competition for resources	Strong	Weak
Intensity of promotion and advertising	High	Low
Customer services	Great	None
Customer satisfaction	Low	High
Regulation of competition	Strong	None
Regulation of products and services	Strong	None
Interest groups	Strong	Weak
Other factors		

Innovation Culture and Innovation Management: Summary

Innovation emerges from action. Motivation determines action. It stands for an urge for activity to satisfy needs. At first glance, it does not matter as to whether this motivation is useful or not. It has in itself no positive connotation, but is basically neutral. However, motivation sets behavior in motion and controls activities towards a particular goal, where personal values and motives set limits to the possibilities.

Autonomy, personal mastery and meaning are the three most important aspects of motivation. People with a high level of personal mastery know how to pursue and achieve their real goals; they are in contact with their greatest resource: their own desire, their own passion, their "heart and soul." They have the abilities of self-reflection and of real dialogue, feel responsible in a broader and deeper meaning.

The development of an organizational culture begins and ends with the discussion of the existing organizational culture, as it manifests in the values, beliefs, behaviors, artifacts. This triggers a conscious transformation process, in which the aspects of the existing culture are modified. This results in impetus for implementation.

The following features characterize innovation culture: visions, network of knowledge, inspiration and leadership, FREIRAEUME[39], creativity, risk taking, communication, recognition and ability to learn and tolerance for failures, errors and mistakes.

The innovation process is divided into two main phases: the first phase—the cloud phase—in which FREIRAEUME, for creative approaches have been created,

[39] For the definition of FREIRAEUME see page 135.

and the second phase—the module phase—in which structure and process management is required. The result of the cloud phase is a business case. Sustainable innovations are well managed with this innovation process.

Disruptive innovations address new markets, which have fundamental uncertainties. Since there is no experience with these markets, they escape the classic corporate planning processes. Markets that do not exist (yet), cannot be analyzed.

The fundamental paradox of innovation management: to act extremely flexible and creative in an organization that is in its very deep nature focused on being highly efficient. The particular capabilities of an organization define their particular disabilities.

Organizations that count on disruptive innovations create very special business domains for this.

It is the characteristics of innovation that with and through them one will enter a new uncharted territory. Thus, innovation management is at the same time change management.

Dimensions of the innovation performance of an organization are: revenues achieved with new products, savings through process innovation, expenditures on research and development, number of patent and utility model applications. Innovation management must fit the organization and its people.

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Invention

6

The drama "Being Innovative"—Act 2, Scene 1

Inventor Thomas E. and decision-maker John G. sit in John G.'s office.

Inventor Thomas E.: I have elaborated the technical concept somewhat further. The easiest way to implement the system is using a peer-to-peer communications technology. The individual subsystems are fully autonomous and process all the information locally. The overall system, kind of emerges from the large number of cooperating subsystems. With this, we build Information redundancies into the system, which ensure that the system behaves fault-tolerant, and, because sensitive information will only be used locally, the concept always ensures privacy and data security. This actually made me very happy. Today, people are quite easy going with their personal data. In a second step, we can then think about a supplement with a central server solution. That again would enhance the performance. All in all, the concept is sound. Do you remember? Two years ago at a conference in Vancouver YLMOP has introduced their new system. That was a great success, they are now all millionaires. With my invention here, it could be the same thing. There is very big money in it. When they can make, we can make it as well.

Decision-Maker John G.: Thomas, I don't understand this. It's too complicated. Don't you have a little example, so I can visualize what the system actually does? That would really help me a lot. And—have you given a few thoughts to the market?

Inventor Thomas E.: No, not yet. But that's next on the agenda. I bought the handbook innovation and this shows how to do this best. Give me a few more days. I still have a few error messages for Mr. Tan from Malaysia to handle. He is pressing hard. As we always say, "customer first."

The drama "Being Innovative"—Act 2, Scene 2

A few days later inventor Thomas E. and decision-maker John G. meet at the coffee machine in the kitchen.

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Decision-Maker John G.: And, Thomas, did you get some information on the market?

Inventor Thomas E.: Yes, so I've been thinking that our system is mostly attracting young people. Therefore, I have assumed that our target group consists of persons between the age of 15 and 35 years. In Germany that accounts for about 5.5 million persons. I have distinguished between women and men, because I believe that men are more receptive and accept the system earlier than women. All in all, I believe that about 7.5 % of the 5.5 million may purchase the system for 100 Euros. Since we are the only ones with this offer—at least the beginning—we have 100 % market share. That adds up to possible sales for us in Germany of about 40 million Euros a year. And that's only in Germany. If we take into account France, Great Britain, nay, the whole of Europe and the rest of the world, then we arrive at much higher values.

Decision-Maker John G.: That sounds all plausible. Have you been able to estimate the cost?

Inventor Thomas E.: I think that we can target at a unit cost of 45 Euros each. For the development in the first two years, we will need about 6 million Euros, and 14 million Euros we must invest in the equipment for development. We need that later anyway for the maintenance of the systems.

Decision-Maker John G.: So that means that we make 40 million Euros in revenue at (John G. mumbles: two times nine is) 18 million Euros direct costs—every year a gross profit of 22 million Euros. In two years, this is 44 million Euros, and for that, we need to invest about 20 million Euros. Well, there are a number of other costs that we have to consider, but that's a good start already.

The drama "Being Innovative"—Act 2, Scene 3

The board member of POLYM AG Alexander H. sits with his assistant Walter K. in his office.

POLYM Inc. Alexander H.: And how is our innovation project doing? Are we progressing?

POLYM Inc. Walter K.: Last thing I've heard there is a first market and cost estimate. Shall we get John G.?

Decision-Maker John G. comes into the office.

POLYM Inc. Alexander H.: I heard that you have done a preliminary market and cost analysis?

Decision-Maker John G.: Well, it's not really a full-fledged analysis, but we have estimated the German market and the cost. We think that we can make about

40 million Euros a year in sales at 18 million Euros in cost of sales. In the first two years, the development costs are at approximately 6 million Euros and 14 million Euros investment. A more detailed analysis, which also takes into account the other costs, is in progress. But for that, we still need to talk to the marketing people and controllers.

POLYM Inc. Alexander H.: If I count correctly, the project will bring a contribution of 12 million Euros to the other fixed costs at the beginning. For this, it should be possible to place the product on the market. The marketing campaign will not be cheap. How is our competition doing?

Decision-Maker John G.: First, we are the only ones who will offer this product. I think the competition will wait and see whether we can place the product successfully, and then follow suit.

POLYM Inc. Alexander H.: Once we have fully developed, we have to make sure that we come down with the cost. If the volumes increase, then we can also use that when procuring. In addition, we must make full use of our learning curve—here the others have a clear disadvantage. As it seems, we should look into this innovation project in more detail. When do you think we will have the technical concept and the business case worked out so that we can take a solid decision?

6.1 Invention: Selected Topics

6.1.1 Inventing Stories

Stories

Plato explained his philosophy with stories. The Bible conveys views and beliefs in the form of stories. From the literature, storytelling is known from "The Arabian Nights," Giovanni Boccaccio's "Decameron," or Geoffrey Chaucer's "Canterbury Tales." In organizations, stories are told; they are an expression of the prevailing organizational culture. It becomes even more evident with innovation culture: How many stories—mostly success stories—are told as who did what, how, and had a huge success in doing so.

A culture lives in the stories that are told or read, if they were written down. Stories relate people, human actions, and events, which in some way affect people, and define meaning among others. For instance, an event receives some significance in that it may affect a series of other events. Meanings are a social phenomenon; the individual attributes meanings, which are an essential part of the culture in which one is located. In all its gradations, groups, communities, societies, major cultural domains, language, or a common understanding that is already agreed mainly mediate meanings. They have a certain dynamic. Thus, some meanings are reinvented, extended, reinterpreted, or rendered meaningless if they are no longer needed.

In a community, stories are useful for all sorts. They

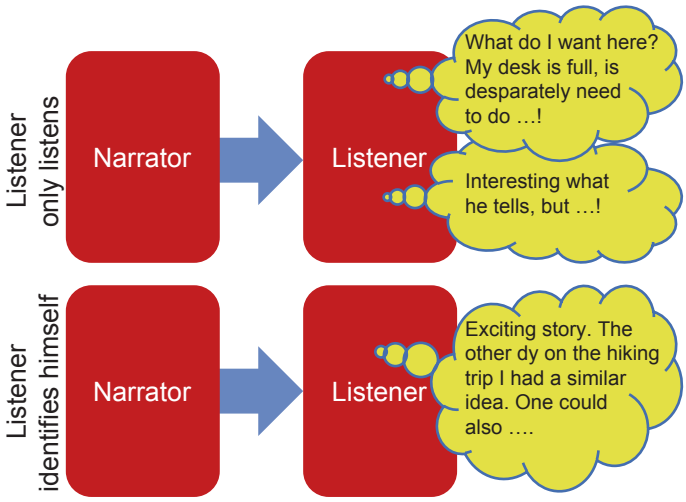

Fig. 6.1 Listening—only just listening or identifying oneself. (Source: Bernd X. Weis)

- Entertain
- Inform
- Convey values, goals, and other exemplary paradigms
- Create meaning
- Build communities and delimit them against the outside
- Establish identity
- Maintain and/or change organizations
- Describe innovations or unveil innovation potential

Stories allow the narrator and the listener to rid themselves of the limitations of space and time. Stories captivate the audience, stimulate their imagination, let images emerge, and enable identification. The audience experiences the story as if they had been there themselves, and thus become (more) perceptive to the underlying ideas. Stories always have something human, and that is precisely what makes them so attractive (see Fig. 6.1).

Each listener has in his head his own understanding and images of how the world works—the Internet, an organization, the state, the tax, for example. With a story, it is now possible to let the listener in his own—perhaps only subliminal—understanding discover and set into a context another new pattern that he has so far not even imagined, and with that he understands something new. "Homo sum, humani nil a me alienum puto."[1]

[1] "I am a human; nothing human is alien to me", Terenz (approx. 190–158 BCE), Roman comedy writer.

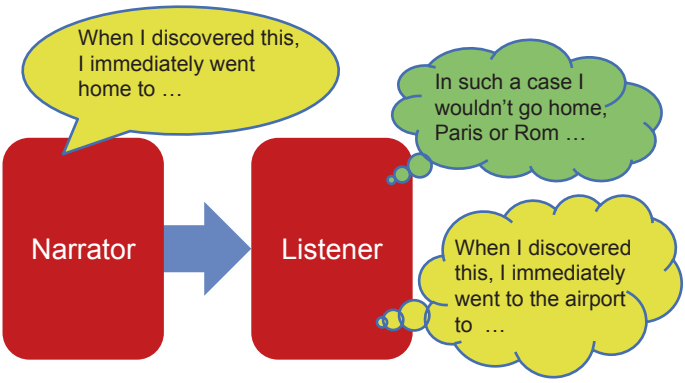

Fig. 6.2 Listening—reinvent. (Source: Bernd X. Weis)

Stories captivate the listener—and perhaps the narrator as well—and may therefore develop a life of its own. With stories, one can draw all the attention to the real issue if the listener experiences the story. Because if the listener can discover himself in the story—in whatever form, be it by references to his own experiences and adventures, be it by stimulating own ideas—then the narrator has attracted his attention. In this case, the listener actually enriches the story told with highly subjective elements, ultimately making it his own personal story.

That a story develops a life of its own is inevitable, the narrator may want it, if his goal is to stimulate the imagination of the audience, and thus to further open up the space of options with the story. On the other hand, it may be undesirable if one pursues a very specific objective with the story. With the story's life of its own, a paradox becomes clear: Although the communication between the narrator and the listener has only one direction, they still interact with each other, in that through the listener's imagination the story becomes his own. The listener emulates the story in his very own context and thus eventually perceives it as his own (see Fig. 6.2). With this, one has already overcome a hurdle, because now to convince someone of something is much easier.

The choice of an appropriate story depends on the objective to be pursued with the story. In the form of reports or presentations, they are ideally suited to report on the normal and expected. However, the real convincing and persuasive power of stories lies in the possibility to tell and convey the abnormal, unusual, surprising, and conflict-laden, that create feelings of curiosity, excitement or even anxiety and question or challenge possibly beloved perspectives. In stories the immature, the strange, the subjective find their place and can be interwoven and mixed with the established, with the ordinary, with the objective. Inconsistencies, insurmountable difficulties, and contradictions can thus be overcome without letting the story itself suffer.

Storytelling is no replacement for analytical thinking. It supplements it in a way that new perspectives, new situations, new "worlds" can emerge, and is therefore

ideal to stimulate and communicate potential innovation and change. Abstract concepts are better accessible and are more easily understandable if a well-chosen and well-constructed story mediates them. Thus, these concepts are combined with the imaginative and communicative power of a story—and the best of both worlds can supplement each other.

There are four basic types of stories, all of which have their own scope in which they are particularly useful. These are:

Stories to Convey Information Based on Verifiable Facts
Reports, presentations, chronicles, histories, traditions, written records, and news.

Stories Which Are Rather Short-Living Content and are Communicated Orally
Anecdotes, rumors, hearsay, gossip, and jokes.

Stories Which Are Long-Living Content and Are Usually Communicated Orally
Fables, parables, myths, and legends.

Stories as a Literary Form
Short stories, novellas, novels, epics, plays, dramas, tragedies, comedies, farces, burlesques, parodies, and satires.

No matter what form is chosen, to be effective three basic rules should be followed for a good story. The story

- Addresses the explicit and/or implicit problem space
- Has comprehensible reference to the current situation, so the mental leap of the audience to get into the story is small, and
- Has or at least allows a "happy ending."

Aristotle describes the structure of a story as follows: "*A whole is that which has a beginning, a middle, and an end. A beginning is that which does not itself follow anything by causal necessity, but after which something naturally is or comes to be. An end, on the contrary, is that which itself naturally follows some other thing, either by necessity, or as a rule, but has nothing following it. A middle is that which follows something as some other thing follows it. A well-constructed plot, therefore, must neither begin nor end at haphazard, but conform to these principles. (…) For beauty depends on magnitude and order. (…) As, therefore, in the case of animate bodies and organisms a certain magnitude is necessary, and a magnitude which may be easily embraced in one view; so in the plot, a certain length is necessary, and a length which can be easily embraced by the memory*." [2]

A story begins describing the initial situation, which—if necessary—is embedded in a larger "real world" context. It stands for its own and does not need to be deduced from other known events. The following middle part is coherently constructed, leading to the end, after which nothing follows (see Fig. 6.3). The length

[2] Aristotle (1): Poetics.

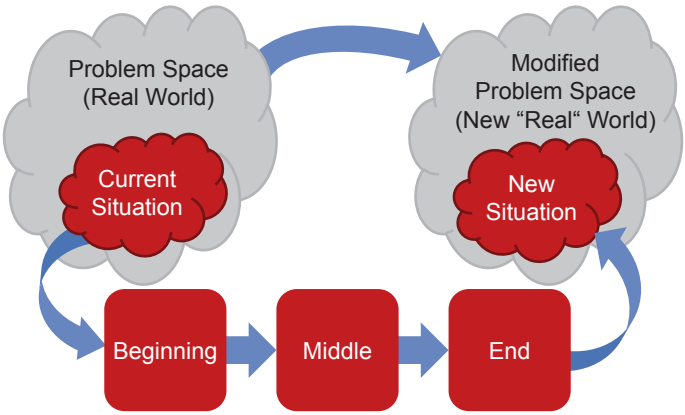

Fig. 6.3 Structure of a story. (Source: Bernd X. Weis)

of the story also has an important meaning. If a story is to be told or read, then it should be neither too long nor too short, but catchy and memorable, and appropriate for the narrator's subject and purpose.

When it comes to innovation stories, the stories to be narrated are to be invented.

6.1.2 Innovation Stories

> It is a period of civil war. Rebel spaceships, striking from a hidden base, have won their first victory against the evil Galactic Empire.
> During the battle, Rebel spies managed to steal secret plans to the Empire's ultimate weapon, the DEATH STAR, an armored space station with enough power to destroy an entire planet.
> Pursued by the Empire's sinister agents, Princess Leia races home aboard her starship, custodian of the stolen plans that can save her people and restore freedom to the galaxy….[3]

Thus begins the exciting story of Luke Skywalker and Princess Leia in "Star Wars."Its content may not be suitable to the context here, since it is a little off topic in both, addressing of the problem space and referencing the current situation, and it will be difficult to convince customers and managers. But it shows that just these four sentences outline the problem space (rebels versus evil Galactic Empire) and make reference to the current situation (Princess Leia rushes to their homes). On this, the rest of the story can now be built.

Strictly speaking, innovation stories are science fiction. They take place in a new world in which there is already something—namely, the innovation—which does not yet exist in the real world. Moreover, most importantly, this new world is a world that might become reality in the foreseeable future. If these references are

[3] Opening crawl "Star Wars: A New Hope".

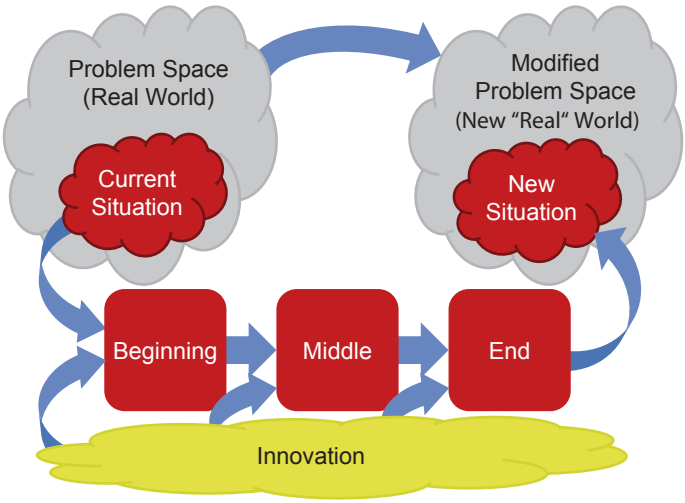

Fig. 6.4 Structure of an innovation story. (Source: Bernd X. Weis)

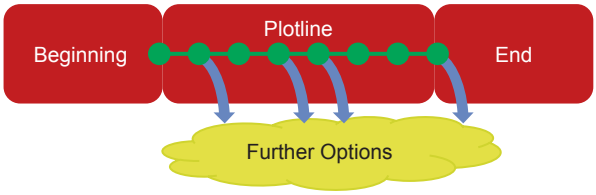

Fig. 6.5 Innovation story—plot and further options. (Source: Bernd X. Weis)

clearly developed and the mental leaps are not too high, wonderful stories can terrifically illustrate potential innovations (see Fig. 6.4).

How one should develop a story Aristotle describes as follows: "*In constructing the plot and working it out with the proper diction, the poet should place the scene, as far as possible, before his eyes. In this way, seeing everything with the utmost vividness, as if he were a spectator of the action, he will discover what is in keeping with it, and be most unlikely to overlook inconsistencies*."[4]

Hence, the narrator has to immerse into his story, imagine how everything looks, feels, etc., and in which meaningful sequence of events may occur. He has to go on a kind of dream or fantasy journey. On this trip, all sorts of events and occurrences take place in which the innovation plays a prominent, but not the main role—the main role is reserved for people. The narrator is perhaps part of this story himself, or just an outside observer.

Ultimately, an innovation story is also called a "use case" when it condenses to purely technical aspects.

Presenting the innovation in stories has some important advantages (see Fig. 6.5):

[4] Aristotle (1): Poetics.

- **Structure:** By embedding the idea into one or perhaps several stories, the idea gains structure. For the story, one has to think of a plot that fits in a temporal and spatial sequence and is in itself coherent and consistent.
- **Communicability:** In a story concepts can be made easier to understand and therefore easier to discuss. The typical addressees are on the one hand other interested innovators and on the other decision-makers.
- **Extension:** Through narrating and the corresponding structuring additional characteristics of the innovation are often discovered which may possibly lead to a broader applicability.
- **First step to the business model:** With the narrative and thus inherently implied reference to applications, the first step towards a business model is already made.

Two Stories

Usually innovation requires two stories. The first story helps the innovator to sort and organize his thoughts, and to communicate with others who have an interest in the innovation and who could help. The other story is to communicate with decision-makers. Ultimately, at a certain point in time the innovator has to disclose his idea to the decision-makers. This is at the latest, when, e.g., the innovator requires resources from the organization to further develop his solutions. It derives from the first story, but is much shorter and denser.

The First Story

The greatest enemy of the innovator is a blank sheet of paper. In modern terminology, the blank sheet is likely to be associated with a blank digital document on a computer screen. Whether leaf or screen, the important attribute is that it is just blank and empty. The blank sheet is on the table, abiding, wants to be written on, crying out for words, formulas, characters, and numbers. Thomas E. hearing these cries wants nothing more than to meet the insinuated need of the paper to be written on. And he thinks, "Nothing easier than that." He has been thinking about it for some time and everything has been considered. Now he sits in front of the sheet, looks stunned at its emptiness, but the right word, the right beginning will just not fall in place.

