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Managing Innovation Driven Companies

Approaches in Practice

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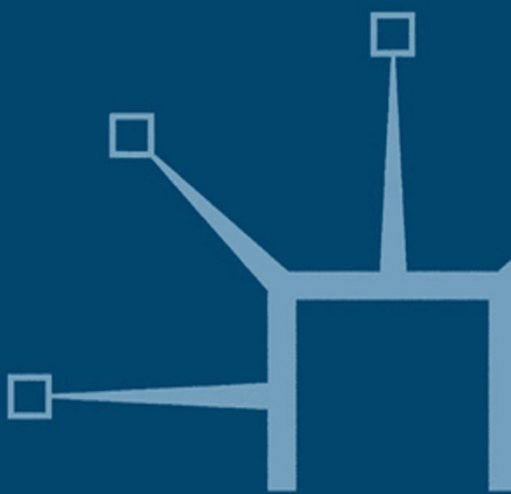

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Edited by

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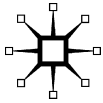

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Foreword

In the spirit of EITIM

This book articulates the spirit of the European Institute for Technology and Innovation Management (EITIM). The Institute was founded in 2000 by researchers and teachers from leading European universities who shared – and still do share – a deep concern about Europe's significant underperformance regarding innovation, compared to the US and Japan. Consequently the EITIM vision "To contribute to Europe's improved innovativeness" expresses the common motivation of the founding members to focus their professional efforts meaningfully on this issue.

In the context of this overall objective, EITIM aims to enable joint cross-national initiatives which complement individual activities in the broad field of Technology and Innovation Management. Such initiatives typically include conducting joint research projects, joint supervision and promotion of dissertations, joint publications, and joint executive seminars addressing the interests of those responsible for technology and innovation on top management boards. Currently EITIM consists of the following universities: University of Cambridge (UK), École Centrale Paris (France), Hamburg University of Technology (Germany), Swiss Federal Institute of Technology (Switzerland), University of Technology Berlin (Germany), Sabanci University (Turkey), University College Dublin (Ireland), Chalmers University of Technology (Sweden), University of Twente (Netherlands), and Politecnico die Milano (Italy).

Lessons learnt from current innovation initiatives

In order to pursue the EITIM vision in practice, conclusions have been drawn from past and current initiatives aiming at reducing Europe's critical "innovation gap." Two major "lessons learnt" resulted.

On the one side, the initiatives taken by the European Union (EU) and European Commission (EC) have been analyzed. Such initiatives include the so-called EU Framework Programs. In 2000 on the occasion of the "EU Lisbon Conference" it was – perhaps over ambitiously – decided to transform Europe within ten years into the "most competitive and dynamic knowledge-based economy in the world!" To this end the sixth and seventh programs were launched with over 17 and 72 billion Euros respectively. They focused on proposed research in knowledge areas such as health, biotechnology, IT, energy, environment, transport, socioeconomic sciences, humanities, security, and space. With respect to the enormous amount

being spent to promote Europe's competitiveness, the question about the effectiveness of such programs inevitably arises. Conclusive investigations do not exist. However it lies in the nature of academic research processes that it will take considerable time – 5 to 12 years – to provide knowledge which may be transferred successfully into significantly increased sales.

Moreover, regardless of available knowledge which may qualify for creating new products, noticeable sales increase due to new products – and thus increased competitiveness – come up only under the sine qua non condition, that companies master a qualified management of technology and innovation (MOT) competence. In other words, the company-internal innovation process – being the "final mile" of the long path from initiating knowledge creation to the economically useful utilization of knowledge – represents the real challenge in order to improve competitiveness. In view of the European innovation gap, it is not contradictory to conclude that this MOT competence is far from being a matter of course:

Although this relatively young discipline of company management is under rapid evolution, it still displays a shadowy existence in textbooks and education on general management. The emergence of technology and innovation management occurred in connection with the ever increasing pace of technological change. In the past, the words "innovation" and "technology" could hardly be found in minutes of top management meetings. This is a very perilous situation. If top management decisions are taken without an underpinning technology and innovation management competence, the chances are considerable that both new innovative business opportunities as well as severe technological risks are underestimated or even not recognized at all.

