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DIPLOMOVÁ PRÁCE

**How to be Successful in Innovation Policy:
Case of Nokia**

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Prohlášení

Prohlašuji, že jsem diplomovou práci vypracoval samostatně a použil pouze uvedené
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ABSTRACT

Nokia represents a great story about how a nearly bankrupt, highly diversified and rather local conglomerate from a small and dispersedly-populated severe climate country of Finland has been transformed into a world leading, focused and innovative hi-tech company in telecommunication industry within less than ten years. This paper tries to identify and explain factors which enabled this amazing growth of Nokia in context of Finnish economy and to answer a question of how Nokia sustains its global market leader position through its sophisticated innovation policy and activities. Role of Nokia in Finnish economy and innovation system is studied as well as Nokia's competitive advantage over its rivals.

ABSTRAKT

Nokia představuje skvělý příběh o tom, jak se během méně než deseti let neproduktivní, diverzifikovaná a bankrotem hrozící společnost z malé severské země Finska transformovala do inovativní, hi-tech a orientované globální společnosti, která se stala globálním lídrem telekomunikačního sektoru v oblasti výroby a vývoje mobilních telefonů a jejich příslušenství. Tato práce se snaží identifikovat a vysvětlit faktory, které umožnily růst společnosti Nokia v kontextu finské ekonomiky a snaží se odpovědět na otázku jak společnost Nokia udržuje svou pozici globálního lídra skrze vyspělou inovační politiku. Role společnosti Nokia ve finské ekonomice a inovačním systému je rovněž analyzována stejně jako její konkurenční výhody.

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Projekt DP

How to be Successful in Innovation Policy: Case of Nokia

Charakteristika tématu:

Nokia se během méně než deseti let transformovala z neproduktivní a diverzifikovaná společnosti do inovativní, hi-tech globální společnosti, která je globálním lídrem telekomunikačního sektoru v oblasti výroby a vývoje mobilních telefonů a jejich příslušenství. Cílem práce je identifikovat a vysvětlit faktory, které umožnily růst společnosti Nokia v kontextu finské ekonomiky a odpovědět na otázku jakým způsobem společnost Nokia udržuje svou pozici globálního lídra skrze vyspělou inovační politiku.

Metody práce:

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Předpokládaná osnova:

1. Úvod
2. Teorie inovací, konkurenceschopnost, globalizace
3. Nokia v kontextu finské historie
4. Konkurenční výhody
5. Role v inovačním systému
6. Úspěch Nokia
7. Shrnutí

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1 Introduction

Nokia is a Finnish multinational company operating in mobile telecommunication industry. Currently, it is a global market leader in production and R&D development of mobile phones and associated equipments. Nokia has been repeatedly praised for its sophisticated innovation policy which many see as a main driver of developing and sustaining its global market position.

Nokia represents a great story about how a nearly bankrupt, highly diversified and rather local conglomerate from a small and population-dispersed severe climate country has been transformed into a world leading focused and innovative hi-tech company in telecommunication industry within less than ten years. This impressive growth has coincided with a very rapid structural change in the Finnish economy and industry in which Nokia has played a major role. Nokia's success has attracted interest of many economists and entrepreneurs seeking to learn a lesson from Nokia.

Although Nokia has become a multinational global company, significant part of its activities are still located in Finland. Thus, considering population of Finland equal to five million, its role in Finnish economy is considerable, especially as in terms of GDP, exports and R&D expenditures share. Nokia has largely contributed to economic growth and direction of Finnish economy since late 90's which has been among the fastest in the EU and directed whole country towards ICT and telecommunication sector. This sector emerged in form of clusters and today contains hundreds of small and medium companies which are growing rapidly. These companies are often directly or indirectly linked to Nokia and have an origin in the same conditions as Nokia.

This paper tries to identify and explain factors which enabled this amazing growth of Nokia and to answer a question of how Nokia sustains its global market leader position via its sophisticated innovation policy and activities.

At first, current concepts of globalization, competitiveness, innovation and related socio-economic phenomena are defined. Focus is put on presenting these concepts as a rather integrated and interconnected system with strong internal links and relations. Effort is made to provide a background for reader to better understand following analysis and drivers of Nokia's growth in globalized economy.

Third chapter summarize and present relevant history of Nokia in context of Finnish economy. Particular attention is given to emergence of Finnish ICT and telecommunication sector, Finnish national policies and Nokia's internal development. Aspiration of this chapter is to present to reader Nokia's relevant history in the most comprehensive and complex form.

Then study moves to identification and analyses of Nokia's competitive advantage over its rivals. Michael Porter's Five Forces Model is thoroughly presented and employed for this purpose. Competitive rivalry in telecommunications sector, threat of new entry to this industry, power of buyers and suppliers and threat of possible substitutes are analyzed in this chapter. At the end predictions of future development of Nokia and telecommunication industry based on previous analysis are expressed.

The role of Nokia in Finnish economy and innovation system is studied next. At first, impact of Nokia on economy is described. Then analysis splits to two ways. First, an effort is made to identify and evaluate what Finland has invested into Nokia's growth, especially via public R&D funding, availability of skilled labor force and domestic market conditions. Second, contribution of Nokia to Finnish innovation system is analyzed. Focus is put on Nokia's cooperation with universities and private companies. In conclusion summary of these effects is presented in as much comprehensive form as possible.

Sixth chapter builds on findings of previous analyses and aspires to answer the question of which factors enabled this impressive growth of Nokia and Finnish telecommunication sector and what is the role of Nokia's innovation policies. Particular attention is given to

impact of EU, deregulation and market conditions in the view of Michael Porter's Diamond Model and to presentation of Nokia's innovation model.

Conclusions only briefly summarize some interesting findings of this paper, raise a question of some possible negative impacts of Nokia on Finnish economy and resume challenges for Nokia and whole mobile phones industry.

2 Innovation in Globalized Economy

2.1 Introduction

When national companies started to expand and invest abroad, economies began to be more and more interconnected. Resources availability in one country, low costs in second, available work force in third and some other comparative advantages in fourth country, all these creates economic alternatives in market which would otherwise be unavailable in some countries. Factors such as deregulation of world economy, EU integration, IT development and outsourcing of production to low cost countries enabled to exploit these alternatives more effectively than ever before.¹ This new reality we started to call globalization in last century.

2.2 Globalization

2.2.1 Definition of Globalization

Many economists have tried to formulate definition of globalization. Many of them see the essence of globalization in rather different social aspects. One definition explains globalization in form of liberalization: *Globalization refers to a process of removing government-imposed restrictions on movements between countries in order to create an "open", "borderless" world economy.*² Another one comes with a definition in terms of internalization: *Globalization refers to a globalized economy in which distinct national economies are subsumed and rearticulated into the system by international processes and transactions.*³ Last one presents globalization rather as a process of universalization:

¹ C. Hay, M. Watson and D. Wincott (1999): *Globalisation, European Integration and the Persistence of European Social Models*, University of Birmingham

² Scholte, J. A. (2000) *Globalization. A critical introduction*, London: Palgrave., p. 16

³ Gray, J. (1999) *False Dawn. The delusions of global capitalism*, London: Granta, p. 10

*globalization means world-wideness, it's a process of spreading various objects and experiences to people at all corners of the earth*⁴.

Even if these particular definitions vary a bit one from the other as they try to explain globalization from different points of view, there is a common idea in all of them. We can conclude that globalization refers to situations when an event in one part of the world can affect reality in another part of the world and vice-versa. In these terms Giddens offers the most apposite definition of globalization: *globalization is an intensification of worldwide social relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa*.⁵

2.2.2 Driving force of Globalization

Information technology revolution enabled a real-time information exchange in dimension hardly imaginable 100 years ago. Improved technology in transportation and deregulation allowed swift movement of people and goods between continents. All of these permitted to individuals and companies to operate and compete globally and therefore exploit world resources more effectively as if it was one single market⁶.

But what is the driving force behind globalization? What cause companies to invest and expand abroad? It is argued that the main driving force is competition⁷. Companies in order to succeed in competition seek further opportunities and better conditions⁸ for their economical activities which are unavailable in their home economies. The best and nowadays most common example is off-shoring of production to low cost countries, where labor costs present only fraction of those in developed countries. But since the competition is in place and causes companies to seek economic opportunities globally,

⁴ Hutton, W. (2001) *On the Edge: Living with global capitalism*, Vintage, p. 12

⁵ Giddens, Anthony (1990) *The Consequences of Modernity*. Cambridge: Polity Press, p. 64

⁶ Of course this would be an ideal situation under condition of no regulation whatsoever and perfect capital, human and goods mobility. But reality slowly moves this way.

⁷ See more in Best. E (1993): *Capitalism in Competition, A global driving force into the Globalization*

⁸ Lower labor costs, better availability of skilled workforce, proximity to customers etc.

there must be a force which drives competition. Many experts see innovation (definition and concepts of innovation will be introduced in chapter 2.4) as this force⁹.

Innovation forms also inherent part of globalization. It takes many forms such as global cooperation between companies and universities, local and international R&D activities, adopting foreign innovation and exporting innovation or licenses and patents.

2.2.3 Global R&D activities

One of the most emphasized forms of creating innovation is R&D activities. High investment in R&D was mentioned many times as necessary condition for high competitiveness¹⁰ and success on global market. But it is evident that high R&D investment alone does not guarantee success in international trade. Research discoveries don't automatically transfer into commercial success. In other words technological competitive advantage doesn't automatically mean high competitiveness. The production and exploitation of innovations are not only based on increasing R&D investment, but also on the effectiveness of R&D activity and the society adoption of innovations throughout economy. One of means which make possible (or more probable) this successful transfer is quality of human capital (see more in chapter 2.3.5)¹¹. Human capital can be improved by investment into education.

R&D activities can be performed locally or abroad. With growing globalization, more and more R&D is conducted abroad nowadays. What motivates firms to move its R&D units abroad? Surprisingly (as one can assume) it is not only costs, but more often also availability of skilled labor force and proximity to customers. The expansion abroad is usually done in two ways, acquisition of foreign existing R&D unit or greenfield investment. While the first option dominates in developed countries, the second one is significantly more important in developing countries.