In most cases, the innovator has ideas about the areas and situations, which his innovation will be useful in. The innovation precisely aims to make improvements in a specific situation or to even enable entirely new experiences. These ideas are often quite specific and initially focused on the specific situation of an application.

This results in a possible starting point, to escape the "cry of the empty sheet," The topic of the innovation, the original problem, which after all has stimulated contemplating possible solutions, the innovator can entrench in the fictional story, which narratively describes the plot in which the problem and the solutions are embedded.

The renewed, but this time more playful penetration of the problem and the solutions devised, should enable even die-hard facts people to let their imagination run wild. Without imposing undue limits on imagination, one should however take into account the above-mentioned aspects. The story should be realistic enough that the

narrator can do without "battle stars" or "laser swords." In addition, the story should be located in a situation and an environment with which potential addressees of the story can easily identify without much intellectual effort.

The Second Story
The second story addresses decision-makers. It should, therefore, be correspondingly short and dense and simultaneously highlight the important points.

First Draft
It need not be great literature. With the story of the first innovator, we have the first draft of a description of his innovation. Based on this the innovation can be further developed.

6.1.3 Innovation Stories: Example

An example will illustrate these considerations.

The story: The Huber family from Munich visited the World Exhibition in Hannover

Innovation and Context of the Story
In this story, the innovation refers to an autonomous communications and processing system for mobile devices such as a smartphone. The system interconnects a multitude of these systems through local ad-hoc data exchange and through their connection to the mobile network and allows:

- Timely and accurate detection of local traffic flows, e.g., to avoid traffic congestion
- Access to local information such as parking situations, public transport, or regional events, etc
- The distribution of messages and news, e.g., individuals distributing interesting news on topics of general interest (news group)

A user profile helps the user of the system, to select the information which is important to him and is not, and only the selected ones are displayed.

The context for the story is a major event that lasts for a longer period of time and attracts many visitors locally and from abroad such as a world fair. The site of the World Expo is Hanover, where the expo was actually held in the year 2000. Ahead of their visit of the exhibition, visitors have the opportunity to download onto their smartphone the free software application HaCoN of the Hanover Community Network. In this network, visitors and organizers of the exhibition deposit information about Hanover and the world exhibition. HaCoN then determines and provides current traffic information for drivers, pedestrians, and public transport (PT). To illustrate the development of the story, changes, which have resulted from discussions

and conversations in the story, are shown with grey shades to distinguish them from the original story.

Preparing the Visit
Huber Family (A. and Sibyl with their children Max and Claudia) decide to go by car. The Hubers have an adult daughter Anna, who studies in Hanover. They want to take the opportunity to meet her there. Mr. Huber orders the tickets via the Internet. Each family member downloads the tickets along with HaCoN to the personal smartphone. The Huber family has recently bought an electric car and everyone is looking forward to the drive. Mr. Huber knows that he has to recharge the vehicle while parking in Hanover. With a range of 600 km, it probably just would not suffice for the return trip.

On the Way
Upon departure, Mr. Huber enters the destination into the navigation system on his smartphone using the speech recognition feature. The traffic information for motorways from Munich to Hanover is retrieved from the relevant services. As soon as the Hubers approach Hanover, GuideWeb—the traffic information module of HaCoN—feeds the navigation system with real-time and accurate traffic information around Hanover. This way Huber family can get around the congestion on B19.

More information about expo are provided as opening times, schedules, current visitor numbers, waiting times, weather conditions as well as "events: today only." The Huber family can register by simply clicking on the corresponding event if this should be necessary. Mr. Huber signs up for the course "Culture and art in modern Korea." The two children prefer to see the show of the magician Magicus. Mrs. Huber is indecisive, she just wants to see the exhibition and walk through the pavilions. In addition, HaCoN shows more information on the city of Hanover. For instance, the Fagus Factory by Gropius in Hanover is a World Cultural Heritage site. Entry fees, opening times, current visitor numbers, waiting times, etc., are displayed.

They learn from HaCoN that on the nearest car park P2 all parking spaces with charging station are already booked, but that there are still some appropriate places available in parking lot P4, one of which Mr. Huber immediately reserves. The navigation system leads to the Huber family to the parking space with charging station in P4.

Alternative scenario: They learn from HaCoN that all appropriate parking options are exhausted around the World exhibition. They will be prompted to better visit the park and ride facility, and to use public transport to the expo. The appropriate connections with public transport are shown. The Huber family use the tram to get to the event.

At the World Exhibition
With the entry permissions on the smartphone in the jacket pockets, the Huber family enters the exhibition through the entrance hall. Everyone has activated the locator to locate and find each other. Mr. Huber is reminded of his event in time depending

on his current position. The smartphone shows him the shortest way to the venue. On his way to the event, Mr. Huber sees a beautiful specimen of Georgina. He photographs it and sends the picture via HaCoN to his wife with the suggestion to have a look at it again together. Huber family then walk together through the exhibition, and HaCoN reminds them that they are near the Georgina, and guides them there.

Leaving the Exhibition
The hotel "City," in which the Huber family has a booking, is located in the city center. To make use of the special offer booked, they must check in before 1800 hours. Therefore, Mrs. Huber decides to take the tram to the city center on her own. Mr. Huber and the children go by bus to the P&R, and then bring the car with the luggage to the hotel. Just when sitting in the tram Mrs. Huber learns from HaCoN, that on her way a tram broke down and now blocks the direct route into the city. Other HaCoN user have consistently reported the same. HaCoN suggests Mrs. Huber to leave public transport and take as alternative a taxi ride including the price to be expected. Mrs. Huber opts for the taxi, which she calls with a click on HaCoN. HaCoN transmits the current position and 5 min later, the taxi takes Mrs. Huber on.

When at the P&R Mr. Huber gets into the car with the kids, he also learns that the situation in the car parks near the hotel has relaxed again, and reserves a place with easy access to the hotel.

Spontaneous Decisions
The Hubers have just arrived in their hotel room when their daughter Anna calls. HaCoN informed her about a very good street musician performing at the Town Hall Square, and she suggests that they meet there. The musician has many positive reviews from other visitors. Spontaneously the Huber family let HaCoN lead them there. Halfway HaCoN suggests a detour of about five minutes to see the old crane on the river Leine from the eighteenth century. Because Mr. Huber had shown interest in it when setting up his profile.

Hunger
The street performance was very nice. After that, all are very hungry. The restaurant "Old Leine Mill" is completely full. With one click, Anna reports this to HaCoN and gets the information that the restaurant "Wonderful" still has some places in the beer garden.

Finding Friends
Anna decides with her boyfriend Tobias and some fellow students to visit the World Expo in two days. On the way to one of the many cafes, Anna gets the hint from HaCoN that their friends have just entered the grounds. As a meeting, point Anna proposes the cafe to which she is currently on the way with Tobias.

The Second Story
Family Huber from Munich decides to drive with the electric car to Hanover. Mr. Huber orders the tickets on the Internet. These are loaded together with the software

application HaCoN onto personal smart phones of the family members. As soon as the Hubers approach Hanover, the navigation system of GuideWeb—the traffic information module of HaCoN—provides real-time and accurate traffic information around Hanover. HaCoN arranges car parking with charging station—possibly Park&Ride if needed. Further information about World's fair is provided, e.g., opening times, schedules, current visitor numbers, waiting times, weather conditions as well as "events: today only." One can register by simply clicking on the corresponding event. In addition, more information on the city of Hanover are shown. The Hubers have admission tickets on their smartphones and all have their locator enabled so that they may find themselves. Within the exhibitions, they orient themselves with the information of HaCoN. One can get real-time hotel and travel information, where current incidents (road works, accidents, etc.) are taken into account. Spontaneous events (e.g., street concert) will be announced and can be evaluated. Similarly, places in restaurants can be reserved, etc.

A decision-maker can identify with this simple story. He can imagine how it is on the way and how useful the application is when visiting the World's fair. He can also complement the story according to his own taste.

6.1.4 Additional Concepts

In the following section, the terms mutually exclusive, collectively exhaustiveness (MECEness) and hypothesis are explained which play a significant role in the preparation and calculation of a business case.

"MECEness"
MECEness is a property of a model and its description.

- "MECE" is an acronym for "Mutually Exclusive, Collectively Exhaustive." The features refered are mutually independent, i.e., a change of one feature does not (directly) influence the other features, and all of them together allow a complete description, i.e., there are no additional features that (significantly) affect the description. "**MECEness**" is thus a property of a description.

A classic example is the determination of a position in a three-dimensional space (see Fig. 6.6). The coordinates (x_0, y_0, z_0) uniquely determine the position of a point. The reason is that the coordinate system is orthogonal (mutually exclusive) and

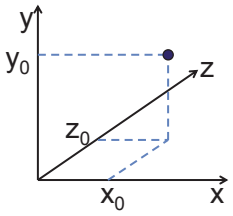

Fig. 6.6 MECEness—example Cartesian coordinates. (Source: Bernd X. Weis)

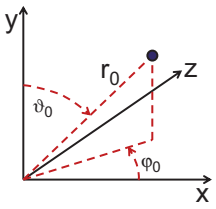

Fig. 6.7 MECEness—example spherical coordinates. (Source: Bernd X. Weis)

completely spans the space (collectively exhaustive). However, there is not only one possibility to determine the location of the point, another option is in a spherical coordinate system (see Fig. 6.7), which is also orthogonal and complete. Here, the spherical coordinates (r_0, φ_0, ϑ_0) give the position. These two representations of the position are equivalent.

However, there is a small but significant difference between coordinate systems and MECEness. In the definition above in the parenthesis, the statements were somewhat softened. Whereas mathematics applies the concept purely, i.e., without the parenthesized softeners, unfortunately, reality does not behave so consequently.

The real world behaves systemically, so that everything connects more or less with everything. Therefore, it does not necessarily help to accumulate more and more aspects and features in a model; it will always be contingent, i.e., it may be so, but could quite as well be different. The possible outputs differ in different peculiarities of their characteristics. Herein lies the advantage of a description with MECEness. If the features are MECE, a change of a feature has no significant influence on the others. This insight is always to be kept in mind in the modeling processes.

The compulsion to MECEness of a model and its description has the advantage that one is forced to penetrate the problem area to be modeled as completely as possible to select those features that appear the most appropriate, and to develop possible solutions, which can be evaluated afterwards. Only then cognizant decisions are possible (see also Sect. 5.1.2).

A Hypothesis Simplifies

Depending on the complexity the penetration of the problematic area, as completely as possible, may require considerable effort. In many cases; however, a possible solution is already apparent in advance of deeper considerations.

► A **hypothesis** is a statement whose validity is believed to be possible, but neither proven nor verified. Usually the conditions are specified under which the hypothesis is supposed to be valid.[5]

A hypothesis is therefore a suspected–expected solution path to a problem in the problem area. If one has a hypothesis, one makes use of it, but still being aware that there will, in all probability, still be further solutions (see Fig. 6.8).

[5] Wikipedia 22.12.2011.

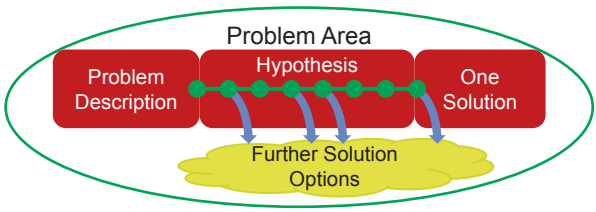

Fig. 6.8 Hypothesis in problem area. (Source: Bernd X. Weis)

With the hypothesis, one can start work—one can try to support it or falsify it (see Chap. 3). In any case, a well-formulated hypothesis definitely helps to address the problem directly and derive at least one concrete and defensible approach to it. If this hypothesis yields no feasible solution, new hypotheses may possibly arise in the process. The original hypothesis is then buried in the cemetery of mistakes and errors (Ohmae 1983).

In daily practice—and in a pragmatic "engineering" way of thinking, namely "one solution is better than none"—a hypothesis

- Is derived directly from the problem statement
- Guides the collection of data and facts
- Provides first evidence of planning
- Provides requirements for data collection and analysis
- Provides a basis for the conclusion

Example Hypothesis

An analysis based on a hypothesis is illustrated in the following, simplified example from mobile telecommunications (see Fig. 6.9).

Hypothesis: The only way for mobile operators to increase revenue is to increase the revenue with multimedia services.

Analysis: This example shows how the characteristics define the problem space and how to ask the questions that support the hypothesis.

6.2 Invention: Concepts and Contexts

In Chap. 3 an innovation has been defined as shown in Fig. 6.10. From Idea + Invention + Diffusion = Innovation derives a natural process: from idea to invention (cloud phase), from the invention to market (module phase), as already explained in the innovation process according to Gassmann and Sutter in Chap. 5.

The focus here is placed on the cloud phase, since at this stage an innovator has to overcome the biggest hurdles. In the module phase, the idea has become a potential innovation, i.e., it is recognized in the organization and will be processed in

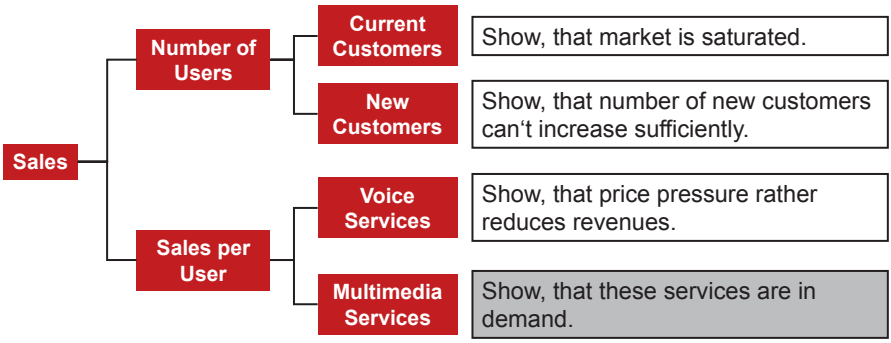

Fig. 6.9 Example for working with hypotheses. (Source: Bernd X. Weis)

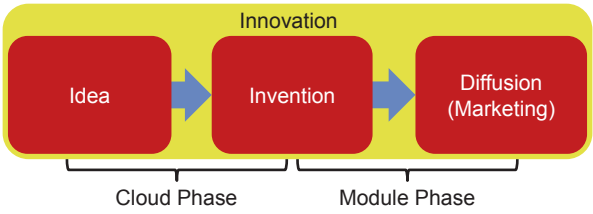

Fig. 6.10 Innovation—Process. (Source: Bernd X. Weis)

accordance with the organization's development processes. These processes are in most cases well developed.

Experience shows that in the cloud phase, the protagonist of the idea is typically also the one who conceived the idea first. He usually is motivated (see Sect. 5.1.1) and summons up the energy to advance his idea even against resistance, which is inevitably to be expected.

Resistance

Figure 6.11 shows qualitatively the cumulative cost of an innovation project. This shows why resistance mainly is encountered in the cloud phase—because it simply is cheaper. Despite the old maxim of the prudent businessperson "For the foregone nothing is given," projects that already have consumed significant resources prevail better against resistance.

In agile development methods, development phases are repeated several times. This way, positive experiences make it much easier to handle resistance.

Marketing

The innovator has to develop his idea and simultaneously tackle its marketing. For the innovator marketing means that he presents and communicates his invention so that decision-makers can decide and at best want to decide positively. He has to take into account that the decision-makers orientate themselves more on the economic benefits of an innovation rather than the technical "beauties"—"What's our

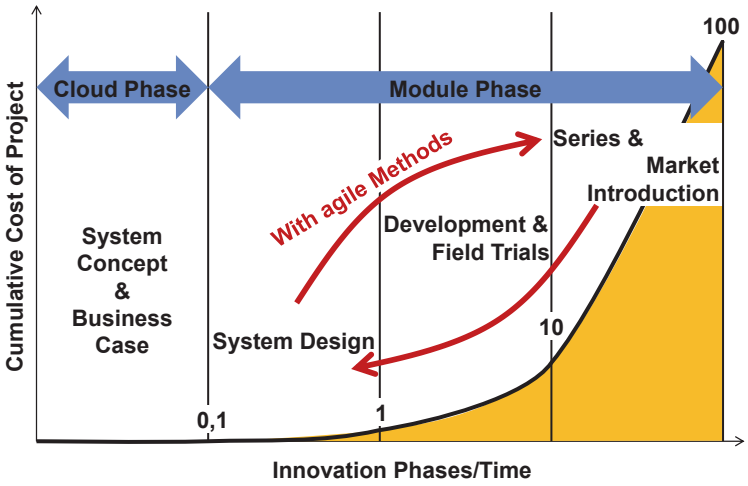

Fig. 6.11 Cumulative cost of an innovation project. (Source: Bernd X. Weis)

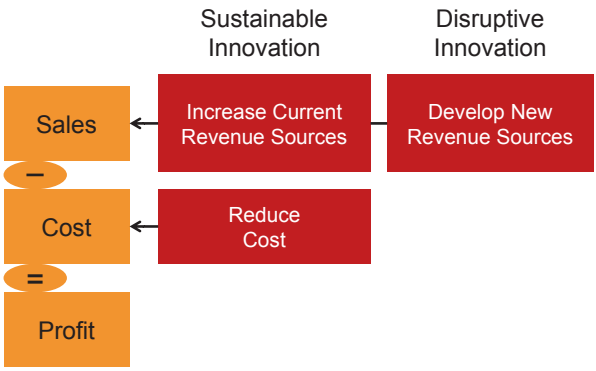

Fig. 6.12 An innovation primarily targets either revenue or cost. (Source: Bernd X. Weis)

benefit? How much does it cost us?" How the innovator can do this is described in the following sections. Here some concepts and relationships from business will be necessary. Here, these are dealt with only as far as they are useful for understanding and communicating.

6.2.1 From Idea to Invention (Cloud Phase): Overview

As shown in Fig. 6.12, an innovation typically has one of two possible directions: it is primarily relevant for either sales or costs. From this, the profit results from using the simple formula profit = sales − cost.

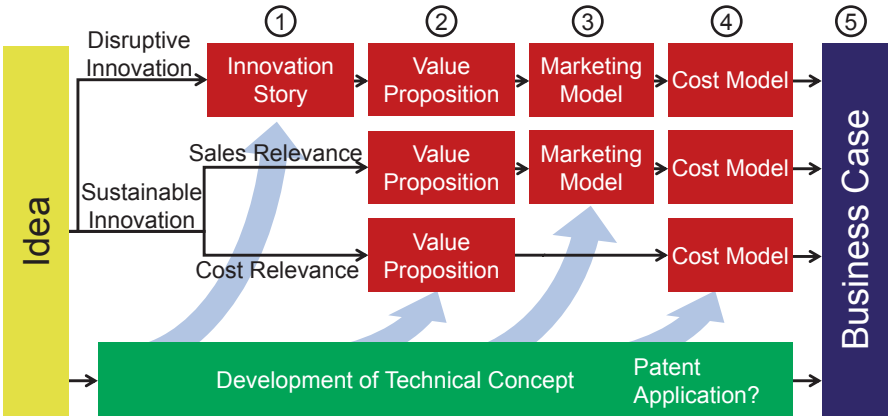

Fig. 6.13 Cloud phase—procedure. (Source: Bernd X. Weis)

With these distinctions, the sequence of steps for the cloud phase falls into place (see Fig. 6.13). The individual steps are first briefly described, and then—if not yet done—accentuated.

Development of Technical Concept
Parallel to steps 1–5, the technical concept is elaborated and the main substantive issues are clarified. It is checked whether the innovation can be patented.

Step 1: Innovation Story
The first step, the development of an innovation story, has been described in the previous section. If the innovation is complex and not easily comprehended, which is the normal case particularly with disruptive innovations, one should go through the trouble of inventing an innovation story. It helps to arrange and structure one's thoughts, and generate a logical sequence in the application of the innovation.

Step 2: Value Proposition
Value propositions were discussed in detail in Chap. 4. The value proposition explains which benefits the innovation produces and how it creates them. The value proposition comprises a description of what is useful, of value and of importance. A value proposition for innovation contains:

- The possible applications, which benefit is created for whom, how, and on which occasion
- The effect, how the benefit or value is experienced, i.e., how the benefit is concretely manifested, how and what differences can be noticed and how they distinguish from competing offers or existing alternatives

Step 3: Marketing Model
In the marketing model at first selective information is collected with respect to customers and customer groups that one specifically wants to address with the value

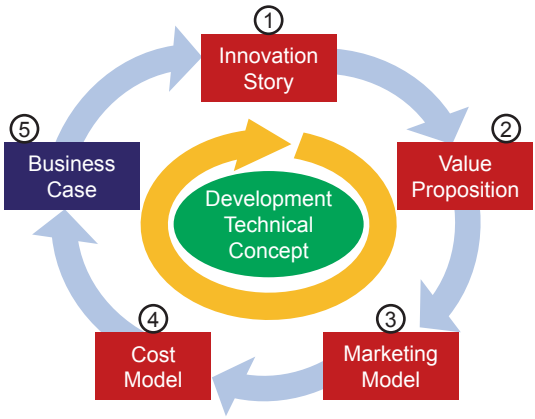

Fig. 6.14 Cloud phase—iterative procedure. (Source: Bernd X. Weis)

proposition. From this, the addressed market segments are identified, resulting in the market in terms of quantities and revenues. With the targeted market share the organization wants to achieve in this market, revenue expectations are derived.