It is amazing indeed that this crucial role of the "final mile" is not appropriately dealt with in current competitiveness promoting initiatives such as the EU framework programs. Instead the prevailing argument expresses the opinion: "The more available useful knowledge – the higher the competitiveness of companies," a view which is quite far from the situation in the real business world.

This leads to the first lesson learnt: it is realistic to admit that exclusively knowledge research driven initiatives per se will not bring about significant short- and mid-term innovation driven improvements to Europe's unsatisfactory competitiveness in the global markets. Instead, substantial improvements can be expected only under the essential condition that European managers take hold of their own destiny and consistently worry about the innovativeness of their enterprises.

On the other side, the general focus of the management discipline MOT has been reviewed. The rapid emergence of MOT was triggered in the 1980s in the US. This was the time when the US felt seriously threatened by Japanese technology achievements. For this reason, the leading MOT document published 1987 by the National Research Council carried the title *Management of Technology – The Hidden Competitive Advantage*.

In order to take effective counter measures, MOT was created. With the intention to achieve a higher productivity of the R&D resources deployed, some first basic tools were developed, for example to identify core technologies. At that time MOT was referred to as the "missing link" between the natural sciences and engineering and general management. As a result of this initial role – outside general management – the subsequent progress of MOT research kept its focus on managing the technology driven entrepreneurial functions such as R&D and production.

This MOT role "outside general management" is not contradicted by a further research result. In order to understand the significance of "technology" and "innovation" in the context of general management, around 30 leading text books which claim to represent state-of-the-art "general management" were analyzed. The result was quite sobering, since hardly any substantial statements and recommendations on technology, innovation and their management were to be found.

This disappointment came up again from a further analysis. An earlier literature research of top management meeting minutes of successful and unsuccessful companies had been conducted. It turned out to confirm that in these documents of unsuccessful companies the words "innovation" and "technology" did not appear. These findings may presumably not have changed dramatically in the meantime.

Both these analyses mirror a perilous situation. If top management decisions are taken without fundamental technology and innovation management competence, the chances are significant that both new innovative business opportunities as well as severe technological risks are either under- or overestimated or just not recognized at all.

Out of these facts and findings, there is the second lesson learnt: it can be seen that coping with technological change has become – and will remain – a fundamental challenge not only for single entrepreneurial functions but for entire companies as a whole. This means that innovativeness and basic technology awareness have to become practically embedded qualities throughout companies at all managerial levels. In other words: they should constitute integrated values of the company culture.

These two lessons learnt clearly affected the past activities of EITIM and will continue to do so. At first, their underlying MOT concept and its content have been fundamentally revised. In the literature sometimes referred to as "New Generation MOT," top management of technology and innovation driven companies is the primary focus. This does not mean that the content of the "old MOT" has been replaced. It rather means that conceptual extensions have been developed, which include the entire company context. This concerns for example the highly sensitive issue of company culture. In fact the "New Generation MOT" can be considered to represent a first step towards an as yet missing basic textbook such as *Managing Innovation Driven Companies*. This first step is illustrated in an EITIM related

book publication titled *Technology and Innovation Management on the Move – From Managing Technology to Managing Innovation-driven Enterprises*.

Then, as a major milestone in the EITIM development, a first joint book publication appeared in 2004. It carries the title *Bringing Technology and Innovation into the Boardroom*. The content attempts to overcome the "splendid isolation" of top management bodies from technology and innovation issues by explaining and illustrating the new role to be played by the upper managerial level.

Further, in the context of this book publication, EITIM is conducting yearly seminars addressed at executives from innovation-driven companies. Typical themes include the CTO function, opportunities from "open innovation" strategies, taking far-reaching technology decisions and cultural leadership measures in order to promote innovativeness throughout the entire company.

Finally, several concerted efforts have been made in the past in order to influence the EU innovation policy towards a more realistic adaption to real life situations. In brief, concrete suggestions were made on how to meaningfully spend the enormous EU resources. Realizing the crucial role of the "final mile," the explicit promotion of the MOT quality of companies as part of the EU programs would be well justified, in parallel to financing research in attractive fields such as live sciences, new materials, and so on. The question is: How much should be spent on promoting MOT competence? As a rough calculation, just 1 per cent of the allocated amounts for the EU programs would be adequate to establish 100 centers of "MOT Excellence" throughout the EU. This would be a very modest "insurance premium" in order to provide a basis for taking decisions on "doing the right thing." Incidentally, this was the approach taken by the Japanese government.

The advances at the EU level did not bear any fruits thus far. However on the national level, encouraging progress can be noticed: in Luxemburg, together with EITIM related colleagues, discussions on the crucial role of the "final mile" started about two years ago. To our surprise, by June 29 2009, a new law on the promotion of innovation had been released, which is explicitly aimed at promoting the MOT competence of companies. Truly a breakthrough.

Content

Coming back to the current book: at its core it represents a continuation of the first EITIM book mentioned above. However it emphasizes the practical side of Technology and Innovation Management. The findings presented on selected topics are research-based, however at the end of each contribution "managerial implications" cover the recommended implementation of the research results.

The content follows the same triple structure as in the previous book: Strategy, Competence, and Innovation.

In Part I "Strategy," the initial contribution "Developing Innovation Strategies: How to Start?" presents a conclusive and straightforward procedure on how to develop an innovation strategy. It demonstrates in particular two innovative MOT concepts called "Innovation Architecture" and "Strategy Morphology."

The following contribution "Organization of International Market Introduction: Can Cooperation between Central Units and Local Product Management Influence Success?" deals with the challenge of Multinational Companies (MNC) on how to best share the responsibilities of central and decentralized local product management in order to improve local market impact.

The third contribution to Part I, this "M&A and Innovation: The Role of Relatedness between Target and Acquirer," is presenting recommendations on strategic aspects – such as technological capabilities, product mix, geographic focus, and customer base – to be observed when trying to improve the effectiveness of M&As.

The final contribution to Part I "Revisiting the Firm's R&D and Technological Ecosystem" contains an innovative approach on how to systematically analye the network of relationships of a technology-based organizational unit and to draw strategically relevant conclusions.

In Part II "Competence," the first contribution "Getting Value from Technology: A Process Approach" outlines case study based solutions on how to best integrate technological competencies into business processes.

Chapter 6, "Successful New Product Development by Optimizing Development Process Effectiveness in Highly Regulated Sectors: The Case of the Spanish Medical Devices Sector" provides findings on factors of successful new product development which challenge traditionally observed managerial practices.

Chapter 7, "Roadmapping at Printco: One Company's Experience" demonstrates – again case study based – Roadmapping to be a most powerful integrating competence for strategic innovation planning.

Chapter 8, "Performance Measurements in Supply Chain Collaborations (SCC)" outlines practice-based findings on recommended competencies on how to design a performance measurement system SCC.

In Part III "Innovation," the initial contribution "Understanding Discontinuous Technology and Radical Innovation" is focused – based on "best practice cases" – on managerial implications in order to establish a system of processes which deal with developing incremental and radical innovations.

The second article "Market Research for Radical Innovations – Lessons from a Lead User Project in the Field of Medical Products" sheds light on the so-called fuzzy front end of the innovation process, in which lead users can

play an eminent role. Referring to field research findings, a four-phase process on how to involve lead users in radical innovation projects is presented.

The following chapter "Relying on Experts: How to Effectively Gather Information for Innovation Projects from Market Specialists" presents recommendations for the management of external information and the identification of market experts.

The final contribution to this part "Generating Innovations through Analogies – An Empirical Investigation of Knowledge Brokers" presents the appropriate use of analogies in order to increase not only creativity effectiveness, but also to enhance project efficiency and improve communication throughout the entire product development process.

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Zurich, October 2010

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Part I
Strategy

1

Developing Innovation Strategies: How to Start? – A Systemic Approach Using the Innovation Architecture

Hugo Tschirky and Gaston Trauffler

Introduction

Coping with the ever stunning development of technological change and mastering a competitive innovation quality have become primordial challenges for most companies. However, keeping abreast with the omnipresent reality of technological achievements and threats requires managerial competencies which differ in many respects from traditional management of the past. In the first place technology and innovation are no longer issues of specific individuals or departments but rather of concern for the entire enterprise. Whereas in the past, Research and Development (R&D) departments often were considered to be responsible for an appropriate stream flow of innovative products, today's "best-in-class" examples of innovative companies reveal an innovation consciousness which is shared by all primary entrepreneurial disciplines such as R&D, production, marketing, and finance.

Being open-minded about new technology and innovation across the entire company is the expression of a company culture which is characterized by management and employees with natural curiosity and willingness to take risks, and above all by low company barriers of internal and external communication.

The existence of communication barriers is at first a fact which can be explained to a large extent by the naturally developed differentness of the various – separate, though complementary – entrepreneurial disciplines. In a figurative sense, this differentness is expressed by differing "languages" which are "spoken" in the various disciplines: In R&D, thinking and speaking in laws of nature, engineering principles, and mathematical rules are dominating the day's work. This "language" might be called "RanDish". In

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contrast, the production discipline is characterized by the colloquial language "Procish" with a vocabulary consisting of specific production technologies, throughput measures, and quality notions. In marketing and sales, the situation is different again. Here people speak "Clientish," dominated by expressions such as customer benefit, sales prices, and unique selling propositions. Finally the finance world of a company is quite different in its own way. Thoughts and operations centre all around profitability, liquidity, and margins which are basic words of "Financish."

This Babylonian confusion of tongues is an everyday fact of company life and represents the main barrier for finding consensus and taking decisions in due time. In this respect, company management is in particular challenged to establish and practice innovation management processes which – on the one hand – consider the large variety of all essential factors which possibly influence major decisions. On the other hand, the same process has to provide for mutual understanding of differing professional positions, accepting changes of such positions, and finally getting to a consensus on the appropriate singular decision to be taken.

This interplay between variety and singularity reflects one way to cope with complexity: A situation can be considered to be "complex," if at a given point in time, a large number of possible next steps that can be taken is existing. Deliberately allowing for all essential decision factors to be taken into account when starting a decision-making process reflects an intentional increase of complexity. In contrast, the subsequent process to establish consensus on the best suited decision to be taken is equal to a mastered decrease of complexity.

Successfully managing complexity is a specific challenge for innovation-driven companies. The ambition to be innovative as an individual or as a company means per se to conquer new territories of customer needs and technologies which might enable meeting such needs. Therefore innovativeness relies especially on the competence to initially increase complexity during the phase of idea gathering and then to reduce it again to a reasonable number of promising innovation projects.

Typical concepts and measures to willingly increase decision complexity in innovation-driven companies include for example so-called "business intelligence systems." They have become an agenda point dealt with priority. They aim at providing the appropriate inflow of information based on the experience that successful innovativeness relies to a large extent on knowledge which has been gathered outside the company. Such systems vary considerably in terms of dedicated resources depending on the size and the knowledge focus of the company. However there are even middle-sized and small companies which have introduced processes which systematically provide relevant outside knowledge based on a coordinated and knowledge field focused information search by single individuals, often called "gatekeepers."

A further challenge of emerging significance is the broad-minded awareness of innovation. A still popular understanding of innovation is focused on new products, new technologies or new services. However, innovative excellence goes far beyond and also includes organizational and business innovations as well. Particularly the latter ones require managerial creativity with perspectives across industries and global economies. Whereas incremental product innovations are gradually dealt with using dedicated processes, service innovations are still far from being systematically explored. And above all the deliberate handling of disruptive technologies and radical innovations is still a very rare managerial competence. However, good examples of companies which deal with this issue successfully exist.

Yet another leading trend has to be mentioned. Under the terms "open innovation" and "distributed innovation" reference is made to structural patterns that are characterized by pooling R&D resources across and beyond organizational and regional boundaries. In this respect Procter & Gamble (P&G) is providing an illustrative example. On P&G's website the chairman of the board, A. G. Lafley, is personally promoting the initiative "connect & develop": "I want us to be the absolute best at spotting, developing and leveraging relationships with best-in-class partners in every part of our business." One of the measures consists of two entries on the website, one reserved for "ready-to-go products or technology" to be offered to P&G, and the other installed for the acquisition of technologies from P&G.

Moreover the venture capital scene is providing an attractive potential for a managed increase of complexity and thus an accelerated innovative growth. The careful and systematic monitoring of start-up companies for example enables identifying the "right" technologies to be made available in a short time and with reduced technological development risks. Finally, further practices to initiate innovation search include highly interdisciplinary decision groups, external networks of experts, lead supplier, and lead user concepts of product development, etc.

Despite these ambitious challenges many professional authors have come to the conclusion that "innovation is not black art." This means that innovativeness is not the result of coincidental circumstances but rather the consequence of responsible leadership which makes use of already available tools and methods of modern management of technology and innovation.

In the following, four selected instruments of innovation management are presented: The newly developed "Innovation Architecture" (IA), the Strategy Morphology (SM), the so-called Business Roadmap (BRM), and the Business Model (BM). They are suited to effectively support the mentioned interplay between increasing and decreasing management complexity. And, above all, they represent practical management instruments aimed at enabling mutual understanding across the various company disciplines, functions, and management levels.

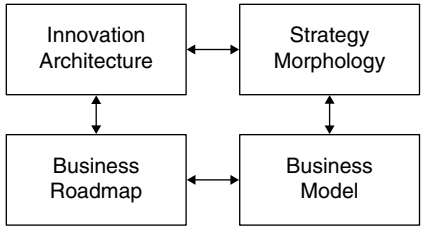

Figure 1.1 "Quadrangle" of Innovation Architecture, Strategy Morphology, Business Roadmap, and Business Model representing the core of strategic Technology and Innovation Planning

These four instruments are closely interrelated and represent the core of modern strategic Technology and Innovation Management (Figure 1.1).

Innovation Architecture representing structured creativity

Generic concept of Innovation Architecture

The IA represents a systemic knowledge map. It covers on the one side all major knowledge which underlies existing and new businesses and products in terms of trends of customer needs and available scientific knowledge (Figure 1.2). On the other side, it displays plausible combinations of such knowledge which constitute the basis of existing and new businesses and products. In this respect it consists of six structural layers: (new) Innovation Trends, (new) businesses, (new) Products-Systems-Services, (new) Product Functions, (new) Technology Platforms, and (new) Scientific Knowledge Fields.

The level of "(new) Innovation Trends" contains all relevant societal, economic, and market trends such as aging society, globalization, knowledge society, technology markets, venture capital, etc. In addition to consider such singular trends it is highly helpful also to include certified assumptions on future processes of activities of individuals, within homes and within organizations, and in society. On the level "(new) Businesses" ideas of future businesses are itemized which complement or replace current businesses. The level "(new) Products-Systems-Services" comprises the existing and possibly future products which might be part of the current or new businesses.

On level "(new) Product Functions" we find items or product features which are shared by more than one product. The implied "thinking in product functions" is absolutely key to IA: Product functions describe primary effects of products and services, such as "print characters" and "process transparencies" in the case of a printer. In this view product functions constitute "translations" of customer needs without preempting the technological

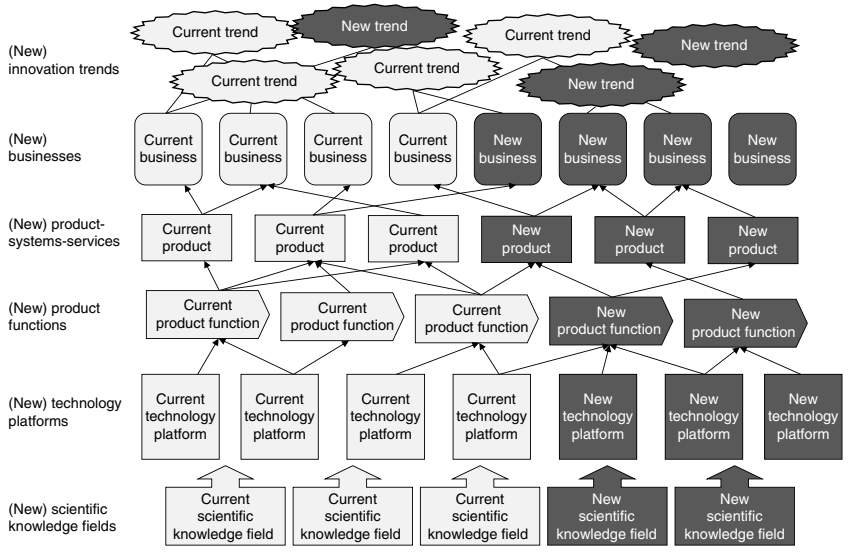

Figure 1.2 Generic concept of Innovation Architecture

solutions. This is essential in order not "to jump to conclusions" too early before all possible technological solutions for each individual functions has been investigated.

Finding best-suited technological solutions is subsequent to identifying major current and new product functions and is assigned to specific technology platforms. They are visualized on the next level of the IA. Together with product functions, "Technology Platforms" constitute the other main focus of IA: The term "Technology Platform" is a strategic term. It itemizes a group of product and process technologies which are to be mastered in order to provide competitive solutions for the identified product functions. Example: A renowned producer of diagnostics instruments identified six product functions which are shared by more than one product or system of two independent business units: "to handle objects," "to control temperature," "to process samples," "to perform analytical measuring," "to control systems," and "to communicate data." Correspondingly, separate technology platforms have been established which are focused on developing best-suited solutions of the various product functions relevant for quite different types of products and systems.

Prior to introducing the concept of technology platforms, two separate R&D departments existed which were assigned to develop pharmaceutical instruments for various business units. In this organization, each R&D department was challenged separately to develop entire "product solutions."

This meant that technological solutions for identical product functions were developed twice which is verbally equal to "reinventing the wheel" several times. Avoiding this obvious loss of productivity was the main motivation to introduce the mentioned technology platforms focused – across business unit boundaries – on technological solutions for individual product functions.

Above all, the concept of technology platforms has a strategic significance as it allows stressing the strategic value of technology: In innovation- and technology-driven companies the number of technologies to be mastered in R&D, production, and supply chain management easily amounts to several hundreds or even thousands. Although each technology represents a substantial financial value, it is practically not feasible to establish a business value for each one of these technologies. Therefore creating meaningful groups of technologies in terms of technology platforms allows management to estimate strategic technology values (Figure 1.3). In this respect the number of platforms is certainly more than one, however, ought not to exceed half a dozen for SME's.

On the final IA-level "(new) Scientific Knowledge Fields" are positioned. They indicate realistically and specifically the origin of the company's technology base. The careful treatment of this level has a significant strategic meaning as well: It reflects the "Strategic Competence Planning" as an indispensable issue of modern strategic planning. Ambitious marketing plans based on technology-intensive products remains superficial until the corresponding fundamental knowledge base has been planned and established. Example: A successful producer of specialty chemicals came to the conclusion that future innovative growth – hopefully as a result of radical innovations – must be based on knowledge from life sciences, nanotechnology, catalysis, and polymers. Having identified these fields as strategic competences to be mastered in future, five separate midterm projects were

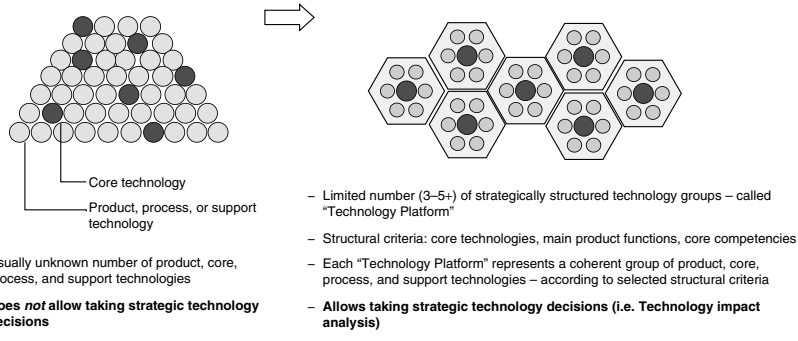

Figure 1.3 From an unstructured to a structured collectivity of technologies

launched in order to establish the aimed at knowledge bases. Only afterwards concrete product innovation planning and development was started. And indeed, several radical innovations using the newly acquired competences resulted.

Generating innovation architectures

Developing an IA does not have to follow strict rules. However, following an often practiced procedure, at first, the current business situation is displayed. To this end in step 1 the existing businesses are captured (Figure 1.4). In step 2 those trends are identified which are of influence for the current businesses. Step 3 deals with the main current products and their affiliation with the different businesses. Step 4 consists of bringing in the product functions which are shared by the current products and services and connecting them with these products and services.

In step 5 the current technology platforms are displayed and connected with the product functions, which they are primarily focused on. The presentation of the current business situation closes with bringing in the essential scientific knowledge fields which had a major influence on product development in the past (step 6).

The creative part as such of using the IA starts with steps 7 and 8: Resulting from earlier studies or dedicated workshops, new significant trends which presumably will influence customer behavior in future and generate new

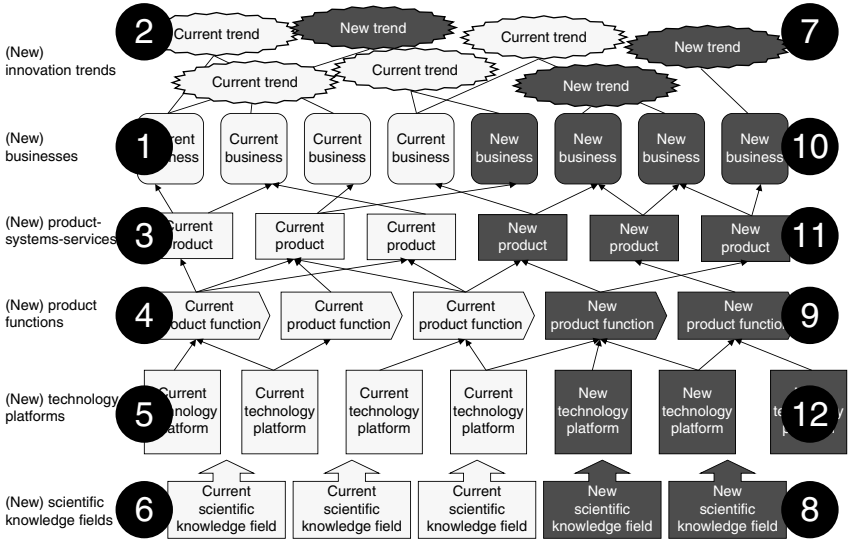

Figure 1.4 Generating an Innovation Architecture

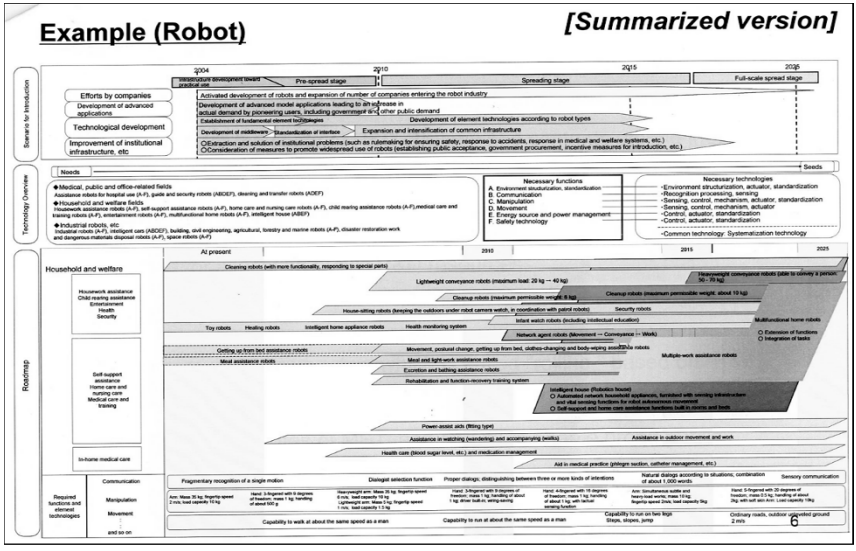

Figure 1.5 Examples of the METI Roadmap Compilation: Robotics

customer needs are introduced. Correspondingly new knowledge fields have to be brought in, in order to stimulate the minds also from this side.

As a next step, it is recommended not to follow the given IA structure and to storm brains on future businesses or products. Instead, making step 9, it is more meaningful to discuss in depth the probable consequences of new trends and needs and "translate" these assumed new trends and needs into new product functions.

This procedure may even be a general recommendation on how to imagine the future: On the one side, quite a number of future trends can be mentioned which have a high degree of certitude. As already mentioned above, they include "aging society," "knowledge society," connected society," etc. Rather than drawing conclusions on future products and businesses, it is less uncertain – and therefore more reliable – to illustrate the future with likely new product functions. For example, it is conceivable that "to provide ubiquitous connections" will become an essential product feature of the future. Only now it makes sense to have creativity sessions on new products or businesses, whereas steps 10 and 11 may be well made iteratively.

Having decided on new functions to be included, discussing the necessary technology backup – and thus step 12 – is next. A most useful source of information for this step has been provided by METI: As a result of an extensive collaboration with industry and academia METI has elaborated