

# HOW TO IMPROVE THE SUPPORTIVE ROLE OF ESTONIAN INNOVATION SYSTEM TOWARD LAUNCHING NEW PRODUCTS BY HIGH TECHNOLOGY COMPANIES?

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## Abstract

The purpose of the study is to evaluate how supportive is Estonian national innovation system toward the launching of new innovative products by high technology firms. The article intends to combine two broad areas of research – national innovation system approach and the different models of the new product launching. Based on the literature review and in-depth analysis of three case studies of Estonian high-tech company's major barriers as well success factors of highly innovative product launches were identified. The barriers of the new product launching were linked with the systemic failures of the national innovation system. The most relevant failures of Estonian national innovation system inhibiting the new product development are capability and networking failures. The sources of innovation of high-technology firms are too narrow, linkages with domestic firms and higher education institutions as well with foreign firms are poorly developed. High-tech firms have also serious capacity problems due to the extremely weak support mechanism by national innovation system on the seed funding stage of product development and prototype building stage as well. Paper argues that resources needed for the innovation should not be looked too narrowly following linear innovation model approach. Instead interactive approach is needed, which combines capability building, network development, interactive learning with direct investments into fundamental research.

**Keywords:** launch strategy, national innovation system, innovation system failures, improvement of innovation policy

## Introduction

Due to the intensity on rivalry and shortening product life-cycles companies are forced to invest extensively into innovative activities and to bring new products into market. Only few of products introduced to the market are successful. Measuring new product success and evaluating success factors is popular research topic among academic researches and also among practitioners, because of high risk of new product development process. Some estimates put the failure rate of new products between 75 and 80 percent (Ambler, Styles 1997). That is why becoming successful and examination of new product success factors is very important.

Another problem is that only few of new products launched to the market are radically new, meaning new for the company and create new market (new to the customer) as well. New products are often related with the terms innovation and high-tech. A completely new product is the result of radical innovation and often

made by a high-tech firm (Sepp 2008). In Estonia very little research has been made on this subject.

The new product development and launching is executed inside the boundaries of the national innovation system. Therefore the intensity and success of the new product development depends on the functioning of national innovation system. The current paper is trying to evaluate how supportive is Estonian national innovation system toward the product innovation by high technology firms. The aim presumes: 1) finding out major barriers and critical success factors of the launching new innovative products by Estonian high-tech firms 2) investigating links between barriers of launching new products by firms and systemic failures of the Estonian innovation system. Finally policy recommendations, which may help to reduce the manifestation of systemic failures of national innovation system, are proposed.

The article is opened with the creation of the theoretical framework about the success factors of new innovative product launch process. Following section is devoted to the opening of the concept of systemic failures of national innovation systems. It deals also with the issue, how the improvements in the functioning of national innovation system could support the launching of the new innovative products. Next section is providing results about the barriers and success factors of highly innovative product launches based on in-depth case studies of three Estonian high-tech firms. Last part of the paper is trying to indicate which systemic failures of Estonian innovation system are behind the barriers identified on the firm level research and some recommendations are given how tackle those problems.

### **Theoretical framework for new innovative products**

In order to define new innovative product, different aspects of product at first have to be pointed out. After that, possible types of new products and degree of product newness were discussed. Product can be considered material (product) and immaterial (service, place, idea etc). Product newness is related with its' type of innovation. But innovation can appear in several areas, not only in product. Innovation can be classified: product, process, position, paradigm innovation (Tidd *et al.* 2005). Literature also offers other possibilities to categorize innovation (Markides 2006: 19; Tamm *et al.* 2007: 3; Trott 2002: 14):

- product, process, organizational, management, production, commercial or marketing and service innovation;
- incremental, radical, modular, architectural and systemic innovation;
- developmental, evolutionary, expansionary and total innovation;
- competence enhancing and destroying innovations;
- disruptive (product, business model and technology) innovations.

Technical idea, when it can not be marketed, is not an innovation (Trott 2002; 2005). In this study major success factors of launching new products are identified and therefore marketing, organizational and other types of innovation are not discussed.

Besides classification based on innovation object, types of innovation are pointed out by the range and newness of the product. Most common product newness measure is level of product novelty (Langerak, Hultink 2006). Innovation can be radical or incremental, continuous or discontinuous. Highly innovative products are defined as “new-to-the-world” products that create an entirely new market (Ali *et al.* 1995). New to the world products are result of radical or discontinuous innovation and they are new both to the market and the firm. Radical product innovations in this study are defined as technologically better and more capable of meeting consumers’ needs than prior technologies (Montaguti *et al.* 2002). Some authors also define radical as breakthrough innovation (Mohr *et al.* 2005). To achieve real competitive advantage, companies’ focus of innovation should be on radically new (new-to-the-world) or new-to-the-market products (Kuczarski 2003: 539).

The success of new product relies on its success on the market, consumers and their adoption plays an important role. Adoption of innovation is described through different types of consumers. It’s important to cross the “chasm” (Mohr *et al.* 2005), which means to attract to your product sufficient number of target customers. To be successful, innovation must be important, unique, sustainable and marketable (Doyle 1998). So it is important, that during development processes consumer needs are also analyzed (Rosen *et al.* 1998). Radical new product, which can be perfect technologically, will not be successful, if consumers do not see the benefit in the product.

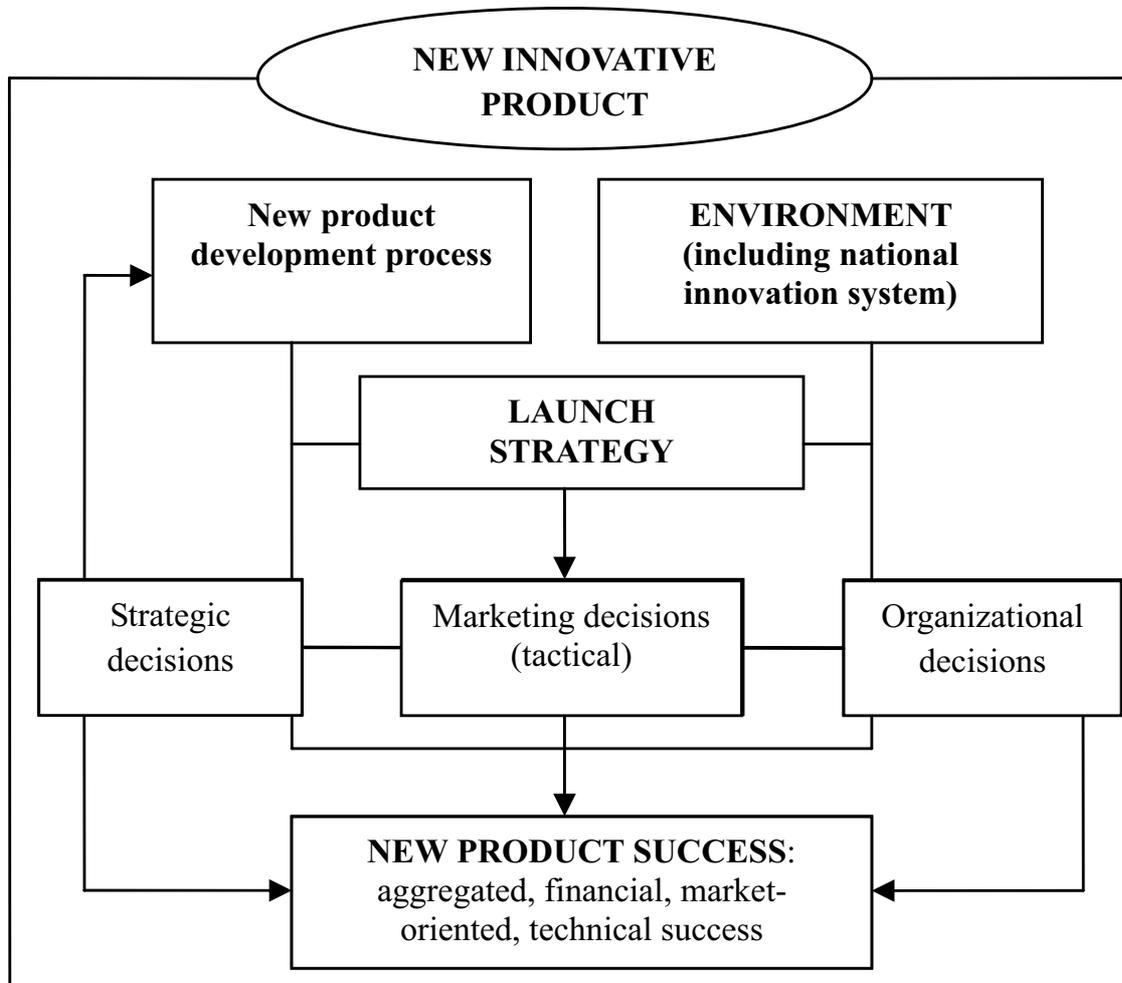
Radical innovation is often discussed in terms of high-tech markets and products. High-tech markets are often uncertain and make people distrustful. To define high-tech markets *OECD* classification is used by which high-tech sectors are related with computers (IT), biotechnology, telecommunication etc. In high-tech markets marketing must be highly related with research and development. In little start-ups too often marketing (including launching) decisions are underestimated or there is lack of knowledge in it (Mohr *et al.* 2005).

The radically new product must be with enhanced product capability and advanced technological capability, then product innovation is technologically and commercially discontinuous (Veryzer 1998) and most likely therefore more successful at the marketplace.

### **New products launch strategy analysis and success factors**

Of all the steps in the new product development process, the product launch often requires the largest commitment in time, money, and managerial efforts (Hultink, Hart 1998). Product launch is defined as the portion of the new product development process when specific product is presented to the market for initial sales (Hart 2005). Important aspects of product launch are also maximizing profit and target market (Guiltnan 1999; Hultink, Langerak 2002) and the tactical level of market entry (Hart, Tzokas 2000).

The specific way of launching new product depends on the launch strategy of the firm. Dundas and Krentler have defined launch strategies as tools to guide new product launches (Trim, Pan 2005). So the launch strategy consists of marketing decisions that are necessary to present a product to its target market and begin to generate income from sales of the new product (Hultink *et al.* 1997: 245; Garrido-Rubio, Polo-Redondo 2005: 30).



**Figure 1.** Framework of new product launch success factors.

It was discovered that launch strategies can be classified by the time of entry (Barczak 1995, Chiu *et al.* 2006), range of the launch (Avlonitis, Papastathopoulou 2006), strategic range (Garrido-Rubio, Polo-Redondo 2005), level of product innovativeness and product newness to the firm – niche innovators versus mass marketers (Chiu *et al.* 2006). New product performance is determined by the interaction of the market environment with new product strategy and development process (Pattikawa *et al.* 2006). Choice of company’s strategy will affect new product launch success.

For measuring the success of launch strategy and new product performance, different ways have been pointed out in literature. Success of launch strategy is

affected by strategic, organizational, process (Pattikawa *et al.* 2006, Chiu *et al.* 2006) and marketing (Chiu *et al.* 2006) variables. Organizational influences such as leadership launch management, but also soft measures like organizational culture. Marketing variable represents the marketing mix as the tactical decisions for product launch. Strategic variable cover general indicators related to the market and external innovative environment – supportive role of the national innovation system.

Different new product performance measures are divided into four main categories: aggregated, market-oriented, technical and financial success measures (Chiu *et al.* 2006; Baker, Sinkula 2005; Lee, O'Connor 2003, Green *et al.* 1995). Conceptual framework of analyzing new product success in the market is presented on Figure 1.

### **Systemic failures of national innovation system (NIS)**

The above described processes of firms to develop and implement their new product launching innovation strategies are not executed in isolation, but being actors of the national innovation system. Therefore is important to understand the functioning of the innovation system and find its bottlenecks. The systemic approach toward innovation presumes that innovation is seen as a continuous nonlinear cumulative process involving not only radical and incremental innovation, but also the diffusion, absorption and use of innovation. (Johnson *et al.* 2003). There is plurality of sources for innovation – most of the new knowledge needed for innovation has not come directly from universities and technical research and in many industries not even from research and experimental development, but rather from other sources like production engineers, customers, marketing, etc. The problem is to integrate these broader contributions into a concept of the innovation process (Lundvall *et al.* 2002). National innovation system (NIS) is defined as the elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge (Varblane *et al.* 2007).

