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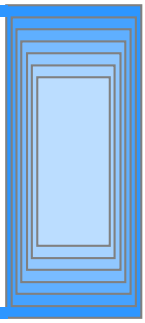
Chapter 1

OVERVIEW



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High-tech product development is a challenging area to work with. It involves multiple disciplines, an endless series of tradeoffs, dilemmas, and as a rule, also dead-ends. Yet, it also involves captivating moments of insight, joy, and sheer excitement in juggling technological challenges at the same time with psychological, social, organizational, financial, and legal ones. This book covers a full array of high-tech product development concepts from the very basics of ideation, usability, strategic and project management, and quality control to Internet marketing, patenting, and financial considerations. We believe you will find our book to be a very useful tool to understand the modern high-tech processes, regardless if you are a top management strategist, an experienced product developer, a student in an engineering or business school, an Information/Communications Technology (ICT) - business entrepreneur, or an academic or industrial expert.

High-tech product development is a form of highest-level knowledge management. Product development teams strive to realize company's strategy and to deal with the challenges of tying them into the routines of project management and marketing (from top to bottom) and on the other hand, to revision and update company's current strategy (from bottom to top). Novelty and research and knowledge intensity characterizes high-tech products and services. It's not surprising that R&D costs are almost without exception the largest part of the end product's price. Also, high-tech product development happens under constant, high-speed upgrades, and is intimately engaged with extremely rapidly evolving markets and changes in customer's taste and fashion. In high-tech, today's customer experienced excellence is tomorrows' update potential.

Finland – A prototype of a high-tech society

A great part of this book is based on Finnish evidence. Why Finland? It's a country, which is both a historical and contemporary pioneer in developing telecommunications applications and services. Finland was among the first countries in the world (only three years after the United States, and one year after Sweden) to build a telephone network in the 19th century. In the 1960s, Finnish authorities and companies began to develop a mobile telecommunications network called ARP (1971). In the 1970s, the same cluster of authorities and companies began developing the world's first modern cellular mobile telecommunications network called the Nordic Mobile Telecommunications (NMT) in 1982.

In 1991, Finland opened the Global System of Mobile Telephony (GSM) network, the next cellular network generation after the NMT. GSM was the world's first digital cellular telephone network. The GSM network is also the key development platform of the Universal Mobile Telephones System (UMTS), that is a 3rd generation cellular network whose field tests (after some aggressive licensing battles) started in Europe and Japan in 2002. The GSM system has become a touchstone for such emerging mobile services and technologies as the popular Short Message Services (SMS), Multimedia Messaging Services (MMS), Wireless Application Protocol (WAP), and General Packet Radio System (GPRS). Of these, the SMS has already proved to be a gold mine for network operators.

Information and Communications Technology (ICT) is a scene of global hyper-competition. Sony, the Japanese consumer electronics corporations, and Ericsson, a Swedish telecommunications runner-up, joined hands in 2002 to form SonyEricsson, a joint venture, to gather strength in the global markets. SonyEricsson also operates in Finland. American companies such as Hewlett-Packard, Tellabs, and IBM as well as several other multinational ICT-companies have established their activities in Finland. Thus, the world's leading companies operate in Finland to benefit from the country's highly developed information and communications technology clusters and other features of this extremely business friendly society.

Within this context, Nokia, a Finnish corporation, is the world's leading producer of mobile phones in terms of sales, profits, and stock-market performance, despite the ICT regression at the beginning of the millennium. For the largest part, Nokia's R&D remains based in Finland, even though its financing and know-how potentials would enable it to relocate freely where ever in the world it would choose. As hinted earlier, reasons for this can be tracked both in Finnish economical, educational and social structures. For us, Finland's high-tech clusters form a laboratory-like setting in which to analyze high-tech R&D techniques, service and product profiling as well as market

mechanisms. It seems obvious that Finland is a country in an eagle-eye position to inspect the ICT.

The information society

As we stated earlier, ICT is characterized by great challenges in terms of finding commercially applicable key ideas and drivers by which to steer the product development and marketing processes. Working in this field means being able to juggle multiple projects, as well as to manage complex arrays of technological and legal issues and relating financial risks. In ICT, end-users, service providers, terminal equipment providers, core network operators, and access network operators strive to develop a networked Information Society; that is, a world where people have seamless, global, mobile access to a communication environment that is intimately customized to their personal and work life.