9 See more for example in Federal Trade Commission 2003: To Promote Innovation: The Proper Balance of Competition and Patent Law Policy, <http://www.ftc.gov/os/2003/10/>

¹⁰ Term of competitiveness will be introduced in chapter 2.3

¹¹ See more in: Human Capital Forum, http://www.managementlogs.com/human_capital.html

Other forms of global R&D activities are R&D cooperation and R&D partnership. Motives are usually to acquire information on local demand for products to be able to meet it, cost savings, access to local knowledge or skilled labor force, acceleration of product development or sharing risk. When developing technology or products together with other organizations, a company can share development risks concerning its potential success with its partner.¹²

Simultaneously, increasing FDI (foreign direct investment) either to R&D units and manufacturing (doesn't matter if it is greenfield or acquisition sort of investment) is sometimes seen unfavorable in domestic economy. Are we becoming a subsidiary economy? Will all decisions be carried out outside the country? What are the effects of foreign-owned¹³ companies on domestic ones? As an example of negative impact is considered outflow of money from economy, for example in form of dividend policy. While domestically owned companies pay dividends to domestic owners, foreign-owned companies pay dividend outside the borders. There is no assurance that the money will be spent or reinvested in domestic country. The same logic applies for taxes from dividends. Domestic owners pay dividend tax home, while foreign-owners might pay the dividend tax outside the country.

Despite some negative impacts, the positive ones seem to be prevalent. The presence of foreign companies usually intensifies competition. They bring new standards into domestic economy and force home companies to adapt to new various competitions coming from outside the country. As a result, the most unprofitable and unproductive companies fail and the successful ones are further strengthening and their performance improved.¹⁴

¹² See more in Uusitalo, Mikko (2006): Open innovation strategy, challenge or opportunity for European global ICT companies, NRC, <http://ckir.hkkk.fi/Workshop2006/Aug29/Uusitalo,%20Open%20Innovation%20Strategy.pdf>

¹³ Companies with 51 % and more shares stake owned by foreign-owned company

¹⁴ See more in: Pain, Nigel (2001): The Impact of Inward Investment on the UK Economy, National Institute of Economic and Social Research, <http://www.hm-treasury.gov.uk/media/8B0/5C/259.pdf>

2.3 Competitiveness

2.3.1 Definition of competitiveness

Stéphane Garelli (2002)¹⁵ introduced following concept of competitiveness: *nation's competitiveness is the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of its people over the long term.* This definition has become widely accepted and is also used by OECD in many analyses as a definition of competitiveness.

Traditional economics argues that prices are the principal determinant of competitiveness. Thus, in explaining competitiveness traditional economists focus on analyzing capital and labor costs and costs of inputs. But wouldn't then the competitiveness be fostered just by obtaining key inputs at lower prices? It seems not in real world. Why do some countries and companies succeed in global competition and some fail? Answer must be somewhere else. Although prices of inputs are important, factors such as productivity, innovation¹⁶, human capital and technology might have significant importance.

Michael Porter (1990)¹⁷ introduced concept of cluster (this concept is thoroughly described in chapter 2.4.4). In his paper Porter argues that successful companies are seldom alone. Often, company's dominant market share and rapid growth is supported by a unique combination of firms tied together by knowledge and production flows. According to Porter, *competitiveness originates from these unique combinations of firms*

¹⁵ Stéphane Garelli (professor at International Institute for Management Development – IMD and director of the World Competitiveness Project 2002) introduced this definition in her article Competitiveness of Nations: The Fundamentals, which is part of study: Chatrand, H. (2002): The Competitiveness of Nations in a Global Knowledge-Based Economy, IMD

¹⁶ Concept of innovation will be introduced in Chapter 2.4

¹⁷ Porter M. (1990), The Competitive Advantage of Nations. The Macmillan Press

and institutions - clusters. Their typical aspects are various interactions among cluster members and technological spillovers and positive externalities.

This concept has become widely accepted by many economists and inspired many researches about competitiveness of country, industry or company. Porter argues that basic unit in country's competitiveness is competitive advantage of a company¹⁸. Thus, national competitive advantage depends on number and size of competitive companies a nation has. Factors such as inherited initial endowment, availability of natural resources, or interest and exchange rates do not have long lasting effects on national competitiveness. In the long run *competitiveness of a country depends on the capacity of its industry to innovate and upgrade* (Porter 1990¹⁹, p. 73). The drivers of these innovation processes are domestic demand and intense competition between companies.

As said in Garelli's definition of competitiveness, a globally competitive country assures high and rising real incomes for its citizens. A national goal of country needs to be high relative incomes and premium prices for domestically produced goods in the global market. Porter sees as a mean for it a continuous improvement in productivity and specialization of country in industries in which the country has a comparative advantage. Porter empirically argues²⁰ that in major number of different industries globally competitive companies (including market leaders) are often concentrated in only a few countries. He concludes that as it concerns global competitiveness, more important is where and how the factors of production²¹ are used rather than the factors themselves.

To summarize, competitive company is able to sell its products in global competitive market, usually for price premium. Important mean how to achieve this is increased

¹⁸ As a micro-level competitive advantage as Porter defines company's ability to stay alive and make a profit in fiercely competitive international markets.

¹⁹ Porter, M (1990), *The Competitive Advantage of Nations*. Harvard Business Review (different edition, compare to Porter M. (1990), *The Competitive Advantage of Nations*. The Macmillan Press)

²⁰ In empirical analysis conducted on several developed countries including Austria, Canada, Denmark, Finland, Great Britain, Norway, Sweden, USA, New Zealand, etc.

²¹ Factors of Production are the inputs to production from outside the business sector (labor, capital, land, entrepreneurship (quality of management etc.).

productivity. Porter sees competitiveness of a country only in regard of how its companies are competitive (and how big and how many there are). National competitiveness is not inherited, but it needs to be created. Availability of inputs of production is not necessary to assure creating and sustaining of competitiveness, but permanent innovation and increasing productivity are. Thus, complex approach is eligible when analyzing competitiveness on country, industry and mainly company level. For the purpose industry and company competitiveness, Porter introduced his Diamond Model²² as the main theoretical framework.

2.3.2 Porter's Diamond Model – Model of Competitive Advantage

According to Porter, competitive global company achieves and sustains its position (high market share and long-term profitability) through continuous innovation process and productivity improvement. *Nations succeed in industries if their national circumstances provide an environment that supports this sort of behavior* (Porter 1990, p. 67). Diamond Model identifies forces which has impact on company's capacity to develop and sustain its competitiveness. These are:

- factor conditions
- demand conditions
- related and supporting industries
- company's strategy, structure and rivalry.
- government
- chance

Some criticism of Diamond Model has arisen. One is presented by Dunning (1993, p. 7-16)²³. Dunning argues that Diamond Model does not adequately take into account foreign direct investments and effect of multinational enterprises. Therefore, another force might be added to original Diamond Model:

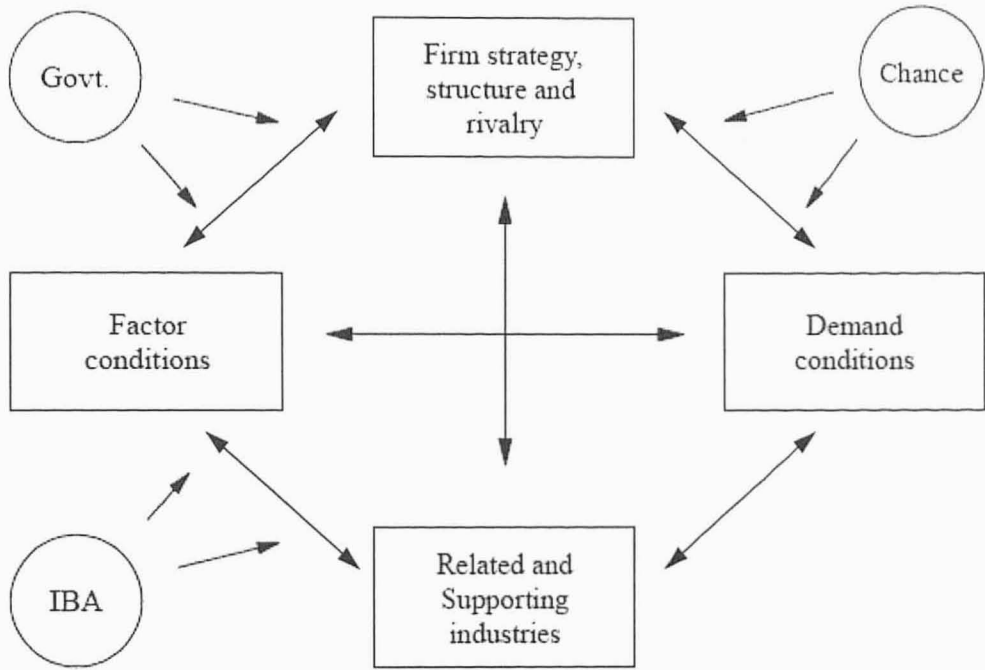
²² Diamond Model was introduced in Porter, M. (1990), *The Competitive Advantage of Nations*. The Free Press, New York

²³ Dunning (1993), *Internationalizing Porter's Diamond*. MIR vol. 33, p. 7-16.

- international business activities (IBA)

The diamond model is summarized in Table 2.1.

Table 2.1: Porter's Diamond Model – Model of Competitive Advantage



Source: Porter 1990 (The Macmillan Press), p. 127, extended by IBA factor²⁴,

These forces form a cluster (concept is cluster is described in chapter 2.4.4) where each part has an impact on each other. Therefore, unfavorable condition in one part of diamond might be compensated by some more advantageous in other part. Also, shortage in some areas might be balanced via innovation process.