Systemic approach toward innovation has caused the paradigm shift from the “market failure” rationale to “systemic failure” rationale (De La Peña 2008). It means, that cause of failure is not on the market, but in the system. In the innovation system approach, the policy rationale is not based on market failures, but rather on systemic failures or problems. The scholars in the innovation system tradition reject the option of optimality (and thus that of equilibrium or failure). Innovation processes are path-dependent and context-specific and it is not possible to specify an ideal or optimal innovation system. (Chaminade *et al.* 2008)

The literature on national system of innovation has defined systemic failures or problems as systematic imperfections that might slow down or even block interactive learning and innovation in a given system of innovation (Woolthuis *et al.* 2005, Chaminade *et al.* 2008). Among those systemic problems, different authors distinguish between infrastructure problems, transition and lock-in problems, institutional, organizational, network problems, information and coordination problems or problems with the complementarities or diversity of capabilities

(Chaminade *et al.* 2008). Various authors paid attention to systemic imperfections, leading to the following list of system imperfections (Woolthuis *et al.* 2005):

1. Infrastructural failures being the physical infrastructure actors that need to function (such as IT, telecom, roads) and the science and technology infrastructure.
2. Transition failures being the inability of firms to adapt to new technological developments.
3. Lock-in/path dependency failures being the inability of complete (social) systems to adapt to new technological paradigms.
4. Hard institutional failure being failure in the framework of regulation and the general legal system. Formal institutions.
5. Soft institutional failure being failures in the social institutions such as political culture and social values. These institutions evolve spontaneously for which reason refer them as informal institutions.
6. Strong network failures being the “blindness” that evolves when actors have closely linked and as a result miss out on new outside developments.
7. Weak network failures being lack of linkages between actors as a result of which complementarities, interactive learning, and creating new ideas are insufficiently used. Malerba (1997) refers to the same phenomenon as dynamic complementarities’ failure.
8. Capabilities’ failure: Smith (1999) and Malerba (1997) both refer to the phenomenon that firms, especially small firms, may lack of the capabilities to learn rapidly and effectively and hence may be locked into existing technologies, thus being unable to jump to new technologies.

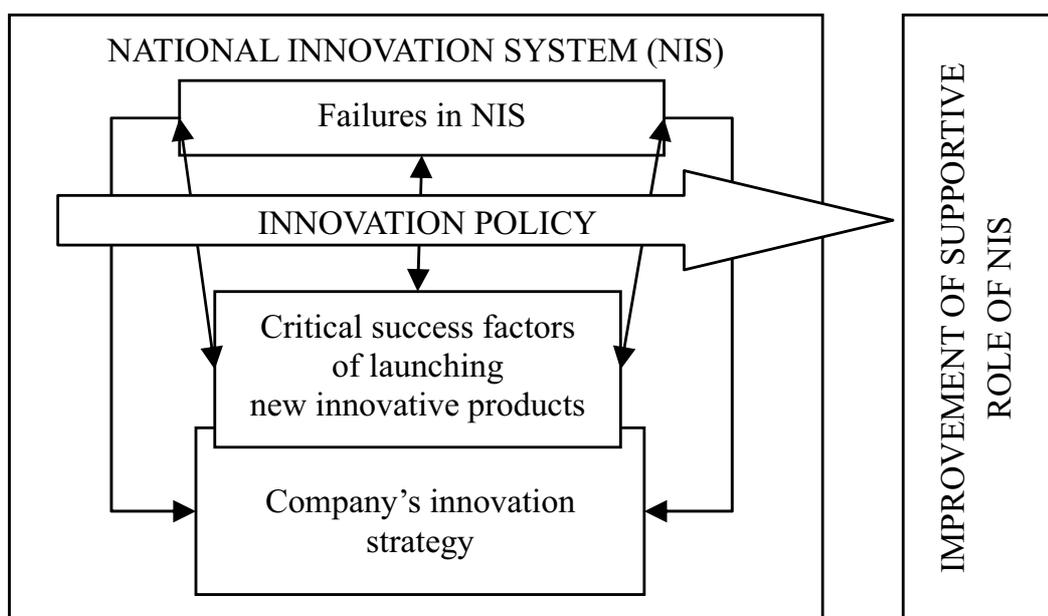
Interactions and cooperative relationship between the actors in the NIS are a central element to the analysis. These interactions not only involve relationships with other firms, but also the interaction with the government, public knowledge institutes, third part consultants etc. (Woolthuis *et al.* 2005)

Already in 2000 Jacobsson and Johnson identified following flaws in the innovation system: poorly articulated demand, local research processes which miss opportunities elsewhere, too weak networks (hindering knowledge transfer), too strong networks (causing “lock in”), legislation in favour of incumbent technologies, flaws in the capital market and lack of highly organized actors, meeting places and prime mover (Smits, Kuhlmann 2005).

Systemic failures are related to missing bridges between organizations or related to dysfunctional institutions (Falk, Leo 2006). To improve innovation policy through analysis of NIS failures, the first step is to analyze the innovation at micro level – firm’s new product launch strategy. So the critical success factors of launch strategy (market entry) can be linked with the failures in the innovation system.

## How the improvements in the functioning of national innovation system could support the launching of the new innovative products

In tandem with national system of innovation is the concept of entrepreneurship, which involves identifying and exploiting opportunities in the external environment, such as the opportunity to launch (commercialize) innovation. Given that NIS seeks to foster innovation, and entrepreneurship has innovation as central component, NIS should promote entrepreneurship within an economy. (Golden *et al.* 2003)



**Figure 2.** Linkages between NIS, new product launch strategy success factors and innovation policy.

Debates on the role and scope of innovation policy intervention have three main research areas: size of the budget, composition of funding and contents of programs (Falk, Leo 2006). Yet there are lack of analyze in new innovative product launch strategies critical success factors and its' relations with government innovation policy. The important role for innovation policy making is “bottleneck analysis” – continuously identifying and rectifying structural imperfection (Rametsteiner 2007). If critical success factors of new product and new product launch strategies have analyzed and pointed out most common failures in national innovation system (NIS), it is possible to create connections and recommendations to improve national innovation policy (Figure 2). From incompatibility between systemic failures of national innovation system and new product launch success factors, the bottlenecks appear and NIS can be improved and innovation policy enhanced. Innovation policy drives it all into overall result – innovation performance.

Innovation policy is implemented by innovation policy mix containing science, technology, education, labour, industry, framework, environmental, rural and regional and other sectoral policies. Innovation policy instruments are divided into three main groups (Rametsteiner 2007):

- Regulatory (norms, intellectual property rights, competition rules),

- Economic (public funding of research, taxation),
- Informational (statistics, reports, foresight, strategies).

In developing countries, a vast majority of firms lack the minimum capabilities to engage in interactive learning and innovation (capability problems) and even when those capabilities exist, linkages among the actors within the systems of innovation are weak (network problems) and institutional frameworks are ill developed (institutional problems). (Chaminade *et al.* 2008)

Although many research on the field of innovation systems are rather practical than create theoretical frameworks to use and there is now ideal or optimal systems, the main goal is to improve the system. As there is big difference in defining national innovation system failures and its' links with companies new innovative products launch strategies or identifying these problems in specific NIS, this article is an initial study to create framework for more deeper empirical study and analyze.

### **Methodology and an empirical study**

The new innovative product launch strategy analysis is based on the in-depth case studies of three Estonian high-tech companies. The aim of the case study was to find out, which are the critical success factors (strategic, organizational, process, marketing) launching radically or incrementally new products. Choice of the companies was made by level of product innovativeness, company's OECD classification and recent new innovative product launch.

To investigate new product launch strategies in Estonian high-tech firms, interviews were made. In all interviews a semi-structured interview plan was used including 30 open-ended questions that were divided into four sections addressing: general information about the company and product(s), product novelty, launch tactics and strategy of specific new product, and success measurement and critical success factors. Interviews lasted 1-3 hours and the answers were transcribed. Main characteristics of the companies are presented in table 1.

First case was Microsoft Estonia and interview with developer and platform evangelist Andres Sirel was made. Microsoft Estonia launched three products at once (Visual Studio 2008, SQL 2008, Windows Server 2008). Microsoft Estonia is a part of the bigger global corporation and they are not involved with the initial development of the new product, but instead fulfilling the other functions by the launching of new products. There is no research and development department in Estonia and Microsoft Estonia is mainly focused on marketing new products, sales and customer support. These new products were sample of incremental innovation.

**Table 1.** Main characteristics of analyzed Estonian high-tech firms

	<b>Microsoft Estonia</b>	<b>Regio</b>	<b>Quattromed</b>
Founded	2003	1990	1999
Location	Tallinn	Tartu	Tartu
OECD classification	IT	Communication	Biotechnology
Employees	37	ligi 80	77
Turnover 2006 (million EEK)	40	54	38

Source: Compiled by authors.

Second case was Regio and interview with product manager Jaan Jagomägi was made. Regio's (globally known as Reach-U) new product was Work Force Management (WFM), which has element's both from radical and incremental innovation. By the marketing of its new product, Regio is using the help from Ericsson, the strategic partner at global market.

Third case was biotechnology firm Quattromed (Icosagen from March 2009) and interview with head of sales and marketing – Hardi Tamm – was made. Quattromed launched radically new product – FITkit. FITkit is an immunological test for measuring natural rubber latex allergens from variety of rubber products, and is first-ever test for the measurement of clinically relevant allergens.

Analyzed new product development processes vary on length substantially. Quattromed FITkit was developed by the research and development department within the three years and was launched at the end of 2001. In opinion of the firm the complete launching of the product takes 10 years. Regio (Reach-U) on the other hand got idea for the new product on summer of 2007 and in May 2008 the software to position field-workers was given already to the client (mobile operator). Product launching process of Regio lasted less than a year. As an indicator of the high level of innovativeness, all the products were launched globally.

Through the case studies the main barriers and critical success factors of new product launch strategies were revealed. Among the most common barriers were mentioned the lack of benefit for the customer and insufficient testing on market. As barriers were listed also the lack of financing, competence and contacts, which all inhibit the introduction of the new innovative product to the market. Success factors of new product launch strategies by Estonian high-tech firms were most often related with product newness (benefits of the product, competition, legislation). Also measures related with organization were important (competence, synergy of marketing and R&D). Particularly was stressed the importance of the networking – existence of reliable partners and collaboration. As two out of three firms are in fact previous spin-offs from the university, the cooperative relationship with academicians was mentioned as their competitive advantage.

Most important tactical launch decision (after product) was choice of distribution channel. It was also noted, that if consumer could identify the benefit of the product, the price sensitivity is declining. Although uncertainty decreases in new product development process, the resource requirements increase substantially during the process and product launch is the most crucial at the success achievement. Main findings of the product launch strategy success factors of Estonian high-tech companies are summarized in table 2.

**Table 2.** Success factors of Estonian high-tech companies' new product launch strategies

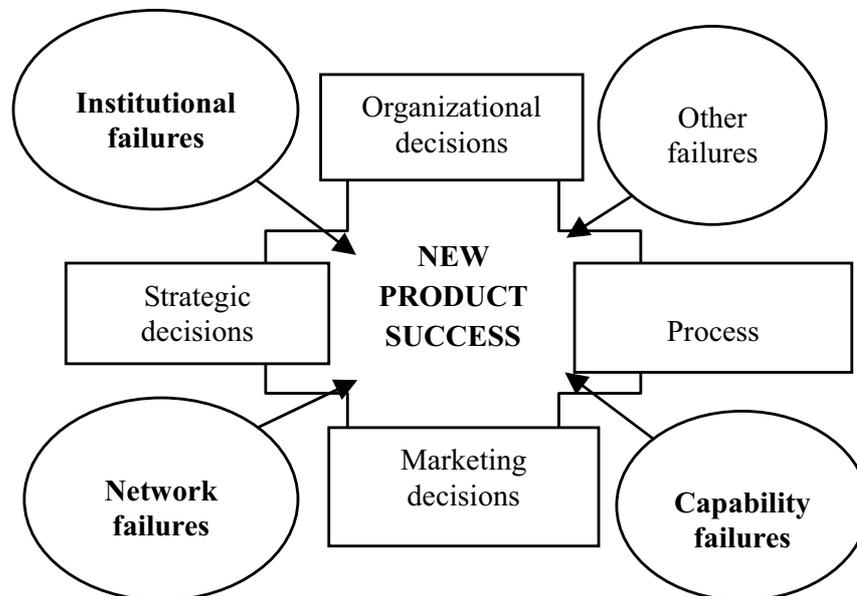
Success factors	Microsoft Estonia	Regio	Quattromed
<b>Strategic</b>	Product with potential to develop (incremental innovation) Global market Partnership program to anticipate competitors	New, functionally best product Quick R&D process Market with potential	Radical new product and specified market No competitors
<b>Organizational</b>	Corporation support (R&D and marketing)	Using strategic partnership (intermediary) to sell own competence	Supportive in-house services
<b>Process</b>	R&D is global, local marketing and supportive services	Product manager 24/7 supportive services	Competent marketing and sales team
<b>Marketing</b>	Strong brand and intensive marketing activities	Distribution channel (partnership with Ericsson)	Specific specialty conferences and constant lobby and explanation

Source: Sepp 2008.

Major problems related with the implementation of the innovative product launch strategy were also figured out. Most of the barriers mentioned are related with the market and customers. Also important were organizational, marketing and problems with budget. Main problems related to barriers of new product launch appeared:

- Market is not ready for the product,
- Consumers do not see the benefit from the product,
- Product testing before launch insufficient,
- Crossing the “chasm” at target market is much more difficult with radical new products,
- Lack of financial and human resources
- Hard to establish contacts with globally relevant players,
- Decision-makers in investment and innovative technology field are different,
- Lack of distribution channels, not enough trustful partners
- Company small and unknown, hard to internationalise.

In the following part of the section the success factors of the new product launching identified from case studies were linked with the systemic failures of the national innovation system. On the Figure 3 are presented three most common groups of systemic failures of national innovation systems of catching up economies as well the major groups of success factors of launching innovative products.



**Figure 3.** Three most important systemic failures of NIS to affect success of new product launch.

The most relevant failures of Estonian national innovation system inhibiting the new product development are capability and networking failures. Capability failures are manifesting themselves through the technology and innovation adoption problems, but also by the lack of marketing knowledge (including R&D, market testing and launch), overall innovation awareness needs improvement. Lack of resources is eternal problem.

High-tech firms have also serious capacity problems due to the extremely weak support mechanism by national innovation system on the seed funding stage of product development and prototype building stage as well. This failure is even more serious due to the fact that neighbouring countries (Sweden, Finland) are supporting strongly the capacity building of their new product developing firms. The networking failures are widely spread. The sources of innovation of high-technology firms are too narrow, linkages with domestic firms, other pioneers and higher education institutions as well with foreign firms are poorly developed. Network failures reveal also by the knowledge sharing and learning process (including generating new ideas for radically new products). Finally also institutional failures of the national innovation system affect the success of new product launching. The overall innovation awareness in Estonia is too low. On the broader international arena Estonia is still unknown or with unclear image, which affects the international (global) launching of new products by high-tech firms. Innovation awareness has been seriously overlooked by the Estonian innovation policy.

## **Recommendations for innovation policy improvement and conclusion**

Government plays the role of facilitating actor in the national innovation system and therefore should address the systemic failures, which affect negatively the new product development and launching process in the high-tech firms. Innovation policy is implemented by the institutional framework of national innovation system. The institutional framework (structure of NIS) gathers four types of institutions – policy designers, program makers, administrative institutions and projects (Polt *et al.* 2007). Greatest responsibility for innovation program administration lies on Enterprise Estonia and related institutions.

Enterprise Estonia established in 2000 promotes business and regional policy in Estonia and is one of the largest institutions of the national support system for entrepreneurship in Estonia, providing financial assistance, advisory, cooperation opportunities and training for the entrepreneurs, research establishments, public and third sector. They have mission to assist to implement the effective ideas and vision to work for the good reputation of the state Estonia with the best business environment in the world. (EAS 2009)

Another rather important institution is Estonian Development Fund, which was established in 2006 with the aim to provide seed funding for the knowledge intensive firms and monitor and analyze global technology trends. Estonia has also adopted rather well structured strategic document “Knowledge based Estonia – Estonian science, technology and innovation strategy 2007-2013”, which creates rather good fundamentals to tackle the above mentioned systemic failures.

But based on the current interviews, as well our previous works (Varblane *et al.* 2007) Estonian S&T and innovation system reveals serious problems with the intermediaries, who should offer services relevant for the potential radical innovators like technology watch, collection of information on relevant existing technologies, technological audit, seed funding evaluations, etc. The levels of competence of the employees of these Estonian governmental institutions are inadequate. Usually the employees of the client knowledge intensive or high-tech SMEs know much more about the new technologies and production possibilities existing in their area than the intermediaries. It reveals that capability failure exists not only on the firms, but also governmental intermediary level. Intermediaries are able to help enterprises on the general level, but not in specific areas.

1. In order to reduce the negative effect of systemic failures and improve the functioning of the national innovation system bringing more radically new products into (usually global) marketplace, following direction in the innovation policy are recommended:
2. To address seriously capability failure issue. It requires much more efforts improving the knowledge transfer. Therefore system of innovation in Estonia as the small catching up economy should support the development of the system of absorption and diffusion of knowledge produced outside and inside of the local economy. It requires opening of the innovation awareness

programs, use innovation vouchers program in order to improve the absorptive capacity on the firm level etc.

3. Capability problems could be also solved using more policies, which are aimed to intensify networking between local entrepreneurs, firms and different knowledge creation organizations (universities, non-governmental research units) and also foreign owned firms. Government could support capability building also by the demand side innovation policy using public procurement, establishing new standards etc., which all motivate firms to enter interactive learning process.
4. Extremely urgent is to create better links between domestic and foreign owned firms and through those links also with the research organizations from the home countries of the foreign investors. Their knowledge base could be used in order to develop further radical innovation ideas, which could not be supported from the Estonian research organizations. This linkage is now extremely weakly developed. Innovation policy should be combined with the FDI policy in order to integrate local firms into knowledge networks of foreign investors.

Radical innovation requires also very good knowledge about the potential customers and marketing channels, how to reach to the customers. Estonian innovation system currently is not addressing seriously enough the development of skills in marketing and exporting. But it is highly relevant particularly launching radically new products. Innovation policy recommendations for Estonia based on our study are summarized in table 3.

**Table 3.** Summary of innovation policy recommendations

Failure of NIS	Manifestation of failure by the new product launching of high-tech firms	Innovation policy recommendations
Network failures	Lack of cooperation with other domestic pioneer firms; Weak knowledge sharing and learning; Narrow sources of innovation; Poor partnership with the higher education institutions; Difficulties in creating linkages with foreign firms.	Enterprise Estonia includes horizontal cooperation clause into major support measures. Special tools will be designed in order to facilitate cooperation in the industry associations' level. Innovation policy should be coordinated with the policies of attracting foreign investors.
Capability failures	Difficulties in adoption of technologies; Lack of knowledge about marketing and launch (including market testing and launch tactics); Lack of seed funding and weak venture capital.	Activate the seed funding through Estonian Development Fund. Expand support of Enterprise Estonia to the product development and prototype building and launching stage.
Institutional failures	Low overall innovation awareness in Estonia; Estonia unknown or with unclear image.	Enrich and expand the Enterprise Estonia support mechanisms with innovation awareness measures. Activate the country of origin campaign of Enterprise Estonia.

Source: Compiled by authors.

In conclusion it has to be pointed out, that resources needed for the innovation should not be looked too narrowly following linear innovation model approach. Instead interactive approach is needed, which combines capability building, network development, interactive learning with direct investments into research.

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