The new and emerging ICT enabling the Information Society is already beginning to be commercially available as for instance, in the form of sophisticated, Internet enabled Personal Digital Assistant (PDA) devices. Especially 4th generation cellular network development is evolving very fast, e.g. creating an all-IP connected network of networks, which means combining Radio Local Area Networks (RLANs) to other access networks based on GSM, ISDN, ADSL or cable modems/satellite Internet access. Hence, we claim that the 4th G is in great deal here even before the 3rd G has even properly started.

An integrated view of high-tech product development

Fig. 1.1. summarizes our high-tech innovation and production framework. The framework codifies a high-tech company's strategy and body of knowledge in terms of instructions and specifications that are manifested for customers in design deliverables. Company's operational body is formed by this framework of substance and social learning in terms of in-house and outhouse knowledge flows that is guided by company's mission and vision. It is a process of fundamental and applied research as well as industrial manufacturing facing the challenges of communication with loyal partners and intimate competitors, researchers focusing on details of the substance (not necessarily so much on commercial considerations), idealistic designers, savvy marketers, entrepreneurial financiers, administrators and legal staff.

Due to the extensive, interactive nature of the high-tech, R&D teams take part in accessing, learning from, making sense of, and distributing the many different combinations of the diverse high-tech knowledge. This knowledge is accessed, processed and distributed by highly specialized team members, who

need to be talented not only in their substance know-how, but especially in their communications skills. In addition, teams should consist of highly motivated individuals forming flexible and cooperative groups, with a great amount of intent and personal integrity.

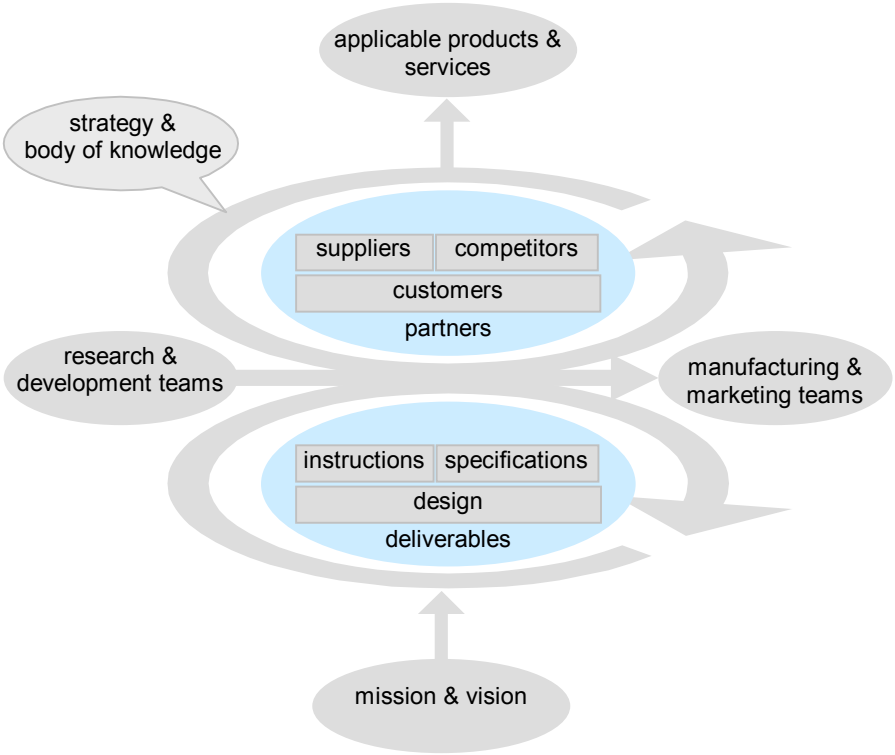

Figure 1.1. High-tech innovation and product development framework

Because of the high costs and uncertainty of high-tech product development, there are exceptionally high requirements for innovations and designs, products and services. Firstly, they must be technically up-to-date, this means that everybody in the work groups must take care of their substance know-how. They must be cost-effective, ergonomic and fashionable, where the last one is usually the most difficult to meet. They must follow company's manufacturing and marketing vision and mission that is manifested in branding. High-tech products and services must be characterized by well-defined quality and solid market potential in the immediate or in the very near future.

Chapter 1

♦ Overview

The Structure of This Book

Inspection of the elements of high-tech framework of Fig. 1.1 underlines that the ways to work in high-tech product development are undoubtedly overlapping. This means that in order to act efficiently and at the right moment we need to strive to comprehend "The Big Picture". In this book, our goal is to outline the practices, models, and strategies that characterize state-of-the-art Finnish ICT service and product development. Sometimes this is implicit, often our discussion is based on cases, interviews and other practical studies. Our multidisciplinary approach enables you to inspect ICT from different points of view that makes it more comprehensible and applicable. This enables you to identify new perspectives in general, and makes it possible to recognize new ways to understand, cluster and interact also in your own ICT framework. We hope you an enjoyable reading experience!

Our book is divided into the following ten chapters:

After this first introductory chapter, the second Chapter (*Systematic Idea Production, and Cultivation in High- tech Product Development*) starts by inspecting a general model of human mind and creativity proceeding then to inspect how to free creativity resources from their typical obstacles. Systematic creativity cultivation methods are divided into Brainstorming and Programmable Strategies whose applicability targets and methods are outlined. This chapter includes extensive look to modern, creativity tools, and covers an outlook how Web can enable or even hinder creative product development in modern high-tech.

The third Chapter (*User Centered Design of Telecommunications Services*) focuses on inspecting usability development and application in telecommunications services. In addition to strictly ergonomic considerations, the standards of state-of-the-art user-centered design and usability testing require inspection of all the relevant factors in terms of the effectiveness, efficiency, and satisfaction that the services should achieve in its specified context of application.

The fourth Chapter (*Product Development Generations: Some Lessons from Personal Digital Assistants and Palmtop Computers*) uses some case examples of Personal Digital Assistants (PDAs) to develop a theoretical lens on the general flow of high-tech product development in any product category. This is then used to predict products, market, and strategies for the forthcoming development in mobile telephony. On the basis of these predictions, the chapter provides words of guidance to service providers and terminal manufacturers.

As a rule, high-tech projects consist of a group of interactive projects. Portfolio management (*Project Portfolio Management in Telecommunications R&D*) in Chapter five, discusses the relationships of these projects. Portfolio management is seen as an excellent tool to reassure the overall project quality, for instance by helping to prioritize different projects based on their strategic importance and profitability to the company, as well as on their influence on the balance of the portfolio. The advantages of portfolio management are also demonstrated. For example, portfolio management can be used to reassure the overall quality of a project in terms of helping to make the right choices about which technologies and products are critical to in-house decisions, and which technologies ought to be subcontracted or bought as specified by market standards.

The sixth Chapter (*Quality in High-tech Product Development*) focuses on identifying quality management philosophies and their applicability in high-tech product development. In addition to the traditional requirement to reassure quality through the direct control of work and end-products, quality management methods now often also make an emphasis on quality techniques based on networking. The network of organizations, groups, and individuals serve to reduce unnecessary risks, to improve the signal-to-noise ratio in information exchange, and to enhance user experienced quality in applications and services.

The Web and mobile communications are fundamentally changing the way we live and do business. However, whether network cooperation is based on remote telecommunication links or in local workgroup meetings it is only worth as much as the quality of linking and interaction between their content and languages allows. This topic is taken up in Chapter Seven (*Innovations in the Internet and Mobile Era: The Real dot.com Revolution Web*), which considers how companies can survive the continuous and turbulent evolvement of ICT-business. This chapter emphasizes that companies should understand what their core assets are and how the new technologies challenge and enhance their profit generating capability. Especially addressed key -elements in these survival strategies are the implementation of modularity, vertical integration, and networking.

The eighth Chapter (*Finance and Venture Capital Markets*) considers the possibilities and demands of venture capital financing in high-tech based organizations. The chapter presents a five-stage financing model and then connects this model to the sources of financing, such as commercial banks, business angels, and venture capital funds.

Understanding and protecting Intellectual Property Rights (IPR) in high-tech academic-industry are made all the more important by the worldwide networking of high-tech ventures. The ninth Chapter (*Patenting and Intellectual Property Rights in Academic – Industrial Ventures*) presents an overview

of patenting and licensing in Europe and in the US, and underlines the related general requirements, procedures and benefits. It presents and compares commonalties and differences between conventional patenting and IPR and strives to understand reasonable and adequate protection level.

Finally, the tenth Chapter (*Role of Universities in the Product Development Process - Strategic Considerations for the Telecommunications Industry*) inspects how to interact in industry-university relationships in ICT-framework. It points out that university-industry collaboration can provide access not only to leading edge technologies, but also to highly trained students, professors and university facilities. Also, working with universities provides the associated companies a level of flexibility in pursuing different technological trajectories either sequentially or in parallel. This is especially important in dynamic technical environment. The chapter is greatly based on extensive interviews both in Finland and abroad.