2.3.2.1 Factor conditions

²⁴ Extension of Diamond Model presented in: Dunning (1993), Internationalizing Porter's Diamond. MIR vol. 33, p. 7-16.

Factor conditions can be divided into two categories: basic factors (natural resources, climate, location, and demographics), which are inherited, and advanced factors (communications infrastructure, sophisticated skills acquired through higher education, and advanced research facilities), which have to be created in the country. To sustain the advanced factors, companies, individuals, and government have to invest permanently. It is through these often highly specialized and industry specific factors of production that the most significant competitive advantages can be gained.²⁵

2.3.2.2 Demand conditions

According to Porter, global companies are most sensitive to the changing demand of their closest (domestic) consumers²⁶. If these domestic customers are demanding and more sophisticated than those in the rest of the world, they represent driving force of innovation and technological developments as well as they help to anticipate future global trends.

2.3.2.3 Related and supporting industries

Porter argues that successful industries tend to form clusters. While companies in cluster compete in the market, they might cooperate, for example, in R&D. Due to the accelerated diffusion of technology and knowledge spillovers, successful cluster has internal synergies that further feed the innovation and upgrading process. By having internationally competitive related industries, a firm in a cluster can gain competitive advantages: it can concentrate on its core competencies and rely on its suppliers for other activities.²⁷

²⁵ Hernesniemi, H (1996): *The Advantage Finland: Future of Finnish Industries*, ETLA and SITRA, Helsinki, p. 8-9

²⁶ Porter M. (1990), *The Competitive Advantage of Nations*. The Macmillan Press

²⁷ Hernesniemi, H (1996): *The Advantage Finland: Future of Finnish Industries*, ETLA and SITRA, Helsinki, p. 10

2.3.2.4 Firm strategy, structure and rivalry

Different management approaches fits different companies and industries in various countries with various cultural background. Also, Porter sees another driver of competitiveness in intense domestic competition. This competition is even more intense if all companies operate under same conditions.

2.3.2.5 Government

Although ideal state would be market with no state intervention at all, government has an important role in some cases:

- Assures availability of some advanced factors
- Stimulates innovation process (environmental restrictions etc.)
- Ensures functioning of market
- Promotes development of human capital.

2.3.2.6 Chance

Chance has a significant importance in development of competitiveness many times. Mostly it comprises the “serendipity”²⁸. It can be some world-meaning breakthroughs which came up rather randomly, price shocks, changes in political systems, wars, etc.

2.3.2.7 International business activities (IBA)

IBA concept was added to Diamond Model, based on Dunning (1993) criticism. They are represented mainly by foreign direct investments. The foreign direct investments of multinational companies are guided by a global specialization. Companies search for the most favorable location for each activity.

²⁸ Serendipity is a situation when although some other output was intended by undertaken actions, something originally unexpected what has a fortunate character occurs.

2.3.2.8 Criticism and valuation of Diamond Model

Thanks to high popularity of Diamond Model, many criticism has had come up during time. Reinert 1994²⁹ argues that if the competitive advantage is actually created – competitiveness is not necessary found in clusters, there are many successful ‘lone stars’ (see more in Reinert 1994). Another criticism says that model might not be suited to small open economies (see more in Bellak and Weiss 1993)³⁰. It is also unclear whether the model is really dynamic or static (see more in Narula 1993)³¹.

Porter’s approach incorporates many well-known economic models. It is evident that Porter has been influenced by new growth theory (developing necessary human capital is one of the key factors in long-term competitiveness and growth), network models (a need for more active communication among market participants), and ideas of user-producer (value chains are closely related to network models) relationships. But Porter managed to combine all different approaches in very comprehensive and understandable way.

2.3.3 Recommendations for high competitiveness

(summarized by Garelli 2002)³²:

- Create a stable and predictable legislative environment.
- Work on a flexible and resilient economic structure.
- Invest in traditional *and* technological infrastructure.
- Promote private savings and domestic investment.

²⁹ Reinert, E. (1994): Competitiveness and its Precursors - a 500-year Cross-National Perspective. STEP, Oslo.

³⁰ Bellak and Weiss (1993): Note on the Austrian “Diamond”. MIR vol. 33, p. 109-120.

³¹ Narula, R. (1993), Technology, International Business and Porter’s ‘Diamond’: Synthesizing a Dynamic Competitive Development Model. MIR vol. 33, p. 85-108.

³² Competitiveness of Nations: The Fundamentals, which is part of study: Chatrand, H. (2002): The Competitiveness of Nations in a Global Knowledge-Based Economy, IMD

- Develop aggressiveness on the international markets (exports) as well as attractiveness for foreign direct investment.
- Focus on quality, speed and transparency in government and administration.
- Maintain a relationship between wage levels, productivity and taxation.
- Preserve the social fabric by reducing wage disparity and strengthening the middle class.
- Invest heavily in education, especially at the secondary level, and in the life-long training of the labor force.
- Balance the economies of proximity and globality to ensure substantial wealth creation, while preserving the value systems that citizens desire.

All of these were (at least to some extent) pursued in Finland (see more in chapter 3). This attitude paid off as one can see when looking at competitiveness reports from last years (published by IMD³³ and WEF³⁴) where Finland has repeatedly scored on top among considered countries.

2.4 Innovation

2.4.1 Definition of innovation

The term *innovation* has become a foundation of many recent discussion and theoretical work related to competitiveness and technology change either on company or country level. Although it is rather unclear what exactly is meant by innovation in all variety cases, it is often highlighted as a synonym for success.

According to classic definition (for many economists as a classic definition of innovation is considered one by J. Schumpeter published in *The Theory of Capitalist Development* in 1911): *Innovation is the carrying out of new combinations of the means of production;*

³³ <http://www.imd.ch/research/publications/wcy/index.cfm>

³⁴ <http://www.weforum.org/en/initiatives/gcp/Global%20Competitiveness%20Report/index.htm>

this can include: (1) the introduction of a new good, (2) the introduction of new methods of production, (3) the opening of a new market, (4) the conquest of a new source of supply of raw materials or half-manufactured goods, (5) the carrying out of a new organization. This original definition has been reinterpreted in many ways during time. According to OECD concept³⁵ *“an innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.”* This definition (although widely used) doesn't explain some important factors which form an innovation. It doesn't distinguish whether an innovation is just learning-by-doing (routine) improvement or world-meaning breakthrough, also neither whether the company has created it on its own nor just adopted a new solution made by others.

Employing this approach, as an innovation could be considered all scale of possible changes implemented, which doesn't explain factors forming the innovation phenomena. In other words this definition explains what an innovation is, but doesn't provide any insight in factors (and their quality) which determines creation of innovation, such as know-how and human capital, invention and diffusion, competitiveness, social infrastructure, technological change or learning. But it is precisely the deeper understanding of these that is essential to successful innovation policy.

Therefore, Van den Ven (1999)³⁶ offers more concrete definition of innovation: *It is a process in which new kinds of products, services or operational concepts are created, refined and utilized. Innovation is recognized as original and useful by the expert community related to its field as well as by the public. It is either commercialized or has stabilized in use. The key actors influencing its development can be named, at least in principle.*

³⁵ OECD, & Eurostat. (2005): Oslo Manual – Guidelines for Collecting and Interpreting Innovation Data

³⁶ Van de Ven, Andrew (1999): The innovation journey. Oxford: Oxford University Press.

This definition adds various interesting findings into our learning about innovation. At first, it suggests that an early invention or discovery is not spread to its users as it is, but rather modified and adapted by its various users to fit one's needs. Users don't accept passively new innovations, but rather add its own ideas and improvements to the existing initial concept and so further improve and develop the initial idea in practice. This approach implies that innovation is not created as such, but rather stems from this interaction process, which determines whether the "result" will be recognized as successful and useful and therefore recognized as an innovation. Thus, innovation is being born gradually and original concept can change drastically before recognized as an innovation. Also, creator of innovation is usually not the original author of initial concept. Creation of innovation stems rather from technical, organizational and social interaction of its users.

Thus, creation of innovation strongly depends on interaction of factors such as quality of know-how and human capital, competitiveness, social infrastructure, technological change and learning. Better quality and availability of these factors, higher probability of creating new innovation.

2.4.2 Open Innovation

Theoretical studies on innovation policy of last twenty years mostly focus on how innovation results from this interaction. They emphasize role of final consumers and firms in innovation process, respectively the declining role of firms and institutions whose only purpose is R&D activity³⁷. A significant portion of innovation initiation has been gradually moving towards consumers and firms, which by the adaptation process (testing, reinventing and diffusing) form a new innovation. This phenomenon is called open innovation (see more in Chesbrough 2006)³⁸: *Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and*

³⁷ See more in: Chesbrough, H. W. (2003): *Open innovation: The New Imperative for Creating and Profiting from Technology*. Cambridge, MA: Harvard University Press.

³⁸ Chesbrough H. W. (2006): *Open Innovation: Researching a New Paradigm*, Oxford University Press

expand the markets for external use of innovation, respectively. This paradigm assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology.

When trying to improve background for successful open innovation process, the most basic aspect to start with is to add business expertise as a base for innovation. This becomes more and more crucial in developed countries as they start facing an increasing competition from low costs countries. As competition through prices becomes harder, higher quality and utility will have to become the way to success. In order to tailor this, a profound expertise about work practices, consumers' needs and cultures or shopping habits is necessary. Therefore, it is argued that innovation policy of small countries has to necessarily focus on subsidizing product development rather than supporting basic research.³⁹ Argument for small countries to focus on subsidizing product development is usually that they don't dispose with necessary financial resources and structure to support basic research on level which is comparable (and thus able of competition) with big developed countries. Also, information spill-over effect is very important in case of small countries.

Therefore, ideal strategy for companies in small countries would seem to be a situation where the self-learning and self-development approach in innovation policy is substituted by adopting procedures that are developed and benchmarked elsewhere and only additionally improved and adapted by product development innovation. This would avoid parallel development in different organizations (which could be too costly in small economies), problems in the prospective compatibility of systems as well as difficulties in comparing the efficiency and effectiveness of solutions between different organizations and companies.