Step 4: Cost Model
In the cost model, initially information on the cost of the elements and components that form the innovation is collected. The first focus is on the development and production costs of the innovation—is it a good or a service. Other cost items that are to be taken into account such as distribution, sales, administrative costs, etc., are then determined.

Step 5: Business Case
In the business case, all the results are combined and potential business developments are analyzed. Additional issues such as financing are clarified. The impacts on the profit and loss account and cash flow statement are presented.

This procedure is iterative, since each step can repeatedly result in new insights that influence the results of the other steps. Therefore, the individual steps are repeated several times (see Fig. 6.14) as deemed necessary and appropriate.

In the following and in Sect. 6.3, methods and techniques are explained that support setting up and presenting these models clearly and well arranged.

6.2.2 From Idea to Invention: Marketing Model

"Marketing guru" professor Philip Kotler defines marketing as follows:

> **Marketing** is a societal process by which individuals and groups obtain what they need and want through creating, offering, and freely exchanging products and services of value with others. (…) **Marketing management** is the art and science of choosing target markets and getting, keeping, and growing customers through creating, delivering, and communicating superior customer value (Kotler and Keller 2009).

Table 6.1 Structuring of markets

Total market	Customers that exist for a particular offer
Potential market	Of this customers who are interested in this offer
Accessible market	Of this customers who also have the funds for and access to it
Qualified accessible market	Of this customers, who meet the added conditions (laws, regulations, restrictions, etc.)
Target market	Of this customers who the organization wants to address
Penetrated market	Of this customers who already purchase the organization's products

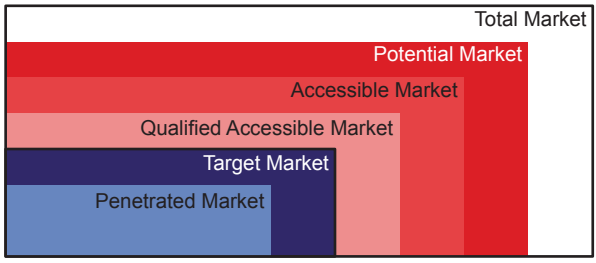

Fig. 6.15 Structuring of markets. (Source: Bernd X. Weis)

Thus, the thrust of the marketing model presented here is clear. It consists of a market model for the selection of target markets in which information is processed, independent of the organization and its activities, and a business and sales model for the acquisition of customers that includes the organization's goals, such as market share for this market.

Markets

Everyone has an idea of what a market is; everyone takes part in markets every day in one way or another.

- A **market** is a mechanism that allows buyers and sellers to come together in a relationship to determine the price and the quantity of goods or services.

For a seller it is important to estimate how much of his product offering (goods or services) may possibly be sold.

- The demand for an offer is structured according to the following markets (see Table 6.1 and Fig. 6.15).
  Market segments are homogeneous groups of customers within a market. The size of these markets is the number of potential customers in it.

With these definitions, it should be noted that the markets—from the overall market to qualified accessible market—exclusively depend on the offer, i.e., depend on the

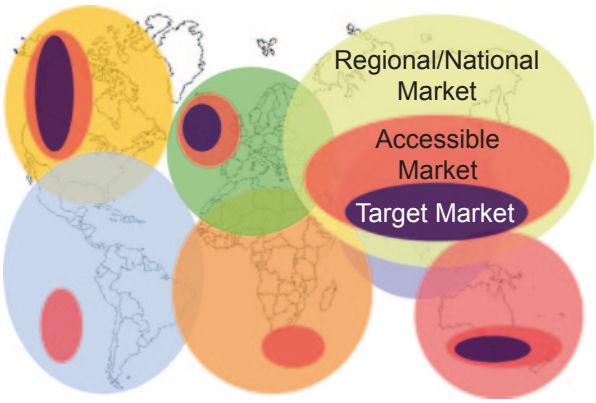

Fig. 6.16 Markets and market segments. (Source: Bernd X. Weis)

satisfaction of needs of potential customers, and are independent of the suppliers. However, the very fact that the company decides to serve this market defines the target market.

Target Markets and Target Market Segments

When a first draft of the innovation story and value proposition exists, the marketing model is set up. Eventually, with the innovation story and the value proposition one has a first description of a typical customer. Since, needs and opportunities of customers depending on region can be different and usually depend on the offer, the markets are additionally distinguished according to regional or national specifications (see Fig. 6.16).

Assuming that the innovation satisfies a need, the characteristics of the typical customers who appreciate the essential characteristics of the innovation are refined until an accessible market can consistently be defined.

From the (qualified) accessible markets possible target markets are selected which are then quantified in terms of their market sizes. Target markets and target market segments in consumer or business customer markets are defined, among other things by the following characteristics:

Consumer Markets

- Individual: age, sex, nationality, occupation, income, education, "lifestyle," personality, family, etc.
- Environment: life and living environment, region, climate, etc.

Business Customer Markets

- Business: industry, company size, geographic area, etc.
- Focus: rather engineering, technology or financial orientation, etc.
- Purchase criteria: quality, price, service, etc.

Table 6.2 Age structure in Germany (statistical data from public sources). (http://www.destatis.de)

Germany	Absolute	Percentage
Total population (01.01.2011)	81,751,602	100
Age less than 15 years	10,954,715	13.4
Age 15–24 years	9,156,179	11.2
Age 25–49 years	28,449,557	34.8
Age 50–64 years	16,350,320	20.0
Age 65–79 years	12,507,995	15.3
Age 80 and more years	4,332,835	5.3

Table 6.3 Education structure in Germany (statistical data from public sources). (http://www.destatis.de)

Persons with education level (2010)	Levels 0–2 (%)	Levels 3–4 (%)	Levels 5–6 (%)
Age 15–24 years	56.7	40.7	2.6
Age 25–54 years	13.4	59.6	27.0
Age 55–74 years	20.7	56.2	23.1

For the quantification of the target markets information and data from public institutions such as Eurostat, national and international statistical offices are used. [6]

Example: Quantitatively Determining Target Market and Target Market Segments

Region: Germany.
Target market: Young people with good education between 15 and 35 years.
Market segments: Distinguish male and female persons.

The data listed in Tables 6.2 and 6.3 are retrieved from the above-mentioned sources. For the first estimate, these data should suffice. First, the size of the age group is estimated: The age group 15–24 years is given (about 9.1 million people), between 25 and 35 years are about 2/5 of the age group 25–49 years, i.e., approx. 11.3 million persons. Hence, there are about 20 million persons in the age group 15–35 years. In the age group 25–54 years, approx. 27% have a higher education degree.

Assuming that in the age group 15–25 years a percentagewise comparable number of persons are pursuing higher education, then the target market would be approximately 27% of the above the specified age group. End 2010, approximately 50.9% were males and 49.1% females in this age group (see Table 6.4).

The same data for other countries in the EU are available in the corresponding databases so that when needed a corresponding estimation for other countries or regions is possible.

[6] http://www.eds-destatis.de, http://epp.eurostat.ec.europa.eu, https://www-genesis.destatis.de/genesis/online, http://www.destatis.de, http://www.uis.unesco.org, http://www.usa.gov/Topics/Reference-Shelf/Data.shtml.

Table 6.4 Target market and target market segments

Germany		
Target market (in million persons)	5.5	
Of which	Female	Male
Target market segment (in million persons)	2.7	2.8

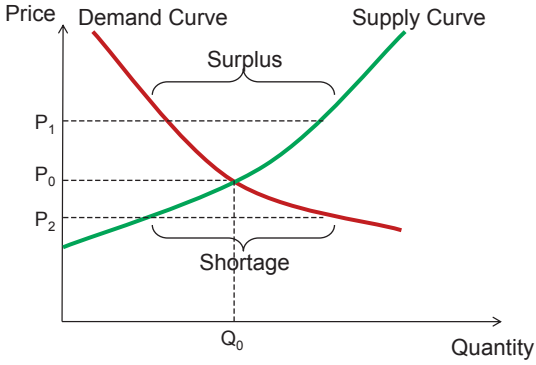

Fig. 6.17 Market equilibrium: supply and demand curves. (Source: Bernd X. Weis)

Parenthesis: From Target Market to Sales

In the next step, the relationship between target market and possible turnover for the organization is derived. It can be assumed that not every person of the target market accepts the offer. How many accept the offer depends largely on its price. Typically, if prices fall, the quantity sold or, in percentage terms, the acceptance rate increases. This relationship tails off when saturation is reached. Conversely, when prices rise, customers possibly satisfy the corresponding need in a different way and substitute the offer against another, so that the quantity sold decreases. The relationship between the percentage change in the quantities sold and the percentage change in price is called price elasticity and is in most cases less than 0. These relations follow from the properties of the utility function, which has been discussed in detail in Sect. 5.1.2.

Example

A brief illustration: If the minute price of mobile communications calls drops, more participants will talk longer. However, "if everything is already said," then this relationship does not hold anymore. The volume in call minutes remains constant even if the prices continue to drop.

The demand curve is a downward curve; when prices fall, demand increases. Accordingly, the supply curve is an upward slope; when prices are high, the supply increases (see Fig. 6.17).

Fig. 6.18 Relationship target market—revenue achievable. (Source: Bernd X. Weis)

Table 6.5 Example: relationship target market—revenues

Target market	Female	Male	Female	Male
Target market segment in million units	2.7	2.8	2.7	2.8
Acceptance rate	5%	10%	7%	13%
Market share	100%		100%	
Offer price per unit	100 €		75 €	
Revenues in million EUR	13.5	28.0	14.2	27.3
Price elasticity	−1.6	−1.2		

The market is at a price of P_0 and a quantity Q_0 in equilibrium. Higher offer price (P_1) results in surplus ⇒ price will fall; a lower offer price (P_2) results in shortage ⇒ prices will rise.

In a competitive environment, the organization has to capture market share with its offering. Ultimately, this also applies to innovations, if they do not address a newly discovered need of the market participants, as it is otherwise satisfied with other offers.

The achievable revenues are then the product of the individual components. Figure 6.18 shows these relationships.

Continuation of Example: Marketing Model

Above, the target market for Germany was prepared. Table 6.5 lists the estimated adoption rates at a price of 100 and 75 €, and the resulting revenues, which can be achieved 1 year after the launch, are calculated.

A complete marketing model might look similar to the one shown in Table 6.6. This marketing model is based on the following assumptions:

- The innovation project begins with the development of the innovation in Year 1, first sales are made in Year 2, and in Year 3 the objective developed above will be achieved.
- The company has opted for a starting price of 100 €, which allows a larger market growth since in the beginning the base is smaller, and leaves greater flexibility in pricing in the forthcoming years.
- In Year 3, a large market growth of 150% due to the expected strong acceptance is assumed. In subsequent years, the market is expected to grow by 33.3%.

Table 6.6 Example: marketing model

Market model	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Target market (female) in million persons	–	2.7	2.7	2.7	2.7	10.8
Target market (male) in million persons	–	2.8	2.8	2.8	2.8	11.2
Target market in million units	–	**5.5**	**5.5**	**5.5**	**5.5**	**22.0**
Acceptance rate						
Acceptance rate (female)	–	2.0%	5.0%	6.7%	8.9%	
Acceptance rate (male)	–	4.0%	10.0%	13.3%	17.8%	
Market growth (acceptance rates)	–	–	150.0%	33.3%	33.3%	
Achievable sales in thousand units	–	**166**	**415**	**553**	**738**	**1.872**
Offer price per unit	–	100 €	100 €	90 €	81 €	
Price deterioration	–			−10.0%	−10.0%	
Achievable revenues in million €	–	**16.6**	**41.5**	**49.8**	**59.8**	**167.7**
Business and sales model	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Achievable revenues in million €	–	**16.6**	**41.5**	**49.8**	**59.8**	**167.7**
Expected market share	–	100.0%	100.0%	90.0%	75.0%	
Revenues in million €	–	**16.6**	**41.5**	**44.8**	**44.8**	**147.7**

- Since the innovation is well positioned in the market and the market is thus attractive, competitors are likely to appear in Year 4; than the price will decrease.

6.2.3 From Idea to Invention: Cost Model

Costs split in variable and fixed costs.

► **Variable costs** are costs that also change with variations in the quantity of the offer. **Fixed costs** are costs that do not change with variations in the quantity of the offer. The **total cost** are the sum of the fixed and variable costs (Begg et al. 1984).

Typical fixed costs are, e.g., research and development (R&D), building costs, and administration; typical variable costs are, e.g., materials and their storage, working hours or transport, and logistics costs incurred directly in the production and distribution of the offer. It should be noted that the structure of fixed and variable costs changes with time. In a short-term view, only few costs are really variable, that can be directly influenced by the organization. In a long term-view, however,

Table 6.7 Example: cost model

Cost of sales in million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Variable cost per unit	–	45 €	41 €	36 €	33 €	
Cost reduction in %	–	–	10.0%	10.0%	10.0%	
Achievable sales in thousand units		166	415	553	738	1872
Cost of sales in million €	–	**7.5**	**16.8**	**20.2**	**24.2**	**68.6**
Additional cost in million € expenses	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Sales expenses		1.7	4.2	4.5	4.5	14.8
Administration expenses	0.2	1.4	3.1	3.3	3.3	11.3
Other cost						
Research and development expenses	3.0	3.0	1.0	1.0	1.0	9.0
Additional other costs	1.5	3.0	1.5	1.5	1.5	9.0
Additional cost in million €	**4.7**	**9.0**	**9.8**	**10.3**	**10.3**	**44.1**

all costs are eventually variable and can be perfectly matched to requirements—so the theory; usually there is just not so much time to really reach this match, before the market conditions have already changed again.

The cost model has two main components: the cost of sales, which are directly attributable to the revenues, and additional costs incurred regardless of sales. Without going into the intricacies of accounting, for a business case the following may be adopted—even though coarsely simplified:

- Cost of sales = variable costs
- Additional costs = fixed costs

Continuation of Example: Cost model

The cost model in Table 6.7 is based on the following assumptions:

- Resulting from further technical considerations in Step 1, the variable cost per unit is estimated at 45 €.
- Taking advantage of learning and economies of scale, the variable cost per unit can be reduced by 10% per year.
- Distribution costs are 10% of sales.
- The administration costs are a fixed 0.2 million € per year plus 7% of sales.
  Note: Distribution costs and administrative costs are often summarized under the term overheads or "Selling, general and administrative expenses" (SG & A). Often, these costs are estimated as a percentage of sales. With a call to the controlling department, this value can be easily determined.
- Research and development costs in Years 1 and 2 are 3 million € and in subsequent years 1 million €.

Other additional costs—mainly marketing expenses—are fixed 1.5 million € per year, an additional 1.5 million € in the year 2 of marketing are spend during market launch.

6.2.4 From Idea to Invention: Business Case

In the business case for the innovation project, the information collected so far is combined and presented in a structured way.

- A **business case** describes a forward-looking business scenario. It
  - Is a tool and often used to evaluate different projects or possible consequences of decisions according to their business value
  - Shows the expected profitability and cash flow of a project or consequence of decisions over time and includes methods to quantify costs and benefits
  - Allows a glimpse into the future based on objectives, assumptions, expectations, and hopes
  - Is neither a budget nor a financial report

Profit and Loss Account (Income Statement, P&L) and Cash Flow Statement
The business case for a project encompasses, among other elements, the profit and loss account (income statement, P&L) and the cash flow statement for the project for a specified period of time. For the structure of these two elements, there are several permissible variants; the one used here is based on the International Financial Reporting Standards (IFRS) and U.S. Generally Accepted Accounting Principles (U.S. GAAP), which are internationally applied and are recognized (Choi 2003; Brigham et al. 1999; Dickson 1998; Glautier and Underdown 1990). Principles of IFRS are those of accrual and going concern assumption. Thus, this ensures that a presentation of the business case can be understood in an international context without major problems. Both the profit and loss account and the cash flow statement are created for a specific period, in accounting this period is typically a quarter or a year. For a business case, one is free to choose the most appropriate or convenient period, as one is not bound by statutory provisions.

Profit and loss account (income statement, P&L)
Figure 6.19 shows the structure of the profit and loss account for a business case. The different elements are:

- **Sales Revenues:** Value, an organization accrues in form of cash or receivables from the sale of goods or services (products) and can be assigned to the corresponding project in the period considered.
- **Cost of Sales (Direct Cost):** All costs that are directly associated with that revenue.
  - **Gross profit:** Difference of sales revenues and cost of sales.
- **Operating expenses and other expenses:** Total sum of sales, general and administrative expenses, and other expenses (research and development, marketing…) assigned to the project in the period considered.
  - **Operating profit (EBITDA):** Profit from operating **activities**, i.e., **E**arnings **B**efore **I**nterest, **T**axes, **D**epreciation, and **A**mortization.

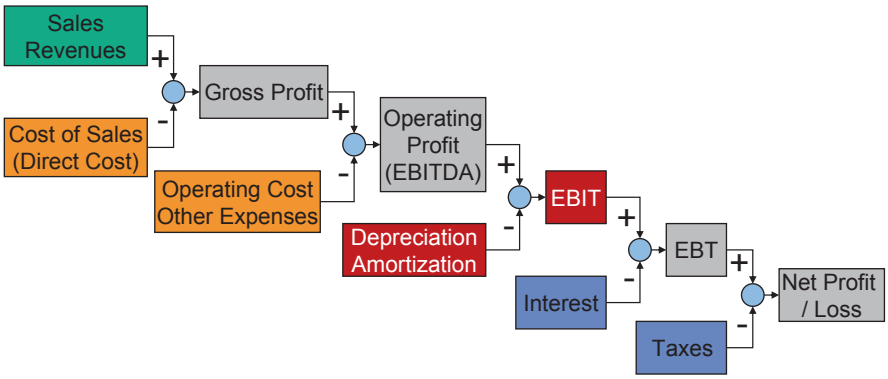

Fig. 6.19 Structure of profit and loss account for a business case. (Source: Bernd X. Weis)

- **Depreciation:** Planned or extraordinary losses in value and impairments of assets within a period. Loss in value for general reasons (aging, wear and tear) or by special reasons (accidental damage, price decrease). This includes, e.g., depreciation of equipment needed for the project.
  - **EBIT: E**arnings **B**efore **I**nterest and **T**axes**.**
- Interest**:** Interest for funds such as loans taken to finance the project.
  - **EBT: E**arnings **B**efore **T**axes.
- Taxes**:** Taxes (tax refunds) incurred on the profits (losses) of the project. Tax refunds are of particular interest if they can be offset against other tax payments of the organization.
  - **Net Profit**: Profit or loss of the project in the period considered.

Cash flow statement

In the cash flow statement, only those cash flows are listed where in the considered period money has **factually** flown. Figure 6.20 shows the structure of the cash flow statement for a business case. The different elements are:

- **EBIT (from P&L):** Earnings before interest and taxes, either a cash inflow if positive or a cash outflow if negative.
  - **Cash inflow or outflow**

- **Depreciation:** Depreciation are accounting items. There is no cash flow. However, since the calculation of EBIT has already taken into account in them, they need to be compensated as cash inflow. Depreciation is considered as costs for using an investment.
- **Decrease in inventories, decrease in assets, and increase in liabilities:** If inventories decreases, partners pay their bills or own invoices will be paid later, this is a cash inflow.
- **Profit** from **disposal of assets:** When selling an asset (e.g., property, plant) cash flows into the organization.
- **Increase in loans:** If loans are borrowed, cash flows into the organization.
  - **Cash inflow**

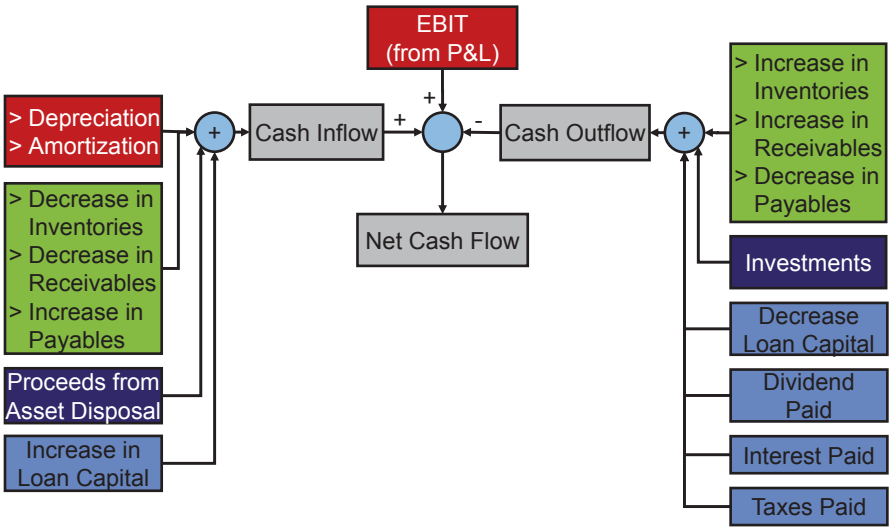

Fig. 6.20 Structure of the cash flow statement for a business case. (Source: Bernd X. Weis)

- **Increase in inventories, increase in receivables, and decrease in liabilities:** If inventories increases, business partners do not pay their bills or liabilities are paid off, this is a cash outflow.
- **Investments:** For investment, cash flows out of the organization.
- **Decrease of loans:** When loans are repaid, cash flows out of the organization.
- **Dividend payments:** The dividend payments made in the period to shareholders are cash outflows.
- **Interest payments:** The interest payments made in the period are cash outflows.
- **Tax payments:** The tax payments made in the period are cash outflows.
  - **Cash outflow**
  - **Cash flow: EBIT plus difference of cash inflow and cash outflow.**

Typically, changes in inventories, receivables, and payables are not relevant in a business case. One can assume here that all products produced are sold and that invoices are paid promptly in accordance. These elements are therefore not included in the considerations below.

Models for the Elements of Profit and Loss Account and Cash Flow Statement
In addition to the marketing and cost models already considered, financing, tax, asset and investment models are useful for the profit and loss account and the cash flow statement (see Fig. 6.21).

The financing model includes, in what way the organization intends to finance the innovation project. Possible models are financing with equity or debt such as bank loans. The tax model includes the tax rates and payment schemes applicable to the organization. The asset model and the investment model relate in some way. Eventually, investments become assets for which the depreciation rules apply.

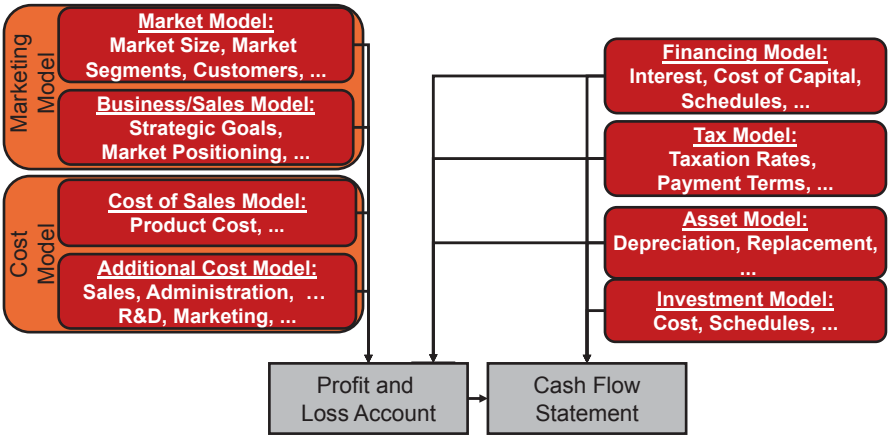

Fig. 6.21 Models for the elements of profit and loss account and cash flow statement. (Source: Bernd X. Weis)

In Sect. 6.1.4, the term MECEness was introduced. One feature of these models is that for a financial overview they are MECE. On the market,buyers and sellers negotiate prices. Unit cost (= cost of sales/volume) depend on the production and the material procurement. Prices and costs are thus independent of each other. Multiplied by the quantity sold, these results in sales revenues and cost of sales. Operating costs depend on the processes and the organization of the company; they are independent of both the revenue and cost of sales. Interest rates depend on how the company is financing the project. Similar considerations can be made for the other elements.

Continuation of Example: Profit and Loss Account (P&L) and Cash Flow Statement

As indicated above in the marketing model an innovation project usually lasts over several periods. Therefore, for a typical business case the profit and loss account and the cash flow statement are developed for several periods over the duration of the project. Probably at the beginning, one will not have all the required information available. Therefore, it often makes sense to estimate a percentage of a relevant reference, even though the individual elements are MECE.

In this example, the period for the profit and loss account and the cash flow statement is 1 year; the total observation duration is 5 years.

The profit and loss account in Table 6.8 is based on—in addition to the ones already mentioned—the following assumptions:

- The depreciation duration of investments are 7 years (the investments are included in the cash flow statement), the investments are written off in Year x with 1/7 of the capital expenditure.
- Taxes are 25 % of profit before tax (EBT). If taxes for this project are refunded, the company in total has a tax savings because of this project.

Table 6.8 Example: Profit and loss account (income statement, P&L)

In million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Revenues	–	16.6	41.5	44.8	44.8	147.7
Cost of sales	–	(7.5)	(16.8)	(20.2)	(24.2)	(68.6)
Gross profit	–	**9.1**	**24.7**	**24.7**	**20.6**	**79.1**
Expenses						
Sales expenses	–	(1.7)	(4.2)	(4.5)	(4.5)	(14.8)
Administration expenses	(0.2)	(1.4)	(3.1)	(3.3)	(3.3)	(11.3)
Other cost						
Research and development expenses	(3.0)	(3.0)	(1.0)	(1.0)	(1.0)	(9.0)
Additional other costs	(1.5)	(3.0)	(1.5)	(1.5)	(1.5)	(9.0)
Operating profit (EBITDA)	**(4.7)**	**0.1**	**14.9**	**14.3**	**10.3**	**35.0**
Depreciation/amortization	(1.0)	(2.0)	(2.4)	(2.6)	(2.6)	(10.6)
Earnings before interest and taxes(EBIT)	**(5.7)**	**(1.9)**	**12.5**	**11.8**	**7.7**	**24.3**
Interest	–	–	–	–	–	–
Earnings before taxes (EBT)	**(5.7)**	**(1.9)**	**12.5**	**11.8**	**7.7**	**24.3**
Taxes	1.4	0.5	(3.1)	(2.9)	(1.9)	(6.1)
Earnings: profit/(loss)	**(4.3)**	**(1.4)**	**9.4**	**8.8**	**5.7**	**18.2**

Profit and Loss Account

Hence, under these assumptions the innovation project generates after initial losses net profits from Year 3 onward. Overall, the net profits are greater than the losses. Figure 6.22 presents the result graphically.

The cash flow statement in Table 6.9 is based on the following additional assumptions:

- Investments are 7 million € in Year 1 and Year 2, respectively, 3 million € in Year 3, 1 million € in Year 4, 0.5 million € in Year 5, i.e., for the innovation project a total investment of 18.5 million € is planned.

EBIT and depreciation is obtained from the profit and loss account, as well as interest and taxes. It should be noted that the tax and interest **payments** are to be listed (e.g., interest and taxes for Year x are paid/refunded in Year $x+1$). The management determines dividends based on the organization's total results.

Cash Flow Statement

The cash flow is 12.3 million €, i.e., within 5 years the project generates more money than it requires. In the initial phase of the innovation project 17.2 million € need to be financed. Figure 6.23 shown the result graphically.

How this is assessed, is discussed in the following.

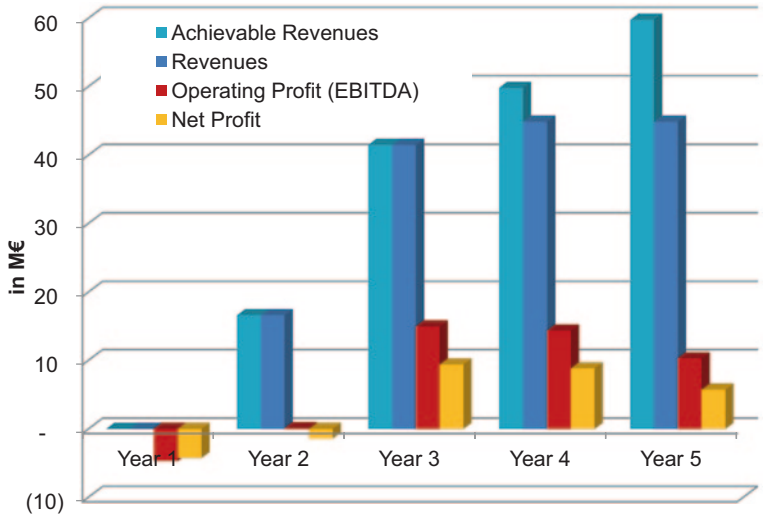

Fig. 6.22 Example: marketing model and P&L. (Source: Bernd X. Weis)

Time Value of Money

In general, it is difficult to compare different time series. Sometimes, some values are larger than others, and then the situation reverses. Therefore, it would come handy if one could determine one single value for each time series, and then compare these values. The concept that allows this is the present value, which takes into account the time value of money (Drukarczyk and Schüler 2007).

Example

In two years from now, one wants to buy a car worth 30,000 €. How much money does one need today to pay into the bank at an interest rate of 5 %? The solution is € 30,000/(100 % + 5 %)^2 = € 27,211.

The net present value (NPV) follows the same principle—"a bird in the hand is better than two in the bush." The farther in the future a cash flow is expected, the less value it has from today's perspective.

► The **Present Value** PV at time T of a cash flow $C(T+n\Delta t)$ at time $T+n\Delta t$, $n \geq 0$, for a given interest rate z_Δ for a period Δt.

$$PV = \frac{C(T+n\Delta t)}{(1+z_\Delta)^n}$$

This process is called discounting. The interest rate z_Δ is also called **discount rate**.

Table 6.9 Example: cash flow statement

Inbound cash flow in million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Earnings before interest and taxes	–	–	12.5	11.8	7.7	31.9
(EBIT) (positive)						
Depreciation/amortization	1.0	2.0	2.4	2.6	2.6	10.6
Disposal of assest	–	–	–	–	–	–
Increase in debts	–	–	–	–	–	–
Inbound cash flow	**1.0**	**2.0**	**14.9**	**14.3**	**10.3**	**42.6**
Outbound cash flow	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Earnings before interest and taxes (EBIT) (negative)	(5.7)	(1.9)	–	–	–	(7.6)
Investments	(7.0)	(7.0)	(3.0)	(1.0)	(0.5)	(18.5)
Decrease in debts	–	–	–	–	–	–
Paid interest, taxes and dividends	–	1.4	0.5	(3.1)	(2.9)	(4.2)
Outbound cash flow	**(12.7)**	**(7.5)**	**(2.5)**	**(4.1)**	**(3.4)**	**(30.3)**
in million €	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Cash flow	**(11.7)**	**(5.5)**	**12.4**	**10.2**	**6.9**	**12.3**
Cumulated cash flow	**(11.7)**	**(17.2)**	**(4.8)**	**5.4**	**12.3**	
Capital requirement	**(11.7)**	**(5.5)**	–	–	–	**(17.2)**

The **Net Present Value** NPV of a series of cash flows C(T + nΔt) at different points in time $T, T+\Delta t, T+2\Delta t, \ldots, T+N\Delta t$, $n = 1, 2, \ldots, N$, is,

$$NPV = C(T) + \frac{C(T+\Delta t)}{(1+z_\Delta)} + \frac{C(T+2\Delta t)}{(1+z_\Delta)^2} + \ldots + \frac{C(T+N\Delta t)}{(1+z_\Delta)^N}.$$

As guideline to select the interest rate serves the **w**eighted **a**verage **c**ost of **c**apital (WACC), from which one accordingly determines WACC_Δ for a period.

Example

Is the considered period a quarter, then $\mathrm{WACC}_\Delta = \sqrt[4]{1+\mathrm{WACC}} - 1$.

► The **weighted average cost of capital** (WACC) is calculated from

$$\mathrm{WACC} = z_{\mathrm{Debts}}(1-\mathrm{tax\,rate})\frac{\mathrm{Debts}}{\mathrm{TotalCapital}} + z_{\mathrm{Equity}}\frac{\mathrm{Equity}}{\mathrm{TotalCapital}},$$

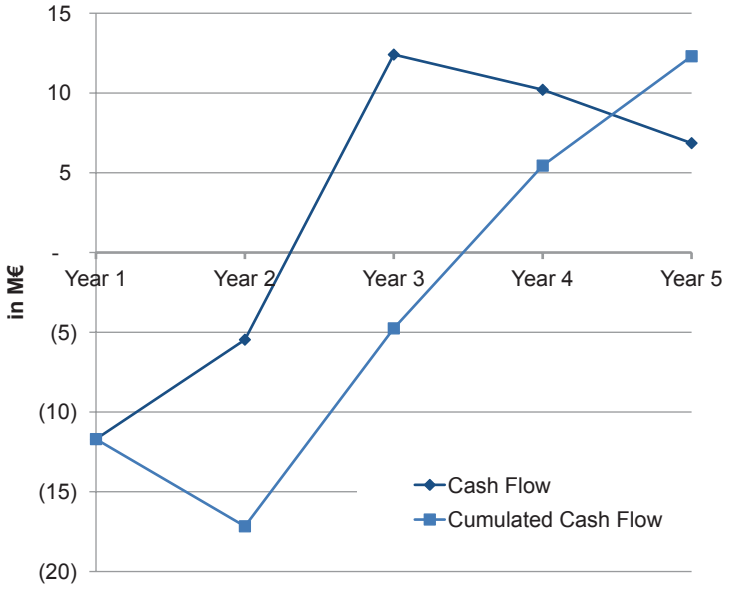

Fig. 6.23 Example: cash flows. (Source: Bernd X. Weis)

- with TotalCapital = Equity(shares,etc.) + Debts(such as bank loans, etc.)
  z_{Debts}: Interest rate on debts,
  z_{Equity}: expected interest rate on equity,
  tax rate: considers that interests on debts are taken into account for tax purposes.

The weighted average cost of capital takes into account the capital structure of the organization and is therefore a measure of the returns expected in the organization.

Example

The capital structure of the company is 40 % equity and 60 % debt. The expected return on equity is 15 % and the interest on debt amounts to 10 %. The organization's tax burden is 25 %. Thus, WACC = 10 % · (100 % − 25 %) · 60 % + 15 % · 40 % = 10.5 %.

Accordingly, when calculating the net present value for an innovation project, a discount rate has to be chosen which is above the weighted average cost of capital. If the net present value of the project for this discount rate is positive, then it is worthwhile for the company to invest in this project.

Continuation of Example: Net Present Value

The calculation of the net present value of the cash flows is shown in Table 6.10.

Table 6.10 Example: calculating the net present value

Net present value (in million €)						
Discount rate 12,0 %	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cash flow	(11.7)	(5.5)	12.4	10.2	6.9	12.3
Discount	100.0 %	89.3 %	79.7 %	71.2 %	63.6 %	40.1 %
Discounted cash flow	**(11.7)**	**(4.9)**	**9.9**	**7.3**	**4.4**	**4.9**
Cumulated disc. cash flow	**(11.7)**	**(16.6)**	**(6.7)**	**0.6**	**4.9**	
Net present value	**4.9**					

Table 6.11 Example: calculating internal rate of return (IRR)

Internal rate of return (IRR)	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cash flow	(11.7)	(5.5)	12.4	10.2	6.9	12.3
Internal rate of return (IRR)	**24.7 %**					
IRR discounted cash flow	(11.7)	(4.4)	8.0	5.3	2.8	0.0

The net present value of 4.9 million € is positive for a discount rate of 12 %, which is higher than the above calculated weighted average cost of capital of 10.5 %. Thus, the project is assessed positively.

Metrics for an Innovation Project

There are common indicators for the assessment of a project other than the net present value.

The **Internal Rate of Return**(IRR) is the discount rate at which the NPV of the project becomes Zero. As already established above for net present value, a project is attractive if IRR is larger than WACC.

The calculation of the IRR is not simple, but most spreadsheet programs offer a corresponding function (see Table 6.11).

Continuation of Example: Internal Rate of Return

The IRR of the innovation project is 24.7 %, which is a good bit above the WACC.

Time to Cash Flow Positive and **Payback Period** are parameters that describe the time behavior of cash flows. The time to positive cash flow is self-explanatory and is determined from the curve of capital flows. The payback period is the time until full repayment of the capital expended from the cash flows of the project. The value is determined from the curve of the cumulative cash flows.

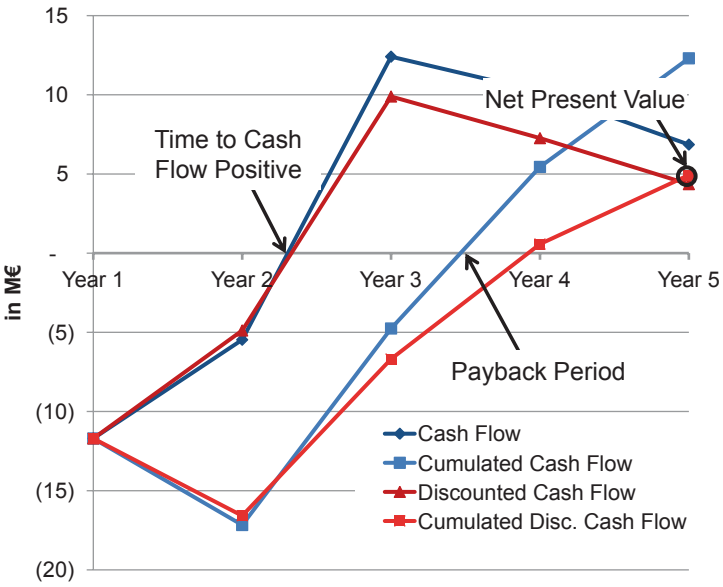

Fig. 6.24 Example: time to cash flow positive and payback period. (Source: Bernd X. Weis)

Continuation of Example: Time to Cash Flow Positive and Payback Period

For the example, Fig. 6.24 shows the determination of these parameters.

Thus, the innovation project generates a positive cash flow after about 2.3 years. The payback period is 3.5 years.

Return on Investment (ROI)

In business practice, an overabundance of other indicators is used that serve as decision support. Especially popular is the return on investment (ROI), which is calculated from profit/investment costs. However, this indicator is not sufficiently well defined. What are the investment costs? Do they comprise only investments or do they include development costs? This can be interpreted differently and therefore using the ROI is omitted here.

Continuation of Example: Summary of Business Case

Table 6.12 summarizes the results of the business case for these assumptions.

Variation of Business Case

If the business case is implemented on a spreadsheet, it is easy to vary individual parameters and to check the variation of the result.

Table 6.12 Example: summary of the business case

In million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Target market	–	16.6	41.	49.8	59.8	167.7
Expected market share	–	100%	100%	90%	75%	
Revenues	–	16.6	41.5	44.8	44.8	147.7
Cost of sales/revenues	–	45%	41%	45%	54%	
Research and development expenses	3.0	3.0	1.0	1.0	1.0	9.0
Additional other costs	1.5	3.0	1.5	1.5	1.5	9,0
Earnings before interest and taxes (EBIT)	(5.7)	(1.9)	12.5	11.8	7.7	24.3
Investments	(7.0)	(7.0)	(3.0)	(1.0)	(0.5)	(18.5)
Cash flow	(11.7)	(5.5)	12.4	10.2	6.9	12.3
Capital requirements	11.7	5.5	–	–	–	17.2
Indicators						
Net present value	4.9 million €					
(Discount rate 12.0%)						
Internal rate of return	24.7%		(WACC 10.5%)			
Time to cash flow positive (years)	2.3					
Payback period (years)	3.5					

Continuation of Example: Variation of Business Case

In the variation shown in Table 6.13, the amount sold is reduced by 10% while simultaneously research and development costs and other additional expenses (marketing costs) are increased by 10%.

Under these modified assumptions, the assessment of the business case is not as clear as before. A net present value just greater than zero and internal rate of return of 13% just above the required 12% are evidence that one approaches the profitability limit with these assumptions. In addition, the capital requirements in the initial stage are higher.

From Idea to Invention: Differential Business Case

For innovations that mainly aim at reducing costs, the business case can be simplified. For this, one takes the business cases for the relevant area of the organization "Now" and after the implementation of the innovation project "Then." The differential business case is then the difference between the business case "Then" and "Now" and is calculated by subtracting the corresponding quantities (see Fig. 6.25).

In a differential business case, the elements that do not change do not need to be considered further. The following example illustrates this.

Table 6.13 Example: summary of the variation of the business case

In million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Target market	–	14.9	37.4	44.8	53.8	150.9
Expected market share	–	100%	100%	90%	75%	
Revenues	–	14.9	37.4	40.3	40.3	133.0
Cost of sales/revenues	–	45%	41%	45%	54%	
Research and development expenses	3.3	3.3	1.1	1.1	1.1	9.9
Additional other costs	1.7	3.3	1.7	1.7	1.7	9.9
Earnings before interest and taxes (EBIT)	(6.2)	(3.1)	10.5	9.8	6.1	17.1
Investments	(7.0)	(7.0)	(3.0)	(1.0)	(0.5)	(18.5)
Cash flow	(12.2)	(6.6)	10.7	8.8	5.8	6.5
Capital requirements	12.2	6.6	–	–	–	18.7
Indicators						
Net present value	0.4 million €					
(Discount rate 12.0%)						
Internal rate of return	13.1%		(WACC 10.5%)			
Time to cash flow positive (years)	2.4					
Payback period (years)	3.9					

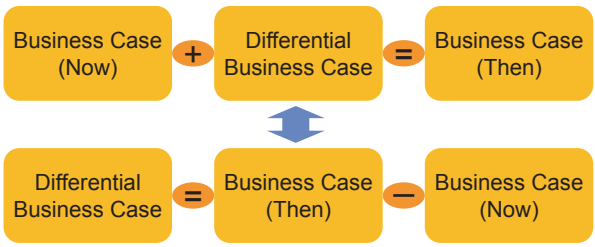

Fig. 6.25 Relationship of a differential business case. (Source: Bernd X. Weis)

Continuation of Example: Differential Business Case

Assumption: The developers have managed to invent a method that reduces the variable costs per unit by 3 € from 45 to 42 €. The cost reductions through economies of scale and learning effects remain unchanged. For this a development effort of 0.5 million € in Year 1 and two additional devices 1 million € each is required, one in Year 1 and one in Year 2.

In differential cost model, the additional cost of sales are negative, i.e., there are cost **savings** (see Table 6.14). These costs appear as a positive contribution to gross profit in the profit and loss account. The additional development costs are positive.

Table 6.15 presents the resulting differential profit and loss account.

Table 6.14 Differential business case: cost model

Cost of sales in million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Variable cost per unit	–	(3.0)	(2.7)	(2.4)	(2.2)	
Cost reduction in %	–	–	10.0%	10.0%	10.0%	
Achievable sales in K units	–	166	415	553	738	1.872
Cost of sales in million €	–	**(0.5)**	**(1.1)**	**(1.3)**	**(1.6)**	**(4.6)**
Additional cost in million €	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Expenses						
Sales expenses	–	–	–	–	–	–
Administration expenses	–	–	–	–	–	–
Other cost	–	–	–	–	–	–
Research and development expenses	0.5	–	–	–	–	0.5
Additional other costs	–	–	–	–	–	–
Additional cost in million €	**0.5**	–	–	–	–	**0.5**

Table 6.15 Differential business case: profit and loss account

In million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Revenues	–	–	–	–	–	–
Cost of sales	–	0.5	1.1	1.3	1.6	4.6
Gross profit	–	**0.5**	**1.1**	**1.3**	**1.6**	**4.6**
Expenses						
Sales expenses						
Administration expenses						
Other cost						
Research and development expenses	(0.5)					(0.5)
Additional other costs						
Operating profit (EBITDA)	**(0.5)**	**0.5**	**1.1**	**1.3**	**1.6**	**4.1**
Depreciation/amortization	(0.1)	(0.3)	(0.3)	(0.3)	(0.3)	(1.3)
Earnings before interest and taxes (EBIT)	**(0.6)**	**0.2**	**0.8**	**1.1**	**1.3**	**2.8**
Interest	–	–	–	–	–	–
Earnings before taxes (EBT)	**(0.6)**	**0.2**	**0.8**	**1.1**	**1.3**	**2.8**
Taxes	0.2	(0.1)	(0.2)	(0.3)	(0.3)	(0.7)
Earnings: profit/(loss)	**(0.5)**	**0.2**	**0.6**	**0.8**	**1.0**	**2.1**

In the differential cash flow statement of Table 6.16, the investments in equipment appear as a significant contribution.

Table 6.16 Differential business case: cash flow statement

Inbound cash flow in million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Earnings before interest and taxes (EBIT) (positive)	–	0.2	0.8	1.1	1.3	3.4
Depreciation/amortization	0.1	0.3	0.3	0.3	0.3	1.3
Disposal of assest	–	–	–	–	–	–
Increase in debts	–	–	–	–	–	–
Inbound cash flow	**0.1**	**0.5**	**1.1**	**1.3**	**1.6**	**4.7**
Outbound cash flow	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Earnings before interest and taxes (EBIT) (negative)	(0.6)	–	–	–	–	(0.6)
Investments	(1.0)	(1.0)	–	–	–	(2.0)
Decrease in debts	–	–	–	–	–	–
Paid interest, taxes and dividends	–	0.2	(0.1)	(0.2)	(0.3)	(0.4)
Outbound cash flow	**(1.6)**	**(0.8)**	**(0.1)**	**(0.2)**	**(0.3)**	**(3.0)**
In million €	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Total**
Cash flow	**(1.5)**	**(0.3)**	**1.1**	**1.1**	**1.3**	**1.7**
Cumulated cash flow	**(1.5)**	**(1.8)**	**(0.8)**	**0.4**	**1.7**	
Capital requirement	**(1.5)**	**(0.3)**	–	–	–	**(1.8)**

Table 6.17 Differential business case summary

In million €	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Cost of sales savings	–	0.5	1.1	1.3	1.6	
Research and development expenses	0.5	–	–	–	–	0.5
Additional other costs	–	–	–	–	–	–
Earnings before interest and taxes (EBIT)	(0.6)	0.2	0.8	1.1	1.3	2.8
Investments	(1.0)	(1.0)	–	–	–	(2.0)
Cash flow	(1.5)	(0.3)	1.1	1.1	1.3	1.7
Capital requirements	1.5	0.3	–	–	–	1.8
Indicators						
Net present value (discount rate 12.0%)	0.7 million €					
Internal rate of return	26.1%		(WACC 10.5%)			
Time to cash flow positive (years)	2.2					
Payback period (years)	3.7					

In the differential form the two accounts, particularly the P&L; have become much easier, since fewer elements have to be taken into account. The summary is shown in Table 6.17. Thus, to go for the proposed process improvement is a good idea. With a net present value of 0.7 million € at 12% discount rate for an investment of 2 million € and an internal rate of 26%, this improvement should be introduced.

From Idea to Invention: Business Case

For the preparation of the business case, the following steps are recommended.

1. **Generate the structure**
   - Determine the time scope (e.g., 5 years) and the period length (e.g., year, quarter…). Typically, these arise from the type of the offer and market considerations in the model. The project start is Year 1.
   - Identify and specify the magnitude (in Euros, in thousand Euros, in million Euros, in billion Euros).
   - Set up the structure of the marketing model and the cost model in a spreadsheet program.
   - Set up the structure of the profit and loss account and cash flow statement in a spreadsheet program.
   - Determine the weighted average cost of capital (WACC) and set the discount rate. Often, all that is needed is a call to the financial department.
2. **Define the basic assumptions of the most likely case**
   - Document the assumptions for the marketing model and the cost model.
   - Compute the profit and loss account and cash flow statement.
   - Determine the key indicators:
   - Capital requirements
   - NPV
   - Internal Rate of Return
   - Time to cash flow positive
   - Payback period
3. **Vary the assumptions**
   - Examine the assumptions, which may occur in the best case. Recalculate according to Step 2.
   - Examine the assumptions, which may occur in the worst case. Recalculate according to Step 2.
   - Examine the assumptions, which make the innovation project just profitable (profitability limit). Recalculate according to Step 2.
4. **Summarize the results**

To determine the profitability limit in step 3, the appropriate parameters must be tested. These are essentially the parameters in the marketing and the cost model.

From Idea to Invention: Business Case Presentation

Many results that have been developed up-to-now are merged into a unified presentation. The advantage of a uniform representation is that decision-makers, who have not yet dealt with the issues presented, quickly find orientation and easily get an overview.

The presentation of a business case can be structured as follows:

1. **Management summary**
2. **Short case description**
   - Demonstrate the particular objectives such as developing new markets, increase revenues, and cost savings.

3. **Business model**
   - Demonstrate the specific features of the business model.
4. **Sketch of the technical solution**
   - Present the technical solution.
5. **Marketing and cost model, general assumptions**
   - Explain the marketing and the cost model.
   - Explain further general assumptions that are essential for all variants of the business case.
6. **Specific assumptions and results**
   - Explain the special assumptions that are significant for the different business cases (probable case, best and worst case, and profitability limit).
   - Present the key results for the cases.
7. **Key aspects**
   - Present the key aspects of sales revenues, costs, profitability, investment, and capital requirements.
8. **Summary and Recommendations**

This structure presents all the essential information decision-makers need to conclude.

6.2.5 From Idea to Invention: The Business Case in the Decision Process

Usually a decision-maker or decision-making committee tests an idea on the way to an invention at least once.

First Decision—Develop Technical Concept
The first decision gives green light for the development of the technical concept. The resources required for this are working hours of the innovator and possibly some materials and laboratory equipment for design models. Elaborating the technical concept is usually the greatest interest of the innovator and exciting.

However, to take this first decision hurdle, the innovator should give the decision-makers an idea about the benefits the invention provides to customers and users, and the benefits the organization gets.

If appropriate, a brief and concise innovation story explains what the invention is about.

The business case presents the advantage for the company. It should be sufficient for the initial assessment that

- The marketing and cost models are plausible.
- The necessary investments are explained.

Second Decision—Launch Development
The technical concept is worked out detailed enough to launch development. For the launch decision the business case, however, must be further refined. In particular, some of the elements are now to be coordinated with the relevant departments. It can be very uncomfortable and undermine the credibility of the business case,

if during its presentation an easily retrievable element such as WACC or typical discount rate is criticized.

- The marketing model is well substantiated and, if needed, coordinated with the marketing departments.
- The cost model is also well justified. Purchase prices for the components are coordinated with the procurement departments, production costs with production planning departments.
- The business model is well founded. The interfaces to partner organizations and customers are outlined.
- The necessary investments are coordinated with the relevant departments for example, procurement and operation.
- The elements such as WACC, sales expenses are reconciled with the corresponding departments, e.g., financial department.

On this basis, the start of the development can be decided. If there are several innovation projects competing for resources, the information for prioritizing the various projects is now available.

This is the typical normal case in a large organization. However, what happens in a smaller company? What if the innovation project requires a significant proportion of the total available resources? What if a failure of the project threatens the existence of the company?

With the business case, the decision-maker can ponder the benefits and risks of the project. Furthermore, possible options how to reduce risks can be looked for:

- How could one better spread investments over time? How could one manage in the meantime?
- How could functional design model look like that one can provide to friendly customers for a trial period? How much development effort would be required for this? Who needs to be on the development team?
- How could a true "market test" be performed earlier in the project? How could this look like? What risks would be expected (e.g., annoyed customers)?

With these considerations, it can be achieved that the capital requirements for the project increase as uncertainty about the success of the project diminishes. In that regard, assistance can be provided, but ultimately it remains a business decision with risks.

6.2.6 From Invention to Innovation (Module Phase)

If the project is given green light to continue, then a series of further decisions are required.

The first strategic decision to be taken is how the innovation project is organizationally placed in the organization. In Sect. 5.2.2 possible organizational forms were discussed where the scope of the innovation project plays an important role. For a large innovation project it can even make sense to organizational spin-off into a subsidiary with own business responsibilities.

In most companies, development processes are established and functioning. Whether these processes are suitable for the implementation of the innovation project must be evaluated and depends on the type of innovation.

Especially for innovation projects, the so-called agile development methods, particularly for software development, become increasingly important. Agile stands for nimble, lively—exactly what is needed for an innovation project, which is always fraught with uncertainty—as already stressed so many times. The market environment can change, the assumptions in the business case may prove to be faulty, or resources are not available as expected. When the project responds quickly to changes, the chances of success of the innovation project increase (see Fig. 6.26).

A manifest details the basic principles of agile development.

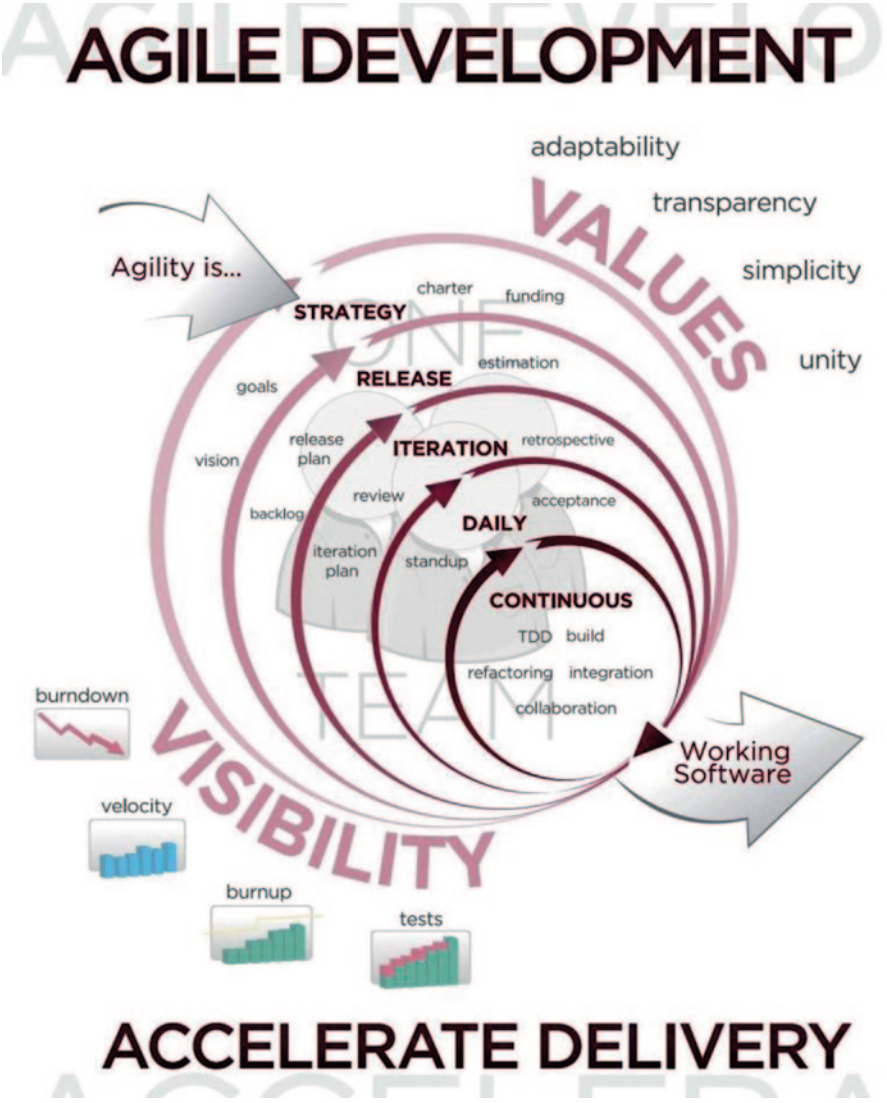

Fig. 6.26 Poster agile software development. (Source: http://commons.wikimedia.org/wiki/File:Agile_Software_Development_methodology.jpg, 20.3.2012; from http://en.wikipedia.org/wiki/Agile_software_development)

- **Manifesto for Agile Software Development:** We are uncovering better ways of developing software by doing it and helping others do it. Through this work, we have come to value:
  - Individuals and interactions over processes and tools
  - Working software over comprehensive documentation
  - Customer collaboration over contract negotiation
  - Responding to change over following a plan

  That is, while there is value in the items on the right, we value the items on the left more. [7]

Based on these principles, a number of development processes were devised such as scrum[8] or extreme programming[9]. These development processes have a fundamental commonality—they rely on self-organizing development teams usually of five to ten people (see also Sect. 5.1.1).

Thus, the decision for the phase from invention to innovation has number of options. Which one is eventually selected, depends on the specific situation (see also Sect. 5.2.2).

6.3 Invention: Tools

6.3.1 Strategy Tools

From the literature a number of tools (Kerth and Asum 2008; Ansoff and McDonnell 1990; Kotler and Keller 2009) helping to devise a business strategy is known. The most important in this context are briefly listed here.

SWOT Analysis
SWOT is the acronym of Strengths, Weaknesses, Opportunities, and Threats. The SWOT analysis combines and differentiates in one representation, the individual areas of corporate competitive strengths and weaknesses as well as the external beneficial and adverse environmental effects over which the organization has no control (see Fig. 6.27).

Depending on the purpose and level of detail the identification of the strengths and weaknesses is performed either based on experience or using specific analytical techniques for the own performance potentials. Typical questions are:

- Customer base, service, image, geography
- Products, marketing, distribution, pricing, quality, organization
- Production, productivity, logistics
- Technology, technical skills, and support

[7] Manifesto for Agile Software Development, http://agilemanifesto.org.

[8] siehe http://en.wikipedia.org/wiki/Scrum_(development).

[9] siehe http://en.wikipedia.org/wiki/Extreme_Programming.

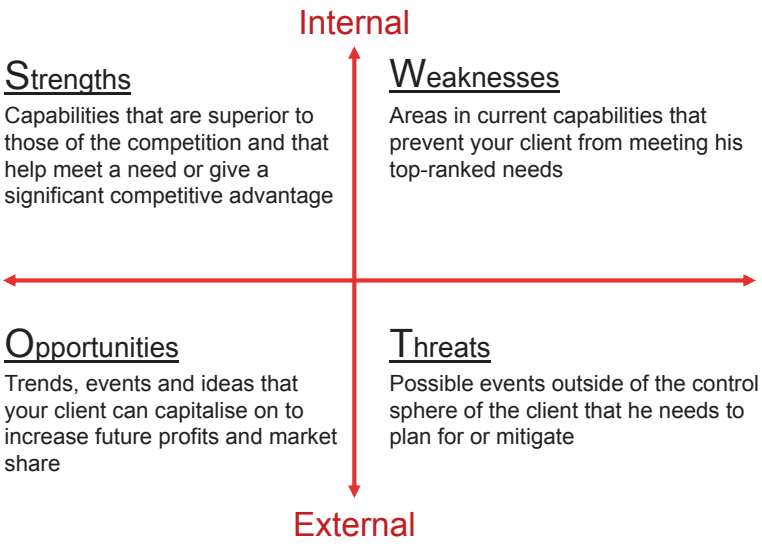

Fig. 6.27 SWOT analysis matrix. (Source: Bernd X. Weis)

- Management, decision-making, communication
- Finances

The identification of risks and opportunities derives from the business environment. Typical questions are:

- Market
- Competition
- Technology
- Economic development, social trends
- Legislative, political, and societal conditions

The SWOT analysis is suitable for all sorts of tasks. However, it should be exercised and applied with care, as often the time references of the present and the future are very different. Nonetheless, SWOT representation provides a simple summary of possibly complex relationships and contexts.

Boston Consulting Group (BCG) Portfolio Matrix

The BCG portfolio matrix is one of the most commonly used representations of the product portfolio of an organization or product group. In a matrix of the four areas Stars, Cash Cows, Question Marks, and Poor Dogs, the individual products/product lines/business divisions are assessed according to their importance for the current and (estimated) future value added. On the horizontal axis, the competitive position is defined as the ratio (percentage) of the market share with respect to that of the largest competitor. If the ratio is greater than 100 %, then the own company is market leader. The vertical axis displays the market growth rate (percentage) of

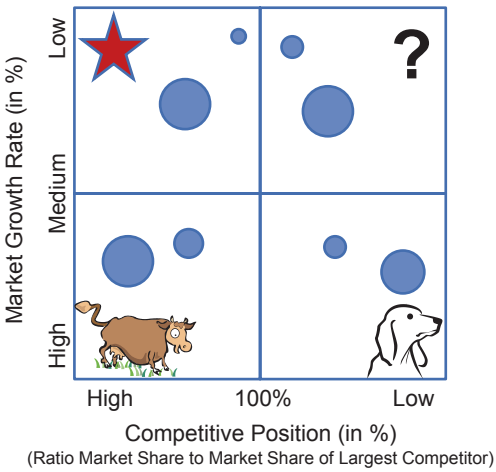

Fig. 6.28 BCG portfolio matrix. (Source: Bernd X. Weis)

the addressed market. With the size of the circles, the proportion of product sales to total sales can additionally be represented (see Fig. 6.28).

- **Stars** are characterized by a high relative market share in a rapidly growing market. Companies will invest here.
- **Cash cows** have a high relative market share and low market growth. These products are usually at the height of their life cycle. The profits are cashed in.
- **Question marks** are new products with high growth potential but low relative market share. One carefully selects from these products.
- **Poor dogs** have low market growth and low relative market share. These products are divested.

In a strategically oriented organization, all areas are harmoniously balanced. Innovative products are located with either stars or question marks. With stars are those products that open up an entirely new market, with the question marks those who attack established products with new methods and technologies. From the portfolio, the importance of the innovation is apparent to the innovator when he positions his innovation. When the areas of star and question marks are sparsely occupied, then there is a need for new products. If they are densely populated, one can expect strong internal competition for resources.

Growth Matrix (Ansoff)

The product market matrix according to Igor Ansoff structures the possible growth paths that an organization can opt for. Based on existing markets and existing products and starting from an analysis of the actual situation, the strategic options are described. After an assessment of the various options the specific growth strategy is developed.

Products / Markets	Existing Products	New Products
Existing Markets	Market Penetration Strategy	Product Development Strategy
New Markets	Market Development Strategy	Diversification Strategy

Fig. 6.29 Growth strategies/ growth matrix according to Ansoff. (Source: Bernd X. Weis)

Ansoff differentiates depending on the product market combination different strategies (see Fig. 6.29).

- **Market penetration strategy:** How can demand for the products be increased? How can customers be encouraged to buy more? How can customers be won from competition?
- **Market Development Strategy:** What new groups of customers could be won? What customer groups can be addressed with which new distribution channels? How could export markets be developed?
- **Product development strategy:** What product innovations or improvements to the product can serve customers or customer groups better?
- **Diversification Strategy:** With which new innovative products can entirely new markets be developed? How can new markets be gained through acquisitions?

Extended Growth Matrix (Ansoff)

The matrix can be refined with appropriate strategies for specific targets. Thus, for differentiated product market combinations appropriate strategies can specifically be developed with the augmented matrix (see Fig. 6.30).

Products / Markets	Existing Products	Improvement in Existing Products	New Products with		New Products with Unrelated Features
			Related Features	Same Brand Name	
Existing/ New Customers	Market Penetration Strategy	Reformulation Strategy	Replacement Strategy	Line Extension Strategy	Product Development Strategy
Customers with Different Needs	Market Develop-ment Strategy	Market Extension Strategy	Market Segmentation /Product Differentiation Strategy	Brand Extension Strategy	Diversification Strategy
Resource Distribution & Export Markets	a) Forward and/or Backward Integration Strategies b) Acquisition c) Strategic Alliances d) Export				

Fig. 6.30 Growth strategies: extended growth matrix (Ansoff). (Source: Bernd X. Weis)

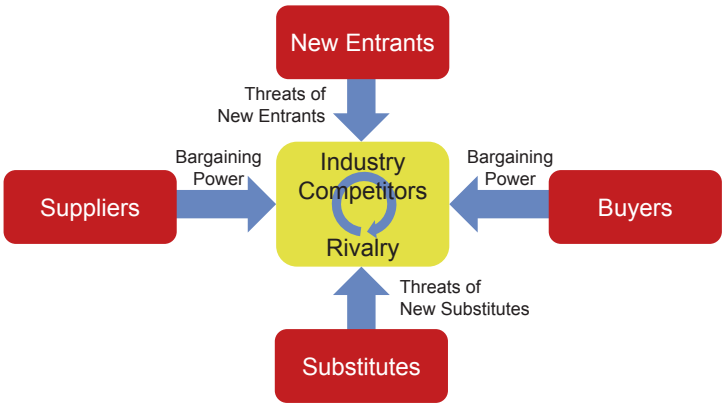

Fig. 6.31 Five Forces Model according to Porter. (Source: Bernd X. Weis)

Five Forces Model According to Porter (Porter 1980)
For strategic analysis, Michael Porter developed the five forces model, in which the forces of the external environment are presented. The underlying idea is that a market is more attractive the less competitive forces act on it. Porter identifies the following key competitive forces (see Fig. 6.31):

1. Rivalry among existing competitors/intra-industry competition as the driving force of competition
2. Threat of new entrants
3. Bargaining power of suppliers
4. Bargaining power of buyers and customers
5. Threat of substitute products (substitutes)

In the following, catchwords representing some characteristics of the forces are listed. These are:

Rivalries
Industrial growth
Overcapacity
Concentration and balance
Differences of competitors
Costs
Product differences
Brands
Complexity
Switching costs
Market barriers to exit
New Entrants, potential competitors
Economies of scale
Product differentiation
Brands
Switching costs

capital requirements
Access to distribution channels
Cost advantages
Access to resources
Development advantages
Policies, subsidies
Substitutes, product equivalents
Price advantage
Switching costs
Product loyalty
Buyers, customers
Negotiating position
Concentration
Volumes
Switching costs
Backward integration
Replacement products
Price sensitivity
Product differentiation
Brands
Quality
Profitability
Incentive
Suppliers
Differentiation
Switching costs in the industry
Replacement products
Concentration effects
Purchasing volumes
Costs
Risks through forward and backward integration

In addition, often a **sixth force** is included in the considerations: the ability to forge strategic alliances and partnerships with complementary businesses is gaining more and more importance (see Chap. 4).

6.3.2 Other Financial Indicators to Complement the Business Case

Terminal Value/Terminal Value Factor to Supplement the NPV Calculation
A business case evaluates business over a predetermined study period usually between 2 and 10 years. Nevertheless, the project will (hopefully) also bear fruit beyond that time in that it also generates profits in the long run. Adding an end value in the last year of the study period is one way to approximate the value of investments beyond the study period. The value of the investment is estimated at the end of the

study period. In finance theory, the sum of future cash flows determines a company's value. The terminal value factor is a factor by which one multiplies the net cash flow of the last year of the study period. This approximates the final value of the investment (see Table 6.18). As a rule of thumb, one could use a value between two and seven. The explicit formula is:

$$\text{Terminal value factor} = \frac{(1 - \text{Discount Rate})^{\text{Period}+1}}{\text{Discount Rate}}$$

$$\text{Terminal value} = (\text{Net Cash Flow})_{\text{Period}} \cdot \text{Terminal value factor}$$

A terminal value factor of assumed 5.31 considerably increases the capital value of the project, which may lead to distortions in the assessment. Therefore, if not absolutely necessary, it is usually omitted.

Return on Investment (ROI)
The return on investment (ROI) is a general term that describes the profitability of a project. Often the internal rate of return is used, but also other indicators.

$$\text{Indicator for capital effectiveness} \qquad \text{ROI} = \frac{\text{Profit}}{\text{Sales}} \cdot \frac{\text{Sales}}{\text{Total Capital}} 100\,\%$$

Return on Invested Capital (ROIC)
More important than the ROI, however, is the return on invested capital (ROIC).

$$\text{Indicator of operating profitability} \qquad \text{ROIC} = \frac{\text{NOPAT}}{\text{Invested Capital}} 100\,\%$$

NOPAT: net operating profit after taxes is the profit after tax and defined as follows:

$$\begin{aligned} \text{NOPAT} = {} & \text{EBIT} \\ & + \text{Amortization of intangible assets} \\ & + \text{Change in provisions} \\ & - \text{Operating taxes} \\ & + \text{Interest for expenses for lease} \\ & + \text{Change in capitalized R \& D expenses} \end{aligned}$$

Tax savings from interest payments on debt are not considered.

Table 6.18 Terminal value factor

Terminal value factor							
	Period (%)	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Interest rate	10	5.31	4.78	4.30	3.87	3.49	3.14
Interest rate	12	3.87	3.41	3.00	2.64	2.32	2.04
Interest rate	15	2.51	2.14	1.82	1.54	1.31	1.12

Economic Value Added (EVA)

The economic value added is based on the fact that an organization can only generate value if the return on invested capital (ROIC) exceeds the underlying cost of capital (WACC). This excess return leads to an appreciation or destruction of value of the organization.

$$\text{EVA} = \left(\text{ROIC} - \text{WACC}\right) \cdot \text{Invested Capital}$$

Other financial indicators

Return on Sales (ROS)

$$\text{Indicator of profitability} \qquad \text{ROS} = \frac{\text{Profit}}{\text{Sales}} 100\,\%$$

Return on Assets (ROA)

$$\text{Indicator of asset performance} \qquad \text{ROA} = \frac{\text{Profit}}{\text{Fixed Assets}} 100\,\%$$

Return on Equity (ROE)

$$\text{Indicator of equity performance} \qquad \text{ROE} = \frac{\text{Profit}}{\text{Equity}} 100\,\%$$

Invention: Summary

The innovator can describe the topic of the innovation, the original problem, which after all has stimulated contemplating possible solutions, in a fictional story. Usually an innovation requires two stories. The first story is for the innovator himself to sort and organize his thoughts. The other story is to communicate with decision-makers.

An innovation typically has one of the two possible directions: either it is primarily relevant for sales or for cost. From this, the profit results from using the simple formula profit = sales − cost.

The typical innovation process has two phases: The cloud phase and the module phase. The procedure for the cloud phase involves five steps. In parallel to these steps, the technical concept is elaborated and the main substantive issues clarified. The first step is to develop an innovation story (1). Then the value proposition (2) explains the benefits the innovation generates. In the marketing model (3) information about customers and customer groups are collected. With the targeted market share of the organization, one arrives at the sales revenues that the organization can achieve in this market. In the cost model (4) information on the cost of the elements that are needed for the innovation is collected. In the business case (5), all these results are combined and potential business developments are analyzed. This procedure is iterative, since repeatedly in each step in new insights can result that influence results of the other steps.

A business case provides the information decision-makers require:

1. Management summary
2. Short case description, objectives such as development of new markets, revenue growth, cost savings
3. Business model with its specific characteristics
4. Sketch of technical solution
5. Marketing and cost model, general assumptions
6. Special assumptions and results (most likely case, best and worst case, profitability limit)
7. Key aspects of sales, costs, profitability, investment, and capital requirements
8. Summary and recommendations

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Creativity

7

The drama "Being Innovative"—Act 3, Scene 1

The board member of POLYM AG Alexander H. sits with his assistant Walter K. in his office.

POLYM Inc. Alexander H.: Our innovation project seems to be developing quite well. And with it, we will enter entirely new markets, and we need this. Have you ever thought about how we, if our innovation project is successful, could develop this new business?

POLYM Inc. Walter K.: No, up to now I haven't thought of it yet. So far, we have enough to do to bring the innovation project to track. Don't you think that it's a little too early for these considerations?

POLYM Inc. Alexander H.: The early bird catches the worm. I've a gut feeling that tells me that there is even more in it than we think. So far, I could always rely on that. We should definitely to think about it. We have people who know how to do this. If we take Thomas' innovation as a crystallization nucleus—as a manner of speaking—around which we can build a completely new business area—even more products and especially services. Don't you have an idea?

POLYM Inc. Walter K.: I don't have a clue right now; I believe that I'm not getting much farther just on my own. It's simply too big. We'll need experts and generalists. Loads of expertise we need to acquire and learn first.

POLYM Inc. Alexander H.: Honestly, I have some doubts whether we have this sort of expertise in our company. Most certainly, a number of issues will come up that we just can't handle with our know-how as of now. Technically, we are doing just fine; no one can really compete with us there. Nevertheless, for us to develop a new business in a new market, that's a different league. When we create a business area, to a certain extent we commit ourselves to this new market. That would be a bold step, which we need consider and plan carefully. We must develop scenarios,

B. X. Weis, *From Idea to Innovation,* Management for Professionals,
DOI 10.1007/978-3-642-54171-1_7, © Springer-Verlag Berlin Heidelberg 2015

what this new business area means for our company—now and especially in the future. We need creative ideas on how we can manage that, without exposing ourselves up to the point where the existence of our company is in danger. I wouldn't want to answer the owners and employees that we may perish, even if we do so in style. We must be fully aware of the risks. For this, we should shop for know-how in the market, at least until we feel secure enough to go the rest alone.

POLYM Inc. Walter K.: I think that as a first step it will be most useful, if we organize a workshop in which we discuss the issues once across all potential departments and try to work out some solutions. Then we'll see what skills we need in addition.

POLYM Inc. Alexander H.: That's a good idea. Let us think about who should attend. In any case, Thomas E. and John G. Because of the innovation project, those two know most about this business. Think about it, who else should be attending otherwise. I try to figure out, how others have done it in a similar situation.

The drama "Being Innovative"—Act 3, Scene 2

Inventor Thomas E. and decision-maker John G. sit in John G.'s office.

Inventor Thomas E.: Did Walter K. approach you because of the workshop? It's to be held next Tuesday. They even have a moderator who works with creativity techniques. This really makes me curious. This get more and more exciting. Building a new business area is a great idea. I'm still convinced that my invention is to fly. The business case shows that crystal clear. I am really looking forward to the workshop.

Decision-Maker John G.: Yes, I am also invited and will attend. We both are so far the only ones who know a bit of it. But, to develop a new business area is not an easy catch. I just hope the management board doesn't leave us alone with it. I don't know anyone in the company who could really think of such a plan so that we could foresee all risks. I'm fairly convinced we need some outside help. Let's see what we will accomplish in the workshop.

7.1 Creativity: Selected Topics

7.1.1 Creative Process

"*Creativity is the ability for evolution.*"[1] Thus defines the Nobel laureate Gerd Binnig creativity. In Chap 4, variation has been identified as an essential element in an evolutionary process, which again and again causally triggers the eternal evolutionary process (see Fig. 7.1). Evolution, at least in its purest sense, has neither an inner

[1] Interview with Gerd Binnig in http://www.drillingsraum.de/gerd-binnig/gerd-binnig-3.html.

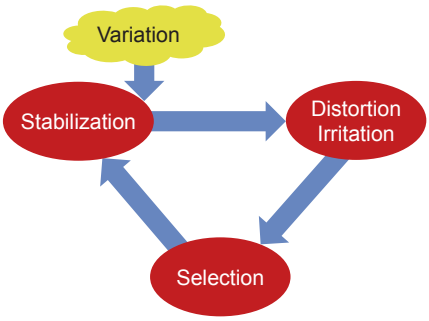

Fig. 7.1 Evolutionary process. (Source: Bernd X. Weis)

cause nor a specific goal—variation as a result of chance drives it. It is by nature contingent—it may be this way or quite as well some other different way.

One can escape the mere random chance that a variation happens, if one provides "creativity" with a task and a target such as satisfying (target) a need (task):

- **Creativity** is the ability to create something new from something already known, which has not yet been conceived in such a way (see Fig. 7.2).

The creative process involves the identification of a task and a solution process. Accepting a task triggers the solution process with the proviso to find a solution achieving a certain objective. Thus, from referring between the familiar and known, new insights and a deeper understanding can result such that by establishing a theory new relationships are discovered, or such that by combination new qualities are produced. Supportive skills are the ability of association and, of course of imagination.

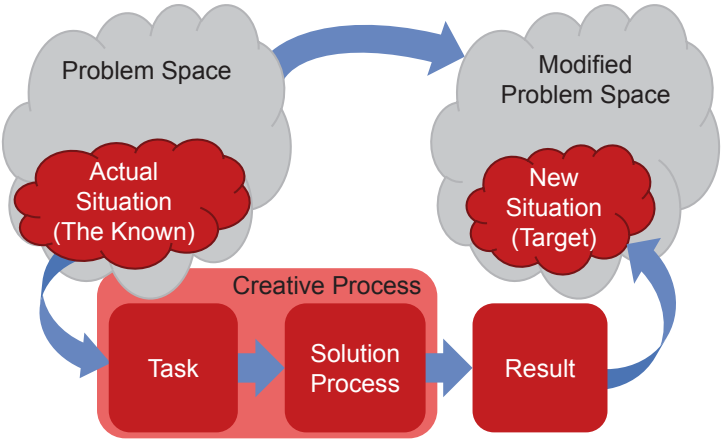

Fig. 7.2 Creative process. (Source: Bernd X. Weis)

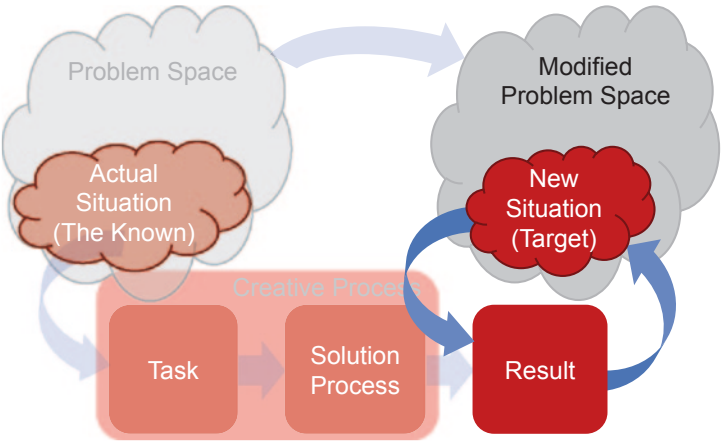

Fig. 7.3 Creative process and emergence. (Source: Bernd X. Weis)

Perhaps already the creative process itself, but in any case its result, is in terms of the evolutionary process from Fig. 7.1 a variation, upon which the system responds in its specific own way. Moreover, systems have—depending on your personal disposition pleasant or unpleasant—the ability of emergence. This means that in the first step with the solution derived in the creative process the intended target is possibly achieved, initiating however a new irritation/distortion, to which the system reacts. Eventually, if there is a final state of equilibrium, it will try to reach it. In the end the result achieved has—hopefully—sufficiently much in common with the intended target, so it can be considered as success (see Fig. 7.3).

Creativity and chance punish the Laplacian demon (Prigogine and Stengers 1980), who wants to create the future by executing a causal chain, with oblivion and with non-compliance, and render naught all the demon's troubles to create an order in his deterministic sense. And mind you, every human being, whether creative or not, welcomes this demon now and then.

Being creative is a game—a game (Eigen and Winkler 1987) in which one discovers by skillfully selecting individual moves in the perceived infinity of available possibilities the one that fulfills the purpose and that feels good. "*All the insights, noble thoughts, and works of art that the human race has produced in its creative eras, all that subsequent periods of scholarly study have reduced to concepts and converted into intellectual property—on all this immense body of intellectual values the Glass Bead Game player plays like the organist on an organ. And this organ has attained an almost unimaginable perfection; its manuals and pedals range over the entire intellectual cosmos; its stops are almost beyond number. Theoretically this instrument is capable of reproducing in the Game the entire intellectual content of the universe*" (Hesse 1943).

Being creative means acting—acting as shown in Fig. 7.3 implies that the result of the creative process in the sense of achieving goals will cause that a change

happens. Peter Graeser puts it this way: "*Creativity only shows in acting; it is the creative force and is awarded to the one, who has shown it, who has thus created something*" (Gräser 2012).

7.1.2 Bohm's Dialogue as Creative Process

> … and they met without encountering each other.
> Mercier (2007).

According to the American quantum physicist and philosopher David Joseph Bohm, matter and thought have a common basic structure. The starting point is the phenomenon of quantum entanglement (Zeilinger 2007), which Einstein called "spooky action at a distance," demonstrated experimentally in macroscopic dimensions. Quantum entanglement is the cause that the state of an entangled system is not localized, but extends over the entire spatially distributed macroscopic system. This shows that the three dimensions of space and time actually receives inadequate importance, and that there are phenomena that transcend space-time[2]. Many prominent physicists such as Sir Roger Penrose among others see in quantum theories that explain these phenomena, possible explanations for the physical causes of consciousness and for exerting intent and free will (Zohar 1997).

Inspired and ultimately driven by these considerations, Bohm designed a worldview in a holistic, indivisible, and processual perspective (Bohm 1980). Additionally the holistic aspects of Buddhism, the pantheistic ideas of Hegel and Whitehead, as well as the ideas (*"Truth is a pathless land"*) of Jiddu Krishnamurti (Krishnamurti 1982) influenced him. As Rilke said in the poem:

> Once, at the edge of the grove,
> we stand together alone
> and are festive, like flames—
> feeling: All is one. Rilke (1897/1898)
>
> *(Einmal, am Rande des Hains,*
> *stehn wir einsam beisammen*
> *und sind festlich, wie Flammen—*
> *fühlen: Alles ist Eins.)*

According to Bohm, the all-pervasive incoherence in human thought processes is the real cause of the endless crises that concern us. Thinking generally conceals this incoherence from the own immediate consciousness and pretends successfully that one's own interpretation of the world is the only one reasonable. Attentiveness is necessary to notice this incoherence.

Bohm developed "Dialogue," (Bohm 1996) a method that, as an alternative to purposeful discourse, targets for developing mutual understanding, coherence, from which by common exchange something new is created. In a group, Dialogue is a

[2] From http://www.nature.com/news/2008/080813/full/news.2008.1038.html (08.01.2012).

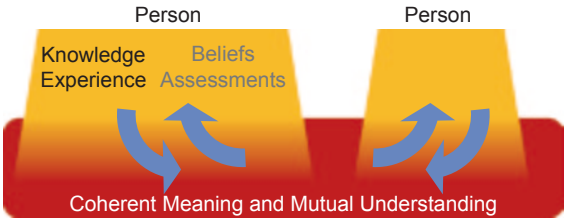

Fig. 7.4 Dialogue according to David Bohm. (Source: Bernd X. Weis)

conscious questioning of one's own knowledge, of one's own beliefs, and of what is believed to be at all possible, as a starting point for thinking in new directions. By connecting different perspectives, entirely new ideas often develop in the group.

In Dialogue[3], it is possible for a group to explore individual and collective requirements, ideas, beliefs and feelings that in a rather subtle way influence interactions. Dialogue is a way to observe together how hidden values and tacit intentions determine behavior, and how unnoticed, cultural differences collide, without noticing what is actually happening. Dialogue is like a stage, on which collective learning takes place and on which a feeling of increasing harmony, collegiality and creativity can be created (see Fig. 7.4).

Dialogue is in essence reconnoitering learning—to be considered not just a result of acquiring information or doctrines and also not a means, to verify or criticize a particular theory or program, but part of an ongoing process of creative interaction among peers. It creates a space in which attentiveness is given, and allows spreading ideas and interpretations, which enables a kind of collective proprioception (self-perception) or immediate mirroring of two aspects: the content of thought and the less apparent, the dynamic structures that dominate thinking.

Dialogue has no goals that go beyond the interest in the development and discovery of common meaning, of coherence. The four basic principles of Dialogue are:

- **Suspension:** To hold own and others' thoughts, impulses, judgments, etc. in balance, requires both real attentiveness in one's own process as well as in the group's process and is essential for exploring. Keeping in suspension is, to disclose reactions, impulses, feelings, and opinions so that others in the group can see, feel, and mirror them.
- **Honesty and transparency:** If a participating person has a good, perhaps controversial idea, he shares it with the group.
- **Building on one another:** People participating try to build on the ideas of others. Groups often develop ideas that go much farther than what the individuals could ever have imagined.
- **No decisions:** During Dialogue, no decisions needs to be taken about anything. Absolutely necessary are Freiraeume[4], where nothing needs to be done, nor a result is to be reached nor something is to be said or not said.

[3] http://www.david-bohm.net/dialogue/dialogue_proposal.html.

[4] For the definition of Freiraeume see p. 135.

Practical Issues
Dialogue works best with 20 to 40 persons sitting in a simple circle. If one invites for a Dialogue, it is useful to agree at the outset on the duration of the meeting and to have someone to look after the time. An optimal time is 2 h. Dialogue is a conversation between equals; hierarchy has no place in Dialogue. Initially, an introduction is necessary, one or two experienced facilitators are essential, who support the process of collective self-perception from the background. Dialogue can begin with any topic. No topic should be excluded.

Dialogue as Creative Process
Dialogue is a way to encourage and to enrich the creativity of the organization. Members of an organization relate in different relationships to each other and to their organization. There may be fears to formulate ideas that can be perceived as a criticism of higher ranks or norms within the organizational culture in a process that emphasizes transparency, openness, honesty, spontaneity, and a deep mutual interest. In an organization, Dialogue must begin with an investigation in all those doubts and fears. For this, it is convenient to begin the Dialogue with a precise agenda. However, no topic is excluded; even the impulse to exclude is certainly a topic that ultimately provides rich material for further exploration.

Most organizations often have predetermined goals and objectives that are rarely questioned, and at first glance, this does not seem to match with a free and open play of thought, which is so essential to the Dialogue process. However, the creative potential of Dialogue is large enough and allows the temporary suspension of all structures and relationships that make up the organization. Modern methods for business management take advantage of Bohm's Dialogue principles (Senge 2011; Scharmer 2011).

7.2 Creativity: Concepts and Contexts

7.2.1 The Thinking Creative Human

The British physician and psychologist Edward de Bono has developed a variety of techniques that support breaking the normal thinking patterns and finding new ideas. He distinguishes between vertical and lateral thinking. Table 7.1 lists the most important characteristics.

Everyone who had a training or studied has some practice in vertical thinking. Vertical thinking ensures that the world functions in its expected routine; while lateral thinking ensures that the world even in its routine remains unexpectedly exciting (see Fig. 7.5 and Fig. 7.6).

To overcome ingrained thinking patterns the control mechanisms of vertical thinking must first be understood and then somehow relaxed. Only then, one can embark on the quest for truly new ways of consideration.

Lateral thinking is often used as a creative technique in accordance with the following principles:

Table 7.1 Characteristics of vertical and lateral thinking

Vertical thinking	Lateral thinking
Is selective	Is generative
Is analytical, logical, rational	Being playful, associative, provocative, erratic
Is hierarchically and subdividing	Is holistic
Is homogeneous, free from contradiction	Is heterogeneous, can deal with contradictions
Is focused on the target	Elicited possible targets
Suggests a promising way	To explore many possible ways
Relies on proven solution method	Relies on other, perhaps completely new solution method
Is transported from the criticisms	Is hampered by the criticisms
uses fixed categories and classifications	Has no provisions

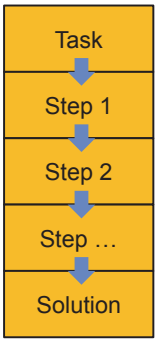

Fig. 7.5 Vertical thinking. (Source: Bernd X. Weis)

- Information will be assessed and used subjectively and intuitively.
- Initial situation and binding conditions can be changed.
- Mental leaps and associations are allowed and even encouraged, not every intermediate result must be correct.
- Every solution, even if it cannot be implemented, leads to a better understanding of the problem. Ideas are not discarded.
- Conventional thinking patterns are questioned, e.g., by consciously seeking the most unlikely solution to a problem.

For this purpose, the following techniques are used:

- Changing and reversing the viewpoint
- Visualizing thoughts
- Decomposing a problem into smaller and smaller units, and then experimenting with new compositions (morphology)
- Reversing relations deliberately, i.e., looking for the opposite
- Searching for analogies, transferring the relations from one situation to another, easier-to-use or already known situation
- Shifting attention from the apparently significant to the less obvious aspects.

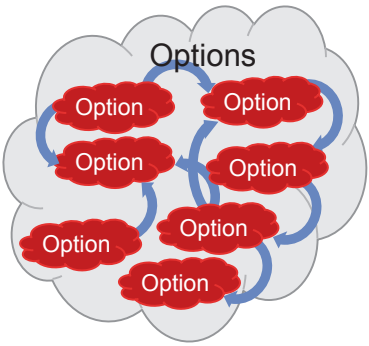

Fig. 7.6 Lateral thinking. (Source: Bernd X. Weis)

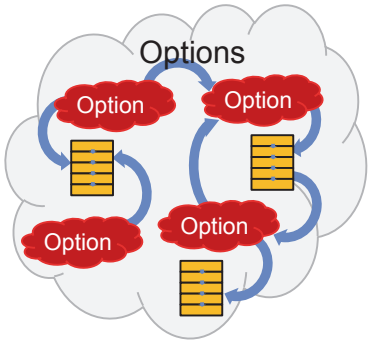

Fig. 7.7 Creative thinking. (Source: Bernd X. Weis)

When thinking vertically every step must be right, not so when thinking laterally. By suspending contradictions and open points, the thinking patterns of the mind are dissolved, judgments are delayed and postponed to let new information interact and thus create FREIRAEUME[5] for new ideas (see also David Bohm's Dialogue in the previous Sect. 7.1.2).

Each person has the skills of vertical and lateral thinking; the proportions however, differ individually. Creative thinking combines vertical and lateral thinking in a dialectical process (see Fig. 7.7).

The following properties characterize creative personalities (Nöllke 2010):

- **Problem awareness:** They identify problems and tasks as such.
- **Flexibility:** They "see" the variety of options and possibilities based on comprehensive learnings.
- **Originality:** They introduce unusual aspects.
- **Fun:** They are driven by the "passion" for the subject matter and by self-motivation.
- **Know-how:** They contribute knowledge and expertise.
- **Endurance:** They can stand frustrations and are not easily satisfied.
- **Sound judgment:** They detect (intuitively) viable solutions and promising approaches.

[5] For the definition of FREIRAEUME see p. 135.

Different people developed these properties to different degrees.

7.2.2 Tasks and Goals

Usually **tasks** in an organization stem from the normal business areas in which the organization operates. They are identified, and appropriate goals (see below) will be derived and then executed. This is part of the daily business. In this process the full efficiency, power, and force of vertical thinking unfolds.

Creative people have the ability to identify tasks that are not (yet) perceived as such by others by questioning the ordinary and penetratingly exploring new opportunities. The question behind the task, i.e., what actually is to be achieved, determines the space of options, in which solutions are sought and developed. Very creative persons can open this space widely.

Thus, Pablo Picasso did not ask himself, "How can I improve my portraits?" or "How could I better use acrylic paint?" Would he not rather have asked himself the question, "How can I display multiple three-dimensional perspectives on a two-dimensional canvas?" The result was cubism, one of the most revolutionary novelties in art in the twentieth century.

Albert Einstein did not ask himself, "How could I improve mechanics?" but he wondered: "How could I combine Newton's mechanics and Maxwell's electromagnetic fields?" The result was the theory of relativity, a cornerstone of modern physics.

The further the creative spark leaps (see Fig. 7.8), the unspecific and diffuse the task is, and, for the uninitiated, the more difficult it is to understand. Nevertheless, it is only a matter of time until contemplating and pondering allows describing a task precisely enough that it can be communicated. Often conceiving the tasks goes hand in hand with developing the goals.

Goals have already been dealt with in some contexts. Sect. 5.1.1 is more about the personal goals of an individual, in Sect. 5.1.2 goals helped to restrict the emerging options to those that are relevant. Goals as a cornerstone of organizational culture, as guidelines for corporate and innovation strategy, and as desired outcome of change processes were discussed in Chap. 5. Goals formed the basis for inventing stories and the business cases in Chap. 6.

Goals (Probst 2007) are defined and sought after potential and achievable endpoints of processes and in general refer to future states, which are different from the current and can and should be reached within a given period.

A goal is formulated in three steps:

1. **Find objective:** What are the desired goals? ("If the good fairy came, then…").
2. **Analyze situation:** What are the strengths, weaknesses, conditions? How does one know the goal is achieved?
3. **Formulate goal:** What are the goals of action?

A goal is effective if it is SMART:

S Specific (concrete, precisely and clearly formulated)
M Measurable (quantitatively or qualitatively)

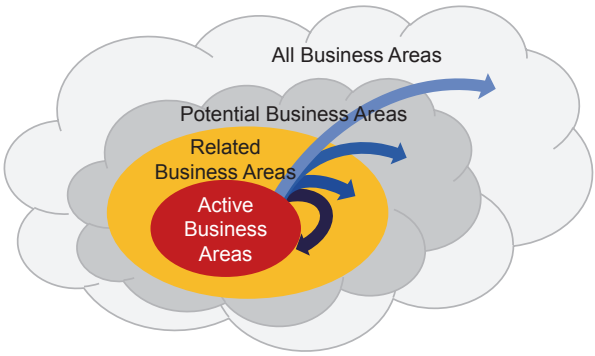

Fig. 7.8 Identifying challenges. (Source: Bernd X. Weis)

A Attainable (positively formulated, motivating)
R Realistic (goal must be reachable)
T Time-bound (until when…?)

Specific: What is to be achieved must be specified clearly. If necessary, differing objectives must be identified, discussed and resolved in consensus. Unresolved conflicts would be a significant burden for further work.
Measurable: The goal must be formulated in such a way that in a later stage it is objectively evident whether it has been achieved or not. When naming the exact measures, differing expectations can be identified, constructively discussed and resolved in consensus.
Attainable: When formulating the goal the intended final state is to be described positively. Negative goal formulation hampers any motivational effect. The same applies to "better"/"more" wordings, since these already express a negative opinion of the current situation.
Realistic: Goals shall be formulated in such a way that even ambitious goals can be achieved through own activities.
Time-bound: When formulating the goal it is determined, at which point in time the goal is to be achieved.

Task and goal being formulating work can begin. The goal emerged from some wishful thinking and is smart, measurable, attainable, realistic, and time-bound (SMART). However, not yet considered, and thus still open are some "what if" questions, upon which some light will be shed with the help of scenarios.

7.2.3 Scenarios

> Imagine, there is war and nobody goes there.[6]

Creative people often imagine the future in scenarios. Scenarios (Fahey and Randall 1998; Gassmann and Sutter 2011) draw pictures, images of the future, as it could

[6] "Sponti" graffiti from the 1970s.

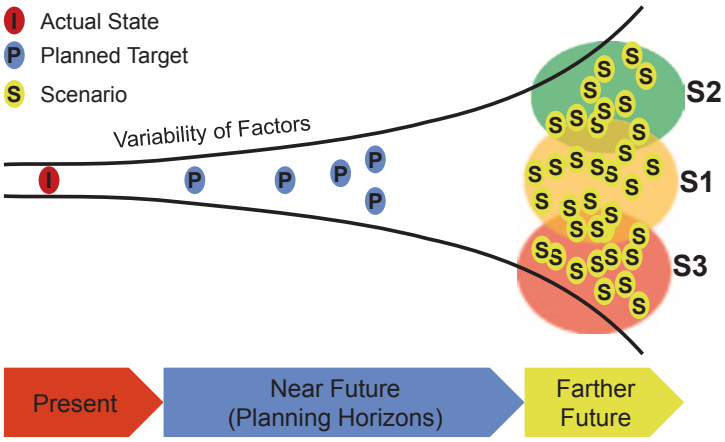

Fig. 7.9 Horizons of scenarios. (Source: Bernd X. Weis)

occur, if this or that would happen. Now the "this or that" are exactly, what cause the uncertainties inherent in these forward-looking images. In Sect. 3.1.3, it was discussed that the perpetuation of the past into the future can lead to cognitive fallacies and delusions. With scenarios, the path of simple perpetuation is left. Different images are drawn based on different assumptions about the factors that are believed to fundamentally shape this future. Depending on how many factors are influential, a variety of scenarios will emerge. Most of the time these can be grouped so that one ends up with a much smaller number of substantially differing, meaningful scenarios (see Fig. 7.9).

In Sect. 3.1.3, scenarios were discussed that are extremely unlikely, but cause an extremely large effect. They are called Black Swans. If as shown Fig. 7.10 an unlikely disruptive event occurs, then many of the assumptions and considerations of the preceding scenarios are no longer valid and applicable.

Due to this fundamental change, new scenarios have to be developed. Because these events are highly unlikely, one will not expend too much effort. However, the resulting scenarios are elaborated to the extent that opportunities and options are uncovered enabling to deal with the corresponding consequences—"*Fluctuat nec mergitur.*"[7]

When developing scenarios one proceeds as described in the following (see Fig. 7.11):

1. Describe the new situation in the future, create an image of the future (see also Sect. 6.1.1).
2. Analyze the current situation and identify the most influential factors.

[7] "It is tossed by the waves, but does not sink", Motto of the city of Paris.

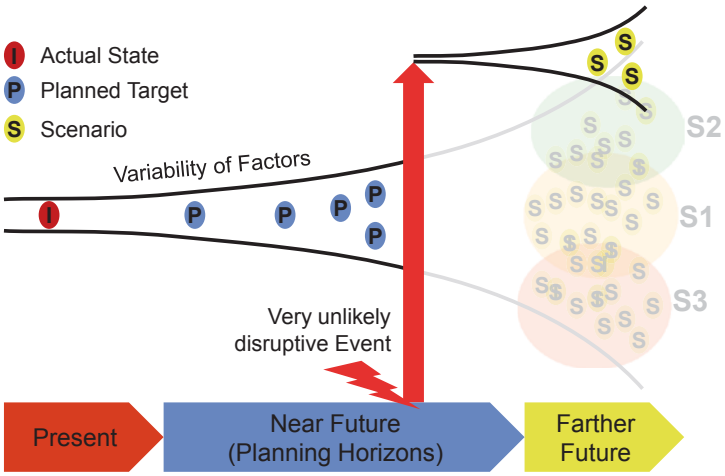

Fig. 7.10 Black Swans. (Source: Bernd X. Weis)

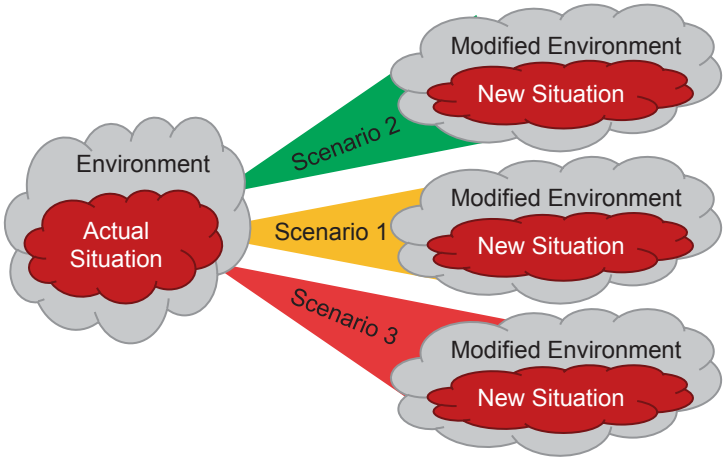

Fig. 7.11 Developing scenarios. (Source: Bernd X. Weis)

3. Show the path that leads from the current to the future situation, which changes of these factors determine the path, and which changes in the problem space may thereby arise.

It is amazingly difficult to establish good scenarios. Scenarios are inherently contingent, i.e., it may be so, but could quite as well be completely different. However, scenarios avoid developing an over-dependence on the supposed reliability of different forecasts. However, the process of developing scenarios is extremely helpful for asking the right questions and thus preparing for the unexpected. Scenarios offer

many benefits. However, they can also lead one astray, if not used with the necessary awareness and care.

Scenarios have four characteristics that make them a powerful tool for understanding the uncertainties of the future developments:

- They expand horizons of thinking.
- They reveal the (almost) inevitable in future projections.
- They prevent groupthink.
- They challenge traditional wisdoms.

Expanded Horizons of Thinking

When contemplating possible images of the future together with a coherent sequence of events that can lead to this future, the thinking horizon expands. If it is shown, how and especially why images of the future could change very quickly from bad to good and vice versa, one can prepare oneself to sudden, disruptive changes. Thus, this process sets limits to the human inclination of perpetuating the past (see Sect. 3.1.6).

The process of developing scenarios clears the view upon the fundamental factors of change. It ultimately requires to coherently describing ways to the possible visions/images of the future. For this, some of the assumptions and beliefs accepted as true have to be questioned and hypothetically adapted leading to a differentiation of those which bring about real change, and those that show little effect and negligible impact.

The (Almost) Inevitable Revealed

In the course of the development process, fundamental factors may show that there are inevitable consequences either of past events or of very profound trends. These factors unveil particularly important new insights, especially of those causes that lead supposedly improbable consequences.

Broadly speaking there are four types of inevitable factors:

- Demographic development
- Limits to growth and market saturation
- Basic economic laws
- Scheduled events

The **demographic development** is almost fatally predictable. The population of the Western industrial nations is almost everywhere constant or declining, while rapidly increasing in developing and emerging countries. In 1960, there were about 3 billion people in the world; by the end of 2011, the 7 billionth human child was welcomed. By 2030 there will be well over 8 billion. Each country or region has its own demographics. It is obvious that no spontaneous changes can be expected. Some of the resulting effects may be so far in the future that they hardly play a role in an image of the future within a foreseeable time horizon.

There are **basic economic laws** that can be considered immutable. If demand increases, then the prices will increase. If a company does not generate profits in long run, it will eventually disappear.

Limits to growth and market saturation are often insufficiently taken into account in business plans. When a new market is developed or the business model is new, forecasts are often too optimistic. Ignoring limits to growth or market saturation makes these future projections appear much rosier than it can really be possible. These effects lead to speculative bubbles that eventually burst sooner or later—economic history is full of them. Unfortunately, even prudent new business models suffer such damage.

Scheduled events are often beyond the time horizon, but already cast their shadows, so that one is well advised to consider them. Typical scheduled events are, e.g., the expiration of long-term credit lines, both on a small scale between banks and enterprises as well as in the large scale between states and nations. In 1898, the British Empire leased Hong Kong for 99 years from China—the termination of the lease did not come all of a sudden. At the latest when the People's Republic of China was founded it became clear that Hong Kong has to be returned to China.

Almost inevitably, mistakes will creep in when considering these effects. Thus, the uncertainties of the timing remain. For example, financial services cannot grow forever proportionally to the gross domestic product. When will the point in time of saturation come? Although there are significant uncertainties here, it is important to include these factors in the scenarios.

Prevented Groupthink

Power structures in organizations often prevent the free flow in a discussion. In many cases especially in highly hierarchically oriented organizations, the highest-ranking person sets the opinion. When developing scenarios, these mechanisms are disrupted. Scenarios offer a "safe harbor" for contrarian and unconventional thinking.

Challenged Traditional Wisdoms

In large organizations, the status quo has a particularly high inertia. A lot of money and some managerial careers flowed into the core assumptions of the organization, which supports the status quo inertia. Developing scenarios also provides a "safe harbor" for opinions where even the foundations of the status quo are no longer valid.

Dangers and Pitfalls When Working with Scenarios

As mighty and powerful scenarios are, they still pose a few dangers in their application, which are addressed briefly below.

The Risk of Non-choice

If only one possible future scenario is considered, it is easier for the leadership team of an organization to make decisions. This is classic management executed with the appropriate methodological skills and self-confidence. However, if the leadership team must choose between several possible scenarios, it may happen (and this is often the case) that the decision for one scenario and thus against the others is postponed—in the hope that the one scenario reveals to be the one. From this procrastination, the aforementioned classical management suffers. Important decisions are

taken (too) late or not at all. In addition, the leadership team becomes disoriented and acts accordingly. This leads to confusion throughout the organization and to a lack of alignment.

Selecting the most likely scenario for further considerations avoids this. However, arrangements are made for the case that a different scenario or one that one has not even imagined emerges. Finally, one can make decisions such that they are not wrong at least in several scenarios.

The Danger of Scenarios that Simplify Too Much
If one has developed a number of scenarios, then one is inclined to develop the feeling that one has actually covered one's back in all directions. Usually one falls into the trap that a downturn as well as a recovery is estimated weaker than in reality (and also often has been). In both cases, one should expand the horizon of thinking and leave the comfort zone. Even small changes in the environment can affect large impacts. To keep these scenarios and the corresponding factors in mind is important.

In addition, one should pay attention that the considered variable factors have the MECEness property (see Sect. 6.1.4). Usually three to five factors are considered unreliable. If for instance scenarios with three determining factors, which can take the values "good," "medium", and "bad," are examined then there are already 27 different scenarios. The number of scenarios but will be reduced to four to five, because certain combinations will turn out to be almost impossible or can be subsumed under others.

The Risk of Erroneous Communication Using Scenarios
The leadership of an organization is not credible when communicating the possible scenarios, without opting for one. Credible leadership is characterized in that a clear goal is communicated, but that the associated uncertainties are also addressed.

Working with Scenarios
From the developed scenarios, one usually crystallizes, which is considered as the most likely and which inspires upcoming decisions. One must however be aware that this scenario is fraught with uncertainties, and that there are alternative scenarios. In addition, the scenarios should be thoroughly checked on a regular basis.

The development of scenarios is a truly creative process that requires imagination and resourcefulness. Scenarios cannot provide answers to all questions, but they help to ask better questions and to adjust to the unexpected, which make them a valuable tool.

7.3 Creativity: Tools

7.3.1 Time to be Creative—Preface

One wants to be creative and to find new solutions—but the head is empty, and just nothing crosses one's mind at all. A number of beliefs prevent creative development. These include:

- "I can't change anything."
- "I do not have time to be creative."
- "Why change anything? Everything still works fine as it is."
- "What will others think of me?"
- "I don't dare."
- "Imagination and creativity are for children."
- "My idea is still good."
- "I can't do it anyway."
- "I'll never be able to do this."

In a creative process, one has to get involved, for it to be successful. The stakes are relatively small compared to the gains, which can be achieved. Submitting to the creative process is facilitated by a creative tension and mood generated by

- Pleasant **atmosphere**—pleasant ambiance, color, music, and many others create new impressions
- Adequate **exercise**—stand-points become go-points, which support a change in perspectives, ways of thinking and patterns of behavior
- Stimulation of the **senses**—also the task can possibly be perceived with other senses which can extend the "view" on the task,
- **Humor—**humorous and creative people think outside and beyond the usual tracks and can make surprising connections.

Visualizations support the creative process. It is always about imagining, what one wants, as vividly and in as much detail as possible. Concretely and with many details one imagines how the result eventually should look like.

Intuition is acting "from the gut." The creative process is by definition determined by intuitive contributions that do not arise from an if-then causal chain. In any case, intuitive solutions can be a valuable contribution.

The following creative techniques are often applied in practice. Which of these are used or whether some of them are combined, depends on the specific case. A variety of other techniques and methods may prove useful.

7.3.2 Brainstorming

Brainstorming sessions generate many new ideas and proposals in a short time.

Group

- Group of 4 to 8, a maximum of 12 participants
- Moderator

Aids

- Pin board

Duration: A total of 45–60 min

- Phase Finding Ideas: 15–20 min
- Phase Assessment: 30–40 min

Execution

Phase Finding Ideas: The task is clearly identified and understood by the participants. The participants express what comes to their mind on this topic. The facilitator writes the ideas down. During brainstorming sessions, there is no discussion and criticism. The ideas of other participants can be developed further.

Phase Assessment: The collected ideas are discussed and evaluated. The following questions should be answered:

- Can the idea ever be implemented?
- Is it possible to immediately implement the idea?
- How far the idea needs to be elaborated?

Advantages

- Is very suitable for group processes
- Provides solutions to a clearly defined task
- Can also be done individually

Disadvantages

- Is less suitable for large-scale tasks
- Is not suitable for very shy participants
- Is difficult when the participants have hierarchically different functions

Software-based electronic support

Using computers can support brainstorming electronically. Thus, this technique can also be applied to larger groups. The electronic support also provides the ability to involve participants in different locations (Computer Supported Collaborative Work—CSCW).

7.3.3 Brainwriting

As with brainstorming, brainwriting sessions generate many new ideas and proposals in a short time.

Group

- Group with ideally six participants, the group size is variable

Aids

- Prepared sheets with the task and six rows of three boxes each for filling in

Duration: A total of 60–90 min

- Phase Finding Ideas: 30 min
- Phase Assessing: 30–60 min

Execution

Phase Finding Ideas: The task is clearly identified and understood by the participants. The participants write ideas for solving the problem in a row of the sheet. After 5 min, the sheet is passed on to another participant. There are six such rounds. During brainwriting, there is no discussion or criticism. Ideas from other participants can be developed further.

Phase Assessment: The 6 sheets have 18 ideas each for a total of 108 ideas that are discussed and evaluated. The evaluation is done as in brainstorming

Advantages

- Is also very good for larger groups
- Provides many solutions to a clearly defined task
- Can also be done as an individual

Disadvantages

- Is less suitable for large-scale problems
- Often not enough time to clearly explain ideas

Variation

The problem of the participants not being in the same location can be addressed as follows: Each participant will receive a notebook in which he records his ideas. After a predefined period, the notebooks will be exchanged. After a certain time the notebooks will be collected and evaluated. A group of persons so far not involved in the process, but familiar with the problem space evaluates the ideas.

Software-based electronic support

Again, computers can support this process electronically, which eases the process with participants at different locations (CSCW).

7.3.4 Mind Map

Information evolves from a central concept in the middle of a sheet of paper, not vertically from top left to bottom right. Thus, a task can be penetrated from many directions in many aspects (see Fig. 7.12)[8].

Group

- Suitable for individual work or very small groups up to four persons

Aids

- A large sheet of paper or software support

[8] http://freemind.softonic.de/.

Fig. 7.12 Example: Mind map created with FreeMind (Source: Bernd X. Weis)

Duration

- 20–30 min, varies depending on the complexity of the task

Execution

The task, the subject matter is written in one word in the center of the sheet and circled. Only keywords are used. Block letters makes it easier for the brain to take words as images and keep them in mind. From the center, lines (main branches) are drawn to other associations. Off the main branches, other side branches bifurcate on which further subpoints are noted. The words are to be written on lines, each line being connected to another. Every word gets a line.

Advantages

- Analyzes the task
- Collects the various aspects, e.g., for planning or strategy
- Can also be performed individually

Disadvantages

- Can only be done as an individual or in very small groups of up to four people
- Requires experience
- Reduces complex issues

Variation

A larger group can also use mind maps. Participants create without time constraints one or more mind maps on posters hung up in a room. Wandering around the room creates additional dynamics in which the participants are continually changing their

perspective on the problem. The joint work on the task lets new associations and possible solutions emerge.

7.3.5 Bisociation

Bisociation refers to pictorial comparisons. Even small children are familiar with the language of images; in fairy tales, animals are often associated with certain characteristics: poor as a church mouse, sly as a fox, hungry as a wolf. Pictorial language makes it easier to imagine something.

Group
- Groups of between 10 and 25 people
- One or two facilitators depending on group size

Aids
- Some interesting images to choose from

Duration
- Approximately 45 min

Execution

Phase Detecting Analogies: The task is clearly defined and understood by the participants. Then the participants select from a number of images, photos, newspaper clippings, or the likes just one. Close inspection of the item inspires to find analogies or common principles. The ideas are noted.

Phase Transfer: The listed ideas are assessed with respect to their usefulness and applicability regarding the task.

Advantages
- Produces unusual ideas and solutions
- Well-suited for technical tasks

Disadvantages
- Can be tedious if no time frame is agreed
- Produces many ideas, but few of them are suitable

Variation

Instead of images, one can also work with words.

7.3.6 Morphological Analysis

In the morphological analysis, the characteristics of relevant categories are differently combined in a systematic way. This results in combinations that have not yet been thought of, but have great potential.

Group
- Groups between one and six people

Aids
- A large sheet of paper, preferably with a table prepared for entries into rows and columns

Duration
- About 120 min

Execution

Phase Defining Categories: Define categories such as shape, color, materials and dimensions that are relevant for the task. The categories are listed in the first column of the table.

Phase Defining Relevant Characteristics: For each category, potential characteristics are sought and entered in the corresponding row in the table.

Phase Combination: The solution variants are analyzed. For a variant, a characteristic from each category is selected and evaluated.

Advantages
- Uncovers a large number of variants by systematic combination
- Well-suited for technical tasks

Disadvantages
- None known

Example

Task: Developing an electric car (see Table 7.2).

7.3.7 Osborn Method

Alex F. Osborn was an American advertising executive, who had developed brainstorming already in the 1950s. He designed a questionnaire, which covers various aspects.

Group
- Groups between one and six people

Aids
- No special aids or tools required

Table 7.2 Morphological analysis

Category	Implementation			
Body	*Small car*	Sports car	Sedan	Van
Number of wheels	*Three*	*Four*		
Drive motor	*One drive at each wheel, no gearbox*	One motor and gearbox		
Power	*Battery*	Fuel cell		
Comfort	Spartan	Normal	*Comfortable*	

A possible combination of characteristics is marked in italic

Duration
- About 120 min

Execution

The task is clearly defined and understood by the participants. The task is analyzed with respect to the following headings, the order of the questions is not important:
- **Substitute:** What can be substituted? Which conditions can be changed?
- **Combine:** Can ideas be combined and connected?
- **Adapt:** Does the problem point somehow to other ideas? Is it similar to something else?
- **Modify:** What can be changed? Which properties can be remodeled?
- **Magnify:** Can something be increased, added, multiplied?
- **Minify:** Can something be decreased, taken away, shortened?
- **Put to other uses:** What can it also be used for? Are there other uses for it?
- **Eliminate:** What can be eliminated? Which conditions can be changed?
- **Rearrange:** Can the order or structure be changed?
- **Reverse:** Can the idea be turned into its opposite? Can the process be reversed?
- **Transform:** Can ideas be transformed?

Advantages
- Creates new options through systematic analysis
- Well-suited for product development and technical challenges

Disadvantages
- None known

7.3.8 Reversal Method

In the reversal method, the problem is turned upside down. The central idea is to think about what you have to do or omit to achieve just the opposite. Creativity also means being out of one's mind (in the sense of moving away) and adopt positions

that allow viewing a task from different angles. If for example revenue is to be raised, then consider effects, which would lead to a reduction. If you want to attract more customers, you wonder what to do to lose customers.

Group
- Group of 4 to 12 participants
- Moderator

Aids
- Pin board

Duration
- About 90 min

Execution
The problem is reformulated into its opposite. With for example brainstorming solutions to this problem are sought, which in turn can be reversed into its opposite. These solutions are analyzed with respect to the original task.

Advantages
- Stimulates unexpected solutions by systematically analyzing the contrary

Disadvantages
- None known

7.3.9 Six Thinking Hats

This method developed by de Bono encourages working on a task under different aspects. The participants play different roles and try to work on the task in the specified role.

Group
- Group with up to 30 participants
- Moderator

Aids
- Six colored hats or other colored symbols

Duration
- About 120 min (depending on group size)

Execution
The task is clearly defined and understood by the participants. There are six symbolic hats available. Each of these hats stands for a certain mind set. As the participants

feel like they can wear one of the hats making the corresponding hat's disposition their own. It is possible that for many participants, the hats are distributed to subgroups. The facilitator writes down the statements.

The **white** hat represents objectivity and neutrality. Information is collected without being assessed. There are only facts and figures, not emotions and judgments. Personal opinions are totally unimportant.

The **red** hat stands for personal feelings and subjective opinion. All feelings, both positive and negative, are admitted without having to justify them.

The **black** hat denominates all factual arguments expressing doubts, concerns, risks, but no negative feelings.

The **yellow** hat denominates the objectively positive characteristics, i.e., opportunities and benefits, hopes and goals, so all aspects are in favor of a decision.

The **green** hat leads to new ideas. It stands for creativity and alternatives, and is a symbol for thinking beyond the usual. It allows for provocation and conflict and can formulate everything that leads to new ideas, no matter how crazy or unfeasible these ideas may be. Critical remarks are not allowed.

The **blue** hat stands for control and organization. With the blue hat, one looks at the overall process from a higher perspective, keeps track and consolidates individual results.

Advantages
- Suitable for complex problems
- Captures different perspectives
- Does not regard tensions in the group (roles)

Disadvantages
- Stays close to conventional thinking

Variation
Disney method: The task is viewed from the perspective of a dreamer (great ideas), a realist (pragmatic solutions) and a critic (unsparing criticism).

7.3.10 Syntegration

The cyberneticist Stafford Beer coined the term syntegration from synergy and integration. Using the method of syntegration existing but dispersed knowledge is used and integrated into a common solution. The perspectives of the participants are networked in minimum time such that maximum information is transferred. As the basic structure for effective communication, Beer identified the icosahedron, the Platonic solid with 12 vertices and 30 edges (see Fig. 7.13). The 12 vertices represent the relevant aspects of the task and the 30 edges represent the people participating. The icosahedron maximizes the efficiency of cooperation by optimally utilizing the maximum possible relationships. It minimizes the information distance between the participants, resulting in the integration and integrity of knowledge, opinions and viewpoints.

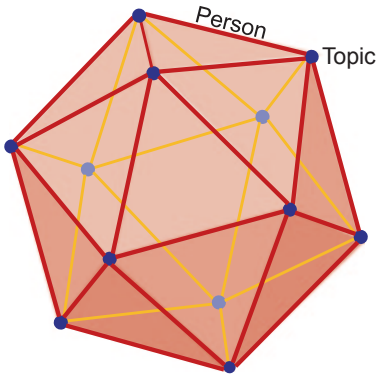

Fig. 7.13 Icosahedron. (Source: Bernd X. Weis)

Group
- Group of 30 (up to 42) participants
- At least two facilitators

Aids
- Two rooms corresponding to the group size

Duration: A total of 3.5 days
- Phase defining the task and role assignments 0.5 days
- Phase Syntegration (3 iterations per day) 3 days

Execution
Phase Definition of Task and Role Assignments: The participants cooperatively divide the task into 12 relevant aspects. The participants prioritize the issues for themselves. Each participant has three roles:
- Participant
- Critic
- Observer

Each participant will be assigned a role—participant, critic and observer—with respect to each of the 12 relevant aspects has to be taken.

Phase Syntegration: Two topical groups at a time meet in parallel to work on the assigned topic. A topical group consists of the participants who are driving the issue, the critics who question the solutions, and the observers who only watch and do not contribute. In 1 day, a topical group meet once. This process is repeated on three consecutive days. The moderators record the results of each topical group meeting. At the end of each day, the results will be presented to the plenary.

Advantages
- Well-considered division of labor or division of topics
- Extreme discipline through strict timing and role allocation
- No group dynamics at the expense of results

Disadvantages
- Very time consuming
- Large preparatory work

7.3.11 World Café

The world café enables creative work in large groups. In the world café, people can work simultaneously on individual facets of large tasks or several tasks.

Group
- Group of 12 to many more participants
- Host for each bar table

Aids
- A room appropriate for group size, bar tables with paper tablecloths

Duration
- About 120–180 min

Execution
The task is clearly defined and understood by the participants. Participants choose a table and contribute their ideas to the solution of (sub-) task of this bar table. After 15–30 min, the participants except the hosts will move to other tables. The hosts ensure an open friendly atmosphere. The world café closes with a phase of reflection.

Advantages
- Stimulates many participants to contribute.

Disadvantages
- None known

7.3.12 Scenario Technique

For scenarios, refer to Sect. 7.2.3 in this chapter.

Creativity: Summary

Being creative means acting—acting implies that the result of the creative process in the sense of achieving goals will cause that a change happens.

In Dialogue according to David Bohm, it is possible for a group to explore individual and collective requirements, ideas, beliefs, and feelings, which in a rather subtle way influence interactions. Dialogue is a way to observe together how hidden values and tacit intentions determine behavior, and how unnoticed

cultural differences collide, without noticing what is actually happening. By connecting different perspectives, entirely new ideas often develop in the group.

Vertical thinking ensures that the world functions in its expected routine, while lateral thinking ensures that the world even in its routine remains unexpectedly exciting.

The following properties characterize creative personalities: problem awareness, flexibility, originality, fun, know-how, endurance, and sound judgment.

Usually tasks in an organization stem from the normal business areas in which the organization operates. Creative people have the ability to identify tasks that are not (yet) perceived as such by others.

A goal is effective if it is **SMART**, i.e. **S**pecific, **M**easurable, **A**ttainable, **R**ealistic, **T**ime-bound.

Scenarios draw images of the future, as it could occur, if this or that would happen. The development of scenarios is a truly creative process that requires imagination and resourcefulness. Scenarios cannot provide answers to all questions, but they help to ask better questions and to adjust to the unexpected, which make them a valuable tool.

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Outlook

8

The drama "Being Innovative"—Epilogues.

Concluding monologues of the protagonists.

Inventor Thomas E.: My project presentation was really good. The made-up story of the application really clarified what the project is all about. According to the discussion and conversations during the breaks, they will approve my project. They're on fire. Both technically and commercially, the concept is now really convincing. I really feel like going all the way.

Decision-Maker John G.: Since the project is now approved and the company is behind the project, I'll get the necessary resources. People are fully motivated and looking forward to it. I hope we haven't done too big mistakes in our estimates. There are still a number of uncertainties about factors, which could derail the project if we got them wrong. A failure would stick to me. I have to keep an eye on this project.

POLYM Inc. Alexander H.: We dare a really bold journey into the unknown. But now we go this way with courage and confidence, decisiveness and determination. We are not just a plaything of the markets; we can change a few rules or make a few new ones. If it should turn out later that it's been too crazy an idea, we can always backtrack and try to make the best of it. We will see how the project develops. There are so many factors—we cannot oversee all of them. It may well be that this is the beginning of a fundamental change of the organization. In any case, after this nothing will be as it once was.

Creativity, courage, luck, and resources are the ingredients that give birth to innovation in the inseminating and nourishing fields of tension that require change in a very pragmatic way (see Fig. 8.1).

In these areas of tension one is somehow positioned somewhere, i.e., in each area one has settled oneself somewhere between the extremes—there is no choice. The positions themselves are not digital, but analog, there is no "either or" but an "as

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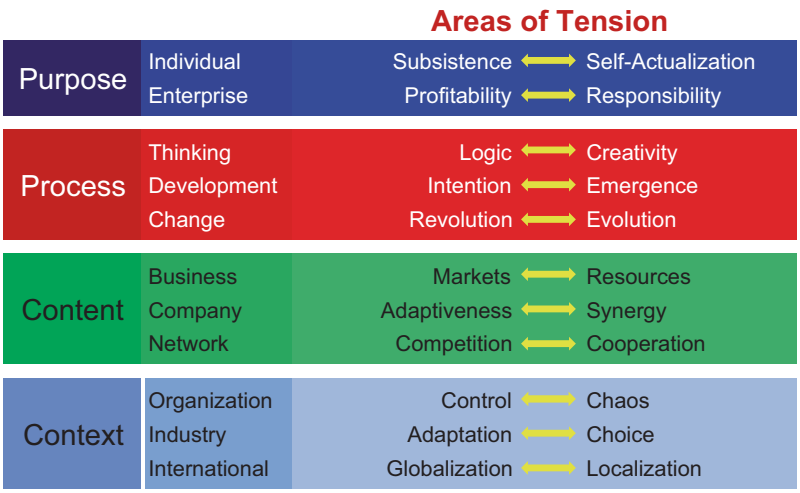

Fig. 8.1 Areas of tension. (Source: Bernd X. Weis)

well as." How and where one positions oneself in these areas of tension is ultimately the result of leadership, both of one's own and of that of the organization.

Nevertheless, what can be said with certainty: The hope that there are positions in these areas of tension, which—at least for a certain time—allow an equilibrium of constant comfort, can safely be given up. Even if such an equilibrium should exist, what can be doubted, one will always be located away from it. That is the essence of complex dynamic ecosystems. Even though this may sound like bad news, it is not, but it is simply the way of the world.

Thomas Jefferson formulated the rule for appropriate behavior: "*Nothing gives one person so much advantage over another as to remain always cool and unruffled under all circumstances.*" [1]

[1] Thomas Jefferson (1743–1826), President of the USA, Co-author of the Declaration of Independence.

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