2.4.3 Alternative drivers of innovation

³⁹ See more in Williams, R.; (2005): Social learning in technological innovation - experimenting with information and communication technologies. Edgar Algar Publishing.

It is argued that some social-economic phenomena which many EU countries currently experience, such as ageing of population or increasing environmental awareness,⁴⁰ create a demand for solutions - product development innovation. Seniors and people environmentally aware usually demand products and solutions which are user-friendly, attractive, smart, nearly maintenance-free and ecological (economical and energy-saving). But these are usually also characteristics of products and services which are considered as competitive world-wide. Therefore, countries (like many EU countries nowadays) which experience these phenomena (ageing of population or increasing environmental awareness) more than others have an advantage which can cause increased exports of these solutions. Finland is one of these countries where people are both environmentally aware and which is experiencing a rapid ageing of population.

Another term which is contemporary used in connection with innovation is networking. In general it refers to ability of one to acquire required resources from various interaction and collaboration among all involved agents in economy which are not directly part of the mother organization or usual market relationship. It emphasizes the role of knowledge and human capital in the production of new products and new information. The early stages of innovation process are often characterized by fairly informal and collaborative networks for exchanging knowledge. These networks become tougher as the innovation process approaches its commercialization. As one form of networking is widely consider a cluster.

2.4.4 Definition of Cluster

Networks of interdependent organizations can develop into cluster⁴¹. Michael Porter defines cluster as a *geographically proximate group of companies and associated*

⁴⁰ See more in Henson, Paul (2005): Population growth, environmental awareness and policy direction, Springer Netherlands

⁴¹ See more in Porter M. (1990), The Competitive Advantage of Nations. The Macmillan Press, term "cluster" was firstly used by Porter

*institutions in a particular field, linked by commonalities and complementarities.*⁴² Porter in same paper introduces also more broad definition of cluster: *Clusters are geographic concentrations of inter-connected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure. Clusters also often extend downstream to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies or common inputs. Finally, many clusters include governmental and other institutions - such as universities, standard-setting agencies, think tanks, vocational training providers, and trade associations - that provide specialized training, education, information, research, and technical support.*

Cluster has economic importance at both micro and macro level. Firms which operate within a cluster do not necessarily need to cooperate directly with each other, but through technological spillovers and other positive externalities generating from interaction within cluster adds value to the whole system. A cluster includes both private companies, research institutions and organizations such as universities.

Success of a cluster depends heavily on available input factors, such as intellectual capital (R&D, national innovation systems, knowledge and social infrastructure and skilled labor force).

The concept of cluster allows us to better understand the evolution and structure of an industry without setting sharp sector boundaries. The focus is set on identifying mutual relations and interactions among companies, institutions and industries and on information flows among them. Thus, cluster promotes efficiency and increases specialization to level which would be hardly accessible for an individual company or institution not associated in cluster. Therefore companies associated in cluster have better chance to succeed in market.

⁴² Michael E. Porter (1998): *On Competition*, Harvard Business Review Books, p. 199

Companies and institutions associated in cluster are usually in geographical vicinity, although it is not a necessary condition thanks to ICT technology and real time information exchange. Piekkola 2006⁴³ argues that *although the significance of geographic distances has decreased with globalization, regional significance has increased*. In his study examining regional competitiveness in Finland, various indicator emerged which determined the competitiveness of each region. Large cities were most competitive. A key result of this research showed that sources of competitiveness varied depending on the region and presence of clusters.⁴⁴

When trying to identify and analyze cluster, it is necessary to start with examining network relations such as R&D cooperation, relations among competing companies and with institutions and among producers and consumers. If these relations are identified, then focus moves on searching where these relations are particularly intense. This concentration is taken as a starting point for a cluster analysis. If real internal synergies are found among these actors, we can refer to the group as a cluster.

2.4.5 Human capital

As said before, an important feature of successful innovation policy is quality of human capital. This quality is closely connected to quality and availability of education, primarily tertiary one. Besides necessity of improving education system etc. all the challenges in this area could be summarized as follows: how to make the most gifted and talented domestic people to stay home and how to make the most educated foreigners to

⁴³ Piekkola, H (2006): Knowledge and Innovation Subsidies as Engines for Growth – The Competitiveness of Finnish Regions. RIFE, Helsinki, article: Globalization paradox: significance of states decreasing, but significance of regions increasing

⁴⁴ ‘The competitiveness of certain regions (such as Oulu and Tampere) comprises a strong innovative approach and R&D activity operating in **clusters**. In other regions, such as Helsinki, core sources of competitiveness are the availability of skilled labor, a large working age population and easy accessibility. Differences in productivity between various areas have not notably diminished. The most important reason for this is that knowledge capital and an educated workforce cluster in certain regions.’ Source: Piekkola 2006

move and settle here. It means also how to manage to educate and motivate most of the population and make them tolerant to immigrants.

As a starting point for mentioned challenges it is necessary to offer individuals equal opportunities to develop themselves into more useful individuals and let them make the right decisions for the benefit of country's competitiveness.

To assure development and quality of human capital, people must be understood as individuals, not mass. When people are seen as a homogeneous mass, they are easily understood to be passive objects of control and actions, whose experiences and understanding can be observed from above, if at all. Thus, people's possibilities to participate and influence things become weaker. But because it is not possible to assure communication with each individual, some sort of well-functioning system of agency must be introduced. Agency must assure that individuals' opinion will be communicated in understandable way to competent institutions and other individuals.

2.4.6 National Growth Strategy

Finally, successful innovation policy requires setting of country's national growth strategy.⁴⁵ Meeting national strategy through innovation policy requires cooperation and interaction across all administrative bodies and boundaries. It requires input and cooperation from all other departments and agents in economy as well. The best results can national growth strategy achieve if it is understood more as a national mission.

Setting of a national growth strategy in an understandable and respectable way is seen as a base for accelerated economic growth. It can comprise of various fiscal, monetary and law policies. Its choice is partly based on political orientation of current government (left,

⁴⁵ See more in Swenson, D. (2004): National Strategies for Sustainable Development: Challenges, Approaches and Innovations in Strategic and Co-ordinated Action, Research Centre of Freie Universität of Berlin

right, middle). In EU during last decades, the typical and most common features of national growth strategy have been policies to:

- Support industrial sectors (tax relief etc.)
- To attract foreign direct investment (investment incentives etc.)
- Support big publicly owned companies (subventions, protectionism etc.)
- Devaluation of domestic currency to boost local competitiveness (especially prior to Euro adoption)

These features, although they usually did their job, sometimes created inequalities in the EU market and they made companies less adaptive to market changes. An effort is being made nowadays to diminish negatives coming from these policies such as:

- Dominance of big companies compared to small and medium companies
- Surviving over-regulation in some EU countries
- Relative importance of unprogressive industries in some EU countries

Nowadays, the most common aspects of national growth strategy in the EU are:

- Efforts to exploit domestic sources as effectively as possible
- Strong focus on promoting innovation activities
- Thorough liberalization and deregulation of market
- Stable macroeconomic environment
- Well functioning of competitive market

The current trend in EU countries is that government policies interfere with the competitive market directly only when it is clear that free market is not functioning properly.

The most common aspects of national growth strategies as mentioned before have been typical also for Finland (see more in chapter 3).

3 Nokia in Finland

3.1 Foreword

Finland had been part of Sweden until 1809, when it was passed to Russia. When the communist revolution took place in Russia in 1917 Finland has declared an independency on 6th December of 1917. In WWII Finland stood on Germany side (compared to neutral Sweden), what caused a slow post-war recovery due to significant war indemnities. Following its neighbors in post-war era Finland adopted the Nordic cooperation model rules.⁴⁶

Today Finland is one of the most competitive economies in the world, well-known for its stability and hi-tech reputation. Since 2001, Finland scored first in many competitiveness rankings⁴⁷, outperforming other Nordic countries and USA. Significant role in this success plays telecommunication sector, mainly mobile phone technologies. One Finnish company, Nokia, emerged into world leading player in mobile telecommunication devices and equipment, drastically influencing Finnish economy and innovation policies. However, today, with the slowdown of world telecommunication sector, both Nokia and Finland faces challenges putting recent success in different point of view.

3.2 Background of Finland

Finland is located in North-East corner of Europe in Scandinavian Peninsula. It is surrounded by Baltic Sea in the South and West, Russia in the East and Sweden and

⁴⁶ Cooperation among Denmark, Finland, Iceland, Norway, Sweden, and the autonomous territories of the Faroe Islands, Greenland, and Aland that gives the citizens of these countries many reciprocal rights in each others' country. It comprises of shared values, perceptions, and conditions of geographical location, climate, language, religion, politics, mixed economies, welfare states, and environmental concerns of the Nordic region.

⁴⁷ See more in WEF and IMD competitiveness reports, www.weforum.org, www.imd.ch/wcc

Norway in the Northeast. 5.3 million population spreads on 338,000 square kilometers. 62% live in towns or urban areas, 38% in rural areas. Principal cities are Helsinki (561,000), Espoo (232,000), Tampere (204,000), Vantaa (187,000), Turku (175,000) and Oulu (129,000). About one million people live in the Helsinki metropolitan area⁴⁸.

Finland has two official languages: Finnish and Swedish. Finnish⁴⁹, a Finno-Ugric language, is spoken by 91,6% and Swedish by 5,5% of the population. Sami (Lappish) is the mother tongue of about 1,700 people. When the Nordic common labor market⁵⁰ was established in 1954, many Finns moved to Sweden to work. However, just a few Swedish moved to Finland vice-versa. 83% of Finns are Lutherans⁵¹.

Finland is a semi-presidential parliamentary republic. President is elected for six years term. Parliament consists of one chamber with 200 members. The members are elected for a four-year term by direct popular vote under a system of proportional representation. The new coalition government formed in June, 2003, is headed by Prime Minister Matti Vanhanen (Centre Party). The government consists of the Centre Party, the Social Democratic Party and the Swedish People's Party. In 2005, Finland's GNP per capita was around 30 800 euros.⁵²

During its independent history, Finland functioned (grace to its geographical position) as an intermediate state between former Soviet Union and USA, trying to satisfy both sides.

3.3 Finnish Economy and Telecommunication Sector

When an inventor in Silicon Valley opens his garage doors to show off his latest idea, he has 50% of world market in front of him. When an inventor in Finland opens his garage door, he faces three feet of snow.

J. O. Nieminen, CEO of Nokia, 1984

⁴⁸ Source: http://virtual.finland.fi/Politics_society/

⁴⁹ Finish language is only related to Estonian, Hungarian and Inuit language

⁵⁰ Since 1954, Nordic countries have had no limitations in free movement of labor force within its markets.

⁵¹ Source : <https://www.cia.gov/cia/publications/factbook/geos/fi.html>

⁵² Source: <http://virtual.finland.fi/netcomm/news/showarticle.asp?intNWSAID=24856>

Based on its geographical location and severe climate, Finnish economy has historically relied on manufacturing of its natural resources. The wealth of country was driven by three main commodities, wood, paper and metal engineering products (mainly shipbuilding). In 1970, these together accounted for 80 % of country total export⁵³, where only paper alone accounted for 40 %. Paper and pulp sector has achieved a technologically world-leading level⁵⁴

After the WWII, in which Finland has stood on Germany side, Finland was made to pay huge war indemnities to the Soviet Union. They took a form of machinery, steel, cables and ships. It is considered that until 80s about ¼ of Finnish total exports were directed east⁵⁵. After having paid war indemnities⁵⁶, trade with Soviet Union continued in form of barter trade, when the Soviets paid back usually in form of oil⁵⁷. The main trade partner in Europe was Sweden. The economy in post-war era growth steadily about up to 5 % and was slowly catching-up to Western Europe countries. In 1961 Finland joined EFTA (European Free Trade Association).

In 70s, Finland formed its policies similarly to other countries of so-called Nordic System (such as Sweden, Norway or Denmark). Taxes were high, payment transfers and public spending huge, nominal exchange rate fixed. Devaluation of currency was coming back regularly. Substantial amount of public spending went to education, creating quality public education, and was growing steadily. About 63% of students finished at least secondary level in 1979⁵⁸.

Private sector consisted mainly of huge and diversified corporations having roots back in 19's century. Valmet was the Finnish no. 1 company in wood machinery. Nokia, originating in 1865 as a wood grinding company, was formed in 1965 by merging three

53 Jutikkala, E., Pirinen, K. (1996): A History of Finland. Porvoo: WSOY

54 More than 2/3 of country surface is covered by forest

55 Klinge, M. (1997): A Brief History of Finland. Helsinki: Otava 1997

56 Finland was the only country defeated in WWII which has paid all its war indemnities

57 Jutikkala, E., Pirinen, K. (1996): A History of Finland. Porvoo: WSOY

58 Antti Kasvio: HISTORICAL ROOTS OF THE FINNISH INFORMATION SOCIETY

different companies, rubber, cable and wood grinding – Nokia⁵⁹. Other sectors of economy were represented by significant number of small and co-operative companies.

In 80s, public spending were increasing rapidly causing growing budget deficits, mostly financed by raising taxes. The inflationary pressures grew. The Finnish economy was becoming more and more uncompetitive, making Finnish government to undertake substantial reforms. Following example of Norway and Sweden, financial markets were liberalized and access to capital improved. Public spending to R&D grew by 11% annually during 80s soon putting Finland among top countries in this regard⁶⁰. Two technology implement and research agencies were formed in order to manage overall research policy and strategy in form of 3-year cycles, the Science and Technology Policy Council⁶¹ and most important TEKES (National Technology Agency).

Finland, as a vast and dispersedly populated country, posed substantial demand on sophisticated and accessible telecommunication sector. The Finnish telecom network, established well before than in majority of world, was never monopolized. The PTT (Public Telecommunication Operator) was set up to operate long distance international calls and serve as a regulatory body. In 1938, 815 local private phone companies operated the network in Finland⁶². From the very beginning were engaged in R&D with manufactures on very co-operative level, what was quite uncommon outside Scandinavia in that time. These companies, under the threats of nationalization, improved its performance quality during following years and formed an Association of Telephone Companies, which stood up as a competitor to PTT.

Two main companies in phone manufacturing in Finland were State Electric Works (established in 1925 as a Radio Laboratory of Ministry of Defense which lately merged with R&D division of PTT and formed Televa) and Nokia. Televa and Nokia lately joined together their marketing and R&D divisions in order to compete outside Finland.

⁵⁹ www.nokia.com – section history

⁶⁰ Antti Kasvio: HISTORICAL ROOTS OF THE FINNISH INFORMATION SOCIETY

⁶¹ Comprised of PM, three ministers (trade, finance, education) and representants of private and R&D sector

⁶² Antti Kasvio: HISTORICAL ROOTS OF THE FINNISH INFORMATION SOCIETY

In 1969, the Nordic Telecom Conference⁶³ started a project of first analog Mobile Network Standard, NMT (Nordic Mobile Telecom) network⁶⁴. Through this system, Finland, Sweden, Norway and Denmark introduced world's largest single mobile market at that time. Since growing rapidly, NMT attracted many firms and R&D bodies to enter mobile industry. In Finland, the Association of Telephone Companies formed a joint venture in 1988, Radiolinja, which operated the first Finnish private network in NMT standard.

In 80s, the Nordic single mobile network was the largest and most sophisticated in the world. It had the highest number of users. On this market total 15 companies competed together. In this time, Nokia through series of mergers and acquisitions (see later) formed a biggest mobile phone manufacturer in Nordic area.

In the early 90s Finland experienced a massive economical crisis. The world paper and pulp prices were falling down steadily during last years, the reunification of Germany pushed up the interest rates and finally the fall of Soviet Union caused sudden drop in east exports. Only in 1991 GDP fell by 6 %, exports by 13%, in 1993, the unemployment mounted by 14% relative to its 1991 level. Marka (Finnish currency before Euro adoption) devalued by 13 % in 1991. In reaction Finnish government (besides other policies, see more in⁶⁵) floated Marka in 1992, cut its spending by 11% and set inflation target to 2%. Finnish economy recovered in 1993, bringing back stable growth of GDP and pushing down the inflation.

The crisis accelerated tendencies to further increase support of R&D sector (see table 3.1) and to introduce some national competitive strategy. The Science and Technology Policy Council introduced in 1991 two reform initiatives to reinforce Finnish innovative capacity, the Centre of Expertise Program and the Cluster Program. Aim of first one was

⁶³ The institution for technical cooperation in telecom between Nordic Countries (FI, SE, DK, NO) PTTs

⁶⁴ First widely adopted technical standard of mobile wireless signal transfer, later replaced by GSM

⁶⁵ Hannu Uusitalo: Economic Crisis and Social Policy in Finland in the 1990's, PRC Discussion Paper n.70, 1996, http://europa.eu.int/comm/enterprise/enterprise_policy/better_environment/doc/e

to improve local competitiveness by increasing innovation, transforming local production structure and creating jobs in sophisticated areas. Second program focused on supporting cluster R&D activities. In the White Paper of Ministry of Industry and Trade from 1993 was outlined a “National Industry Strategy”⁶⁶. It stated that all policies must be conducted on extended (global) level, therefore beyond ministerial and other actors’ boundaries. *The role of the government is to create favorable framework conditions, which emphasizes inter-organizational cooperation and accumulation and transfer of know-how*⁶⁷. Therefore, policies concerning technology, education and competitiveness became a core stone of the Finnish Industrial Policy.

Table 3.1: Development of R&D expenditures by sector (in absolute numbers and as a % of total) in Finland (1991 - 2006) in mil. EUR

	1991	1993	1995	1997	1999	2000	2002	2004	2005	¹⁾ 2006
Bus. Entreprises	975	1049	1373	1917	2644	3136	3375	3684	3877	4058
Public Sector ²⁾	358	380	374	409	470	497	530	530	555	566
University Sector ³⁾	378	368	425	580	765	789	926	1040	1042	1113
Total	1 711	1796	2172	2905	3879	4423	4830	5253	5474	5736
as % of GDP	2,0	2,1	2,3	2,7	3,2	3,3	3,4	*3,46	*3,5	*3,4
Bus. Entreprises %	57,0	58,4	63,2	66,0	68,2	70,9	69,9	70,1	70,8	70,7
Public Sector % ²⁾	20,9	21,1	17,2	14,1	12,1	11,2	11,0	10,1	10,1	9,9
University Sector % ³⁾	22,1	20,5	19,6	20,0	19,7	17,8	19,2	19,8	19,0	19,4
Total	100	100	100	100	100	100	100	100	100	100
1) Estimates on the basis of inquiry responses and other calculations										
2) Including Private Non-Profit Sector										
3) Including central university hospitals and polytechnics										
* preliminary data										

Source: Statistics Finland: http://www.stat.fi/tup/suoluk/suoluk_tiede_en.html

In order to support growing R&D sector and increasing demand for highly skilled workforce, government decided to further improve tertiary education, mainly by allowing more students to enter universities. Liberalization of financial market either continued to

⁶⁶ www.ktm.fi

⁶⁷ White Paper of Ministry of Industry and Trade from 1993, www.ktm.fi

provoke growth of competition and so availability of funds to finance new projects and ventures. Finland continued the reorientation from eastern to western markets. Exports to west boosted, while trade with Russia dropped to about 4% in 1995.

In 1995 Finland joined EU, what further accelerated integration into European Common Market and allowed harmonization of law and regulation. After the accession to European Union, Finland succeeded to attract many FDI⁶⁸, most of them coming from Sweden. In 1970, exports of paper, wood and metal engineering products accounted for 80% of total Finnish exports. In 2005, this ratio shrank to 20, 8 % (paper alone from 40% to 15.5 % in the same period). Telecommunication products accounted for 28 % of exports in 2005⁶⁹.

The Finnish telecommunication sector was traditionally (compared to other EU countries) very liberal with minimal state interference. Even some compulsory EU policies in telecommunication were adopted with antipathy as they were considered as step back in liberalization of telecommunication sector. However, Nordic countries didn't succeed in pushing their NMT standard global. GSM became first standard used globally (except for USA and some other countries). But Finland adapted soon and Radiolinja became the first operator to launch a GSM commercial network followed shortly after by PTT which was turned public in order to continue liberalization of telecommunication sector. Finland is also one of few countries in the world which allow companies to offer mobile communication services freely without necessity of granting licenses from government. Finland also granted 3G (3rd generation licenses)⁷⁰ without any further restrictions.

⁶⁸ Foreign Direct Investment

⁶⁹ See more in Economic Survey February 2006 p. 17, Ministry of Finance, www.wm.fi,

⁷⁰ A standard which is supposed to follow GSM standard in next generation (integrated voice and high speed data), is referred to as UMTS standard. First generation is considered to be an analog NMT standard.

3.4 History of Nokia's Success

Nokia Corporation is today present in 170 countries, has the most valuable non-U.S. brand and still the highest margins in the mobile phone industry. It represents a great story about how a nearly bankrupt diversified conglomerate⁷¹ from tiny severe climate country transformed itself within less than 10 years into world-leading innovative player in mobile telecommunication industry with revenues growth over 30% annually during this period.

In 1865 Fredrik Idestam opened a Nokia wood-grinding mill in southern Finland. Later in 1898 the Finnish Rubber Works producing galoshes, tires and rubber products opened its production facility in vicinity of Nokia. Shortly after company started to use Nokia brand for its products. In 1912 Finnish Cable Works established its production near Nokia and started to produce cables for telephony and later telephone equipments. These three companies merged into Nokia Group in 1967⁷².

In 1969, Nokia was the first company which introduced digital transmission equipment, in 1982 Nokia started vending Europe's first fully digital telephone switch. Nokia Mobile Phone Division, established in 1979, introduced one of the very first mobile phones for Nordic NTM network standard. During following time, NMT standard was adopted by many countries (incl. CZ) and Nordic countries became the world leaders in mobile phone use. Swedish Ericsson became a leader in production and development of network equipment for mobile industry, while Nokia focused on mobile handset development.

Although the Mobile Phone Division emerged and grew rapidly, the core business of Nokia Group in 1980 still laid in rubber and cable products (87 % of sales in 1980), when most of the production were sold locally. Therefore, CEO of Nokia Kari Kairamo set a new strategy for growth. The aim was to invest more to consumer products, computers and telecommunications. These were seen as challenges for future. In 80s, Nokia

⁷¹ In early 90s (during economic crisis) Nokia was offered to Ericsson which turned the offer down

⁷² For more see www.nokia.com section history

undertook many acquisitions in Europe, mostly in electronics sector. The acquisitions took place primarily in Sweden, Germany and France and about half of them were TV and computer manufacturers. Already in 1988, sales in Nokia electronics sector tripled. But this rapid growth brought many problems. First of all, Nokia's new electronics divisions (incl. mobile phone division), weren't ready for such an increase in production. Problems appeared in financial and management side of business. Nokia employees haven't been used to operate internationally and adaptation took longer time than was expected.

After Kairamo's death in 1988, new CEO Simo Vuorilehto set a new stabilization plan. Nokia stopped making new acquisitions and focused more on integration of new businesses and on divesting of unprogressive businesses, including paper and rubber products. But as soon as restructuring began, Finland was hit by massive economic crisis. The sales went down, Nokia Group started to lose huge money. There wasn't a single division in Nokia which would not be affected by crisis (as there wasn't any company or institution in whole Finland). Nokia major shareholder, consortium of Finnish biggest banks (which faced crisis on their own), wanted just to cash it and get out. Nokia was offered to Ericsson who turned the offer down.

A turn-around came in 1992 when Jorma Ollila was appointed a CEO of Nokia. He joined Nokia in 1985 and in 1986 he became CFO. Since 1990 he led the Mobile Phone Division from 1990.⁷³ Thanks to him this division was saved from bankruptcy during crisis and he was expected to do the same job for whole Nokia Group. General opinion in that time was that Nokia should be sliced to pieces and sold part by part. If Nokia should have been saved, major reforms needed to be implemented.

First of all, Jorma Ollila identified and gathered into team key people from all across the company, people who were enthusiastic about Nokia and dedicated to its future. In May 1992, he came up with his first idea, to build a purely telecommunication company. This was a big gamble and totally unsure whether it would ever pay off. Telecommunications

⁷³ Source: <http://r2.nokia.com/nokiahistory/index.html>

still accounted only for 1/3 of Nokia total sales and just recovered from crisis. Furthermore, it was not obvious whether the world growth of telecommunication would continue in long-term. Lately the same year Ollila introduced new company vision ought to be by 2000, described as: "Focused, global, telecom-oriented, and value-added."⁷⁴ In 1994, the board authorized Ollila to pursue this vision and divest every business but telecommunications over three years. It was decided that every business except for telecommunications and mobile phones should be divested, disregard whether it is a profitable one or not or whether it is a global business. What wasn't telecom went out, including cable works.

Ollila set a target to acquire 25 % of global mobile phones market by 2000. Having limited R&D funding, this required Nokia to focus on just one area. GSM⁷⁵ was growing rapidly and many countries have adopted this system already. Nokia chose to focus on this one and the gamble paid-off. Nokia delivered first mobile phones for this standard well before the competitors. As said before, telecommunications sector in Finland was fully liberalized from beginning and never monopolized. This wasn't the case for rest of the Europe. But with started deregulation in first half of 90s, situation changed dramatically. Now many just privatized mobile operators in EU were willing to buy new modern technologies doesn't matter where they come from. French, German or British state telecoms would never buy mobile phones and network equipments from outside their countries, it was too much politics. With liberalization in these countries situation changed. Nokia also succeeded to sell networks equipment to China and India.

So far, mobile phones from Nokia were sold under many different marks⁷⁶. Since mobiles phones market was more and more proving that it would become a mass-market, Nokia decided to push its own brand through unified design and technology, which would be the same all over the world. In that time, this meant a revolutionary approach. The result was a user-friendly design with many aspects later adopted by many other companies as a

⁷⁴ Another motto of that time were: "Voice is going wireless"

⁷⁵ Global System for Global Telecommunications, second generation standard (2G)

⁷⁶ Electronics chains store names, operators names etc.

new standard⁷⁷. First mobile phone under this concept, Nokia 2100, was launched in 1994. The sales target was set to 400.000 pieces. Actual sales hit 20 million. In the same year Nokia performed the world's first satellite call using a Nokia GSM handset.

Nokia, in order to be able to succeed in customer-oriented market of mobile phones, needed to respond swiftly to the changing customer's needs. In other words deliver what customers wants before somebody else does. Under this logic, Jorma Ollila employed decentralized decision making system which were rather uncommon in that time. Instead of deciding new ideas on CEO level and than pushing them down through the organization, Nokia let its inventors to come up with ideas and then push them up through the organization. This boosted innovative potential, sort of "can-do" and informality way of working enhanced commitment of people and of course brought results. Nokia started to have a reputation of company which is "worth working for" and whose employees are very closely knit together and interested less in money and more in personal achievement.

Nokia also needed a significant capital investment to finance company's rapid growth, what wasn't within a power of Finnish financial market. Therefore, Nokia was listed on New York Stock Exchange in 1994. As a result, Finnish shareholders went down from 90 % in 1991 to just 13 % in 2001. The biggest part of shares is hold by US small investors (about 60 % in 2005). This increased a company transparency and Nokia adopted some aspects of US corporate governance, primarily shareholders value maximalization way of thinking. Also, Nokia left the Nordic system of corporate governance⁷⁸ and adopted the US model of the combined CEO and Chairman of the board, who was Jorma Ollila.

1/3 of Nokia employees were directly engaged in R&D which were mainly run in-house in some of total 56 R&D units around the world. Most of them worked on product development and only minimum in basic research.

⁷⁷ Switch able covers, big screen with scrolling text menu, signal and battery indicators, etc.

⁷⁸ President who run the company and non-executive chairman of the board

By the year 1997, Nokia became purely telecommunication company. The target set by Ollila in 1992 to acquire 25 % of global GSM market share had been already accomplished, three years in advance. In 1997, Nokia controlled 30 % of GSM global market share and kept highest margins in the industry, 16 %. Therefore, Nokia needed a new challenge to pursue. In 1997, Nokia was number two in global mobile phone industry, right behind US Motorola, which was a clear leader. New goal was set to beat Motorola. But, Nokia overtook Motorola just one year later.

‘For most of its history the company had exported to Europe, other Nordic countries and the Soviet Union. As late as 1991, more than a quarter of its turnover still came from sales in Finland. But after the strategic change of 1992, Nokia saw a huge increase in sales to North America (shortly after became 4th biggest seller in USA), South America and Asia. The 1990s also saw unparalleled growth in global sales. Between 1996 and 2001, Nokia’s turnover increased almost fivefold from EUR 6.5 billion to EUR 31 billion.’⁷⁹

Soon, the new challenges were needed to be set as the old ones had been accomplished one by one. Nokia sales grew steadily for more than 30 % annually during last years, what looked more and more unrealistic to keep when total sales hit 10 billion Eur in 1997 and mobile phones penetration in Europe and US market was vast. These were seen rather in improving existing markets and in expanding wireless mobile technologies into new market segments rather than in continuing of mobile phones penetration.

Nokia’s management responded by internal reforms. In June 1998, Nokia Ventures Organization (NVO) was formed. Annual Report of Nokia from 1998 says, that *NVO’s target was to foster growth opportunities beyond the scope of the existing business groups*. NVO was supposed to provide a shelter for new business ideas which had a potential but did not fit to any existing business structure within Nokia and needed a space to develop. It took a form of an incubator for new ideas, which provided both financial and technical support. The only criterion on ideas whether to be put into NVO or not was a potential of generating at least 500 million Euro within 5 years. Important

79 www.nokia.com section history – subsections Expanding markets and Soaring sales

part of NVO was Nokia Ventures Fund (NVF), based in Silicon Valley, which provided external venture business activities. It acted as an intermediate between innovators from Nokia and external entrepreneurs and investor. NVO brought up many new products, one of them was WAP⁸⁰ that were later widely adopted by competitors. WAP became a starting point for next Nokia mission, to bring internet to pockets of everyone. The Mobile Information Society slogan was introduced.

By 1998, Nokia's focus on telecommunications and its early investment in GSM technologies had made the company the world leader in mobile phones.⁸¹ In the early 1999, Nokia stood as a clear market leader. Within eight years, it had accomplished an incredible turn-around from nearly bankrupt and highly diversified conglomerate to focused globally dominant company both on production and innovation side, the market creator. In 1999, Nokia sold 80 million mobile phones worldwide in 1999 and employed over 55 thousand people. Its market share in whole mobile phones industry (not only GSM) was 28 %, second largest competitor, US Motorola lagged behind with 16 % of global market share and Ericsson with 11.5 % on third place (regarding margins: Nokia 23 %, Motorola 7 %, Ericsson 5 %).

Today, Nokia still keeps its position of the world's number one manufacturer of mobile phones and one of the leading producers of mobile networks. In 2006, Olli-Pekka Kallasvuo, formerly Nokia's CFO, took over a CEO position and replaced very successful Jorma Ollila. The next step in Nokia's continuing evolution is already under way. In June 2006, Nokia and Siemens decided to merge Nokia's networks business and the carrier-related operations of Siemens into a new company, Nokia Siemens Networks.⁸² In table 3.2 Nokia's activities in different countries are summarized (as of 2006).

80 Wireless Application Protocol, data transfer system for mobile phones

81 www.nokia.com section history – subsection: Nokia becomes the world's biggest mobile phone manufacturer

82 www.nokia.com, section history – subsection Nokia Today

Table 3.2 : Nokia's activities in different countries (as of 2006)

<i>Producing Capacities*</i>		<i>R&D Units</i>	<i>Listed on stock exchange</i>
Austria	Malaysia	Finland	Finland
Brazil	Mexico	Germany	Germany
China	Morocco	USA	United States
Czech Republic	Netherlands	Hungary	Sweden
Denmark	Philippines	China	UK
Estonia	Portugal	Malaysia	France
Finland	Singapore	South Korea	
France	Slovakia	Australia	
Germany	Spain	United Kingdom	
Hungary	Sweden	Japan	
India	Switzerland	Italy	
Ireland	Taiwan	Canada	
Israel	Thailand	Sweden	
Japan	UK	Denmark	
Korea	USA	Thailand	

* Both contract manufacturing and supplier locations

Source : <http://press.nokia.com/PR/199904/77705.html>, <http://www.nokia.com/A4252214>

4 Porter's Five Forces – A Model for Industry Analysis

4.1 Introduction

In 1980, economist Michael Porter from Harvard Business School published his work *Competitive Strategy: Techniques for Analyzing Industries and Competitors*⁸³. In this paper Michael Porter presented his Five Forces Model (A Model for Industry Analysis).⁸⁴

By many economists, this model is considered as a simple but powerful tool for understanding strength of company's⁸⁵ current competitive position, and the strength of a position company wants to move into.⁸⁶ This is performed by analyzing five main forces which determine the company's performance (see below). Porter argues that when it is understood clearly where the competitive strengths of company lies, one can better take advantage of a current situation, improve weaknesses and avoid taking bad decisions in future.

In classical economics, the assumption of pure competition implies that risk-adjusted rates of return should be constant across firms and industries. But many economic studies have showed that different industries or firms can sustain different levels of profitability. Porter explains this difference by industry or firm structure. Five Forces Model assumes that an industry or firm is influenced by five forces⁸⁷:

- Intensity of rivalry amongst existing competitors (competitive rivalry)
- Threat of entry by new competitors (threat of new entry)

83 Porter, Michael E., *Competitive Strategy: Techniques for Analyzing Industries and Competitors* – this paper is main source for this chapter

84 Paper also discusses how to recognize and act on market signals, how to forecast the evolution of industry structure, discusses competitive strategy for emerging, mature, declining, and fragmented industries and strategic decisions related to vertical integration, capacity expansion, and entry into an industry and how to conduct an industry analysis.

85 Or Business, industry etc.

⁸⁶ Source: www.quickmba.com/strategy/fiveforces

⁸⁷ Source: wikipedia.com, Five Forces Model section

- Pressure from substitute products (threat of substitution)
- Bargaining power of buyers-customers (buyer power)
- Bargaining power of suppliers (supplier power)

These Five Forces determine the attractiveness of a market. Porter referred to these forces as the microenvironment. He argues that they *consist of those forces close to a company that affect its ability to serve its customers and make a profit. A change in any of the forces normally requires a company to re-assess the market place.*⁸⁸ Therefore, this model can be used to better understand where the success of firm or industry comes from (where lies competitive advantage or strength of firm or industry and identify possible weaknesses).

Porter's Five Forces model has repeatedly been criticized by other academics and economists (see more in K. P. Coyne⁸⁹). Coyne says that three assumptions underlie the five forces:

- That buyers, competitors, and suppliers are unrelated and do not interact and collude
- That the source of value is structural advantage (creating barriers to entry)
- That uncertainty is low, allowing participants in a market to plan for and respond to competitive behavior⁹⁰.

Another criticism (or rather extension of Five Forces Model) has been presented by Brandenburger and Nalebuff. In their paper⁹¹, they have made an important extension to Five Forces Model. Using Game Theory, they added the concept of complementors (often called sixth force). As a sixth force they identify government whose role might be

⁸⁸ Porter, Michael E., *Competitive Strategy: Techniques for Analyzing Industries and Competitors*

⁸⁹ Coyne, K.P. and Sujit Balakrishnan 1996, "Bringing discipline to strategy", *The McKinsey Quarterly*, No.4

⁹⁰ Source: wikipedia.com, Five Forces Model section

⁹¹ Brandenburger, A.M. and Nalebuff, B.J. (1995), "The Right Game: Use Game Theory to Shape Strategy", *Harvard Business Review*, Jul-Aug, pp.57-71

significant in some cases. Therefore it is worth considering government in some cases when performing Five Forces analysis.

4.1.1 Competitive rivalry

If assumptions of perfect competition would hold in reality, all profits of rival firms would equal zero. But perfect competition is only ideal state, thus, firms are not only price takers and actively strive to gain a competitive edge over their rivals. The degree of rivalry among firms is different for various industries and firms.

Economists usually measure degree of rivalry by indexes of industry concentration. The most common of these indexes is one provided by The U.S. Bureau of Census⁹². It is called Concentration Ratio (CR) and measure market share which is hold by biggest firms in the industry⁹³. Four types of CR index are available, for 4, 8, 25 and 50 firms. Higher the CR index is, higher market share is controlled by the biggest companies in the industry (4, 8, 25, or 50 biggest companies in industry) and therefore the industry is more concentrated.

If only a few firms hold a significant market share (for example CR 4 index is high), the industry is less competitive and closer to monopoly. Contrary a low CR index means tat the industry is composed of many rival companies none of which is controlling a significant market share. Thus such an industry is supposed to be competitive.

If degree of rivalry is low (for instance CR index is high), industry is considered to be disciplined. If one firm starts behaving in a way which is in conflict with habits and morals of that specific industry, degree of rivalry escalates. Usually, degree of rivalry is assessed to be cutthroat, intense, moderate or weak based firms' aggressiveness in order to gain an edge over its rivals.

⁹² www.census.gov

⁹³ See more in US Census Bureau (May 2006): Concentration Ratios, Subjects Series

Several steps have been identified in order to gain an advantage over rivals, the most usual are:

- Changes in prices
- Improving products (innovations)
- Market segmentation (targeting specific customers)

Besides other factors which intensify degree of rivalry we can mention:

- Large number of firms (a lot of firms compete for same resources and customers)
- Effort to gain a market leadership
- Slow industry growth (firms has to compete for existing market share)
- Low switching costs (between different products mean higher competition)
- Low levels of product differentiation (contrary brand differentiation lower rivalry)
- Corporate stakes (if firm has a potential for high gain or is losing market share)
- High fixed costs (economy of scale effect, firm has to produce near capacity)
- Exit barriers (firm has to stay in market even if not profitable)
- Cultural diversity of rivals
- Industry shakeouts (if previously growing market becomes saturated, shakeouts can occur to reestablish stability)

Bruce Henderson introduced his theory called the Rule of Three⁹⁴. According to this theory, a stable industry will have from three (to maximum four) main competitors. At the same time the biggest firm will have less than four times the market share of the smallest firm in the three to four group. Based on this theory, if industry has more than three to four main firms, a shakeout is inevitable. Then:

- Surviving rivals will have to grow faster than the market

⁹⁴ Published and summarized by Sheth, Jagdish 2002: *The Rule of Three: Surviving and Thriving in Competitive Markets*, Free Press, Sheth in his book dedicates origin of this idea to Bruce Henderson, founder of Boston Consulting Group.

- Eventual losers will have a negative cash flow if they attempt to grow
- All except the two largest rivals will be losers

This is rather empirically based theory, but provides some useful insight into degree of rivalry analysis with interesting findings. Therefore, we can conclude that changes in supply and demand and market stability affects degree of rivalry within an industry.

4.1.2 Threat of new entry

Again, under the assumption of perfect competition, any firm would be able to enter or exit market at no costs. In reality, several factors exists which inhibit or restricts additional firms to enter or exit the market. In general, these are called barriers to entry.

In theory, when profits in the industry grow, more firms are expected to enter that specific industry up to level when profits are driven back down to equilibrium level. When profits decrease, firms are expected to leave the market driving profits up to equilibrium level. In reality, some of the major three to four firms in industry might keep prices low to deter new entrants. Some other threats which prevent firms form entering market might be uncertainty in the industry or high start-up costs.

Thus, barriers to entry diminish number of new entrants even when the conditions in the industry are favorable and motivating for new firms to enter the industry. Therefore, these barriers can be used as a mean to gain competitive advantage over rivals.

Barriers to exit have similar logic as barriers to entry. When they exist, firm's ability o leave the industry might be restricted or even impossible and can lead to increased rivalry because firm is forced to compete.

Some of the most usual barriers of entry/exit are following:

Industry is easy to enter if there is:

- Easy access to customers via distribution
- Common and available technology
- Low brand awareness

Difficult to enter if there is:

- Patented protected know-how or products (IPR)
- Uneasy brand switching
- Difficulties in accessing customers (restricted distribution channels)

Easy to exit if there are:

- Liquid assets
- Low exit costs
- Independent businesses

Difficult to exit if there are:

- Illiquid (specialized) assets (cannot be easily sold or converted into other uses)
- High exit costs
- Interrelated businesses

Besides these factors we recognize government as a powerful actor in creating threats to entry/exit an industry (regulation vs. deregulation of an industry, monopoly).

4.1.3 Threat of substitution

In theory, as more substitutes become available to main product in the market, more elastic demand curve becomes because customers have more alternatives to choose from. Therefore, a lot of substitutes bound firm's ability to operatively raise prices.

Risk of this factor comes from product availability in other industries. Threat of substitutes usually affects firms in industry through price competition with its rivals, but

might have also a non-price character such as higher attractiveness of substitutes, technological advancement or incapacity of switching to substitutes.

4.1.4 Buyer Power

The power of buyer is the influence of customers on firms. According to economical theory, when buyers have a strong impact on firms, the market situation is close to monopsony⁹⁵. In reality, buyer's power is strong when availability of close substitute is high and therefore risk of losing customers is high. Or, if customer buys a significant volume of total output, in example some huge retail stores or if buyers are concentrated, their buyer power is also high.

Similarly, buyer power is low when the availability of substitutes is low and buyer cannot easily switch for other products. Buyer power is also low if end customers are fragmented and none of them has any significant impact on price or product (typical for consumers' goods). Also, if firms are vertically integrated (in example own distribution channels) buyer power is also low. Last example might be situation when firm supplies a critical and unique part of final product (for example Microsoft Windows XP).

4.1.5 Supplier power

This factor is significant when for example supplier of firm provide scare and unique resource which is unavailable from other suppliers or whose switching costs to alternative supplier are high. Suppliers can thus ask higher prices to acquire some of firm's profits. Same situation occurs when suppliers are concentrated or organized into some unit.

⁹⁵ Monopsony is usually referred to a market situation where there are many firms and only one customer who is the price setter.

Supplier's power is low when a lot of competitive suppliers deliver homogenous product. Another example is when unique firm or type of firm exists to which suppliers had to deliver or when firms are concentrated.

4.2 Diagram of Porter's 5 Forces

Porter identifies numerous aspects to be considered when performing Five Forces analysis. List of aspects as originally summarized by Porter was extended using various sources⁹⁶.

Competitive rivalry

- Number of competitors
- Rate of industry growth
- Industry concentration
- Fixed costs/Value added
- Intermittent overcapacity
- Product differences
- Switching costs
- Brand identity
- Diversity of rivals
- Corporate stakes

Threat of new entry

- Absolute cost advantages
- Learning curve

⁹⁶ Sources for chapter 4.2 are:

<http://technologypolicy.web-log.nl/>

<http://www.cse.dmu.ac.uk/~nkm/sisp/LECT4.html>

http://www.exed.hbs.edu/products/sbsca/components_environment.html

<http://www.anu.edu.au/people/Roger.Clarke/SOS/Strat1STh.html>

http://www.mindtools.com/pages/article/newTMC_08.htm

http://www.12manage.com/methods_porter_five_forces.html

<http://www.brs-inc.com/porter.asp>

http://www.tutor2u.net/business/strategy/porter_five_forces.htm

http://home.att.net/~nickols/five_forces.htm

- Government policies
- Access to inputs
- Economies of scale
- Capital requirements
- Brand identity
- Switching costs
- Access to distribution
- Expected retaliation
- Proprietary products

Threat of substitution

- Switching costs
- Buyer inclination to substitute
- Price-performance trade-off of substitutes
- Perceived level of product differentiation

Buyer power

- Bargaining leverage
- Buyer volume
- Buyer information
- Brand identity
- Price sensitivity
- Threat of backward integration
- Product differentiation
- Buyer concentration vs. industry
- Substitutes available
- Buyers' incentives

Supplier power

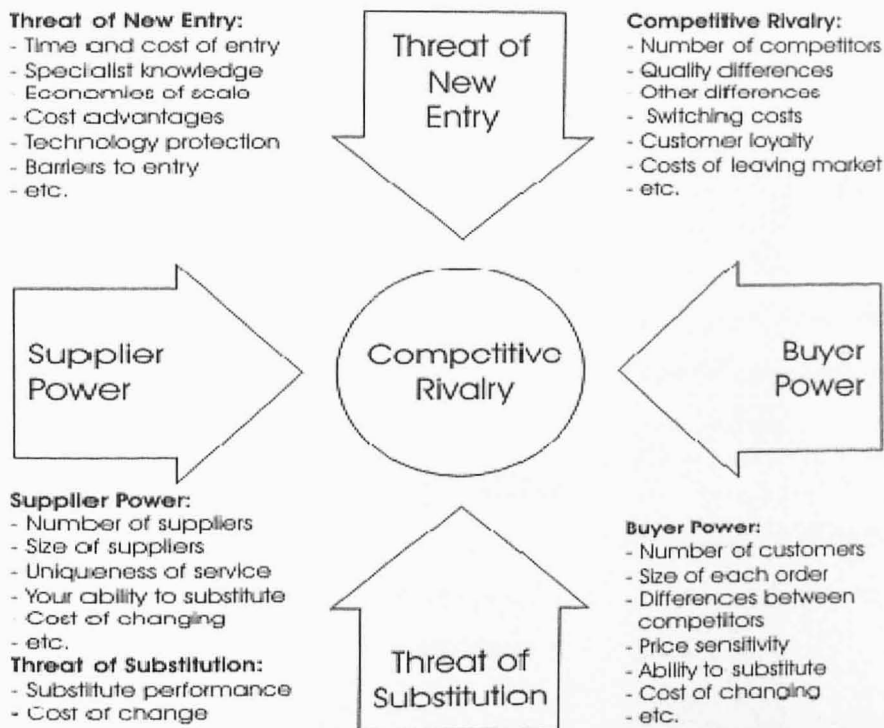
- Supplier concentration

- Importance of volume to supplier
- Differentiation of inputs
- Impact of inputs on cost or differentiation
- Switching costs of firms in the industry
- Presence of substitute inputs
- Threat of forward integration
- Cost relative to total purchases in industry

These aspects can be summarized into following diagram:

Table 4.1: Diagram of Porter's 5 Forces

Porter's Five Forces



Source: www.market-modelling.co.uk

Porter identifies three strategies (cost leadership, differentiation and focus) that can be implemented at the business unit level to create a competitive advantage. The proper

generic strategy will position the firm to leverage its strengths and defend against the adverse effects of the five forces. These three strategies can be summarized in following table and will be useful in next chapter where Five Forces Model is applied to Nokia.

Table 4.2: Generic strategies and Five Forces

	Generic strategies and Five Forces		
	Cost Leadership	Differentiation	Focus
Threat of new entry	Ability to cut price in retaliation deters potential entrants.	Customer loyalty can discourage potential entrants.	Focusing develops core competencies that can act as an entry barrier.
Buyer Power	Ability to offer lower price to powerful buyers.	Large buyers have less power to negotiate because of few close alternatives.	Large buyers have less power to negotiate because of few alternatives.
Supplier Power	Better insulated from powerful suppliers.	Better able to pass on supplier price increases to customers.	Suppliers have power because of low volumes, but a differentiation-focused firm is better able to pass on supplier price increases.
Threat of Substitution	Can use low price to defend against substitutes.	Customer's become attached to differentiating attributes, reducing threat of substitutes.	Specialized products & core competency protect against substitutes.
Competitive Rivalry	Better able to compete on price.	Brand loyalty to keep customers from rivals.	Rivals cannot meet differentiation-focused customer needs.

Source: Porter, M. (1980)

4.3 Five Forces analysis of Nokia

4.3.1 Degree of Rivalry

Mobile phones manufacturers industry has its roots in 50's of last century, but didn't practically develop until the beginning of 80's. Industry can be divided into two parts, mobile phone handsets (phones) and mobile phone infrastructure (transmitters etc.). As pioneers in the industry are considered Nokia, Ericsson and Motorola which are active in both segments of industry. Market is considered to be slightly less than 420 million mobile phones sold worldwide (2006)⁹⁷. The most penetrated market is in Europe.

Mobile phones manufacturers industry is facing intense competition nowadays as growth rates of industry are slowing down due to high penetration of mobile phone usage. Steep growth of industry, characteristic for mobile phone manufacturers industry in 90's, has slowed down significantly in the beginning of 2000. High growth rates attracted new entrants from especially consumer electronics industry (LG, Samsung, Panasonic, Philips), which joined the traditional mobile phone manufacturers from 90's. Supply in the industry when new entrants joined the industry soon out passed demand in the market. Four largest mobile phone manufacturers are (according to net sales) Nokia, Motorola (US), Samsung (KO) and Sony Ericsson (JP-SE merged mobile phone divisions in 2001).

As competition became intense and growth rates slowed down significantly many producers left the industry during last years (Panasonic, Philips, Siemens (Benq), Sagem). Today market is composed by traditional producers (Nokia, Motorola, Sony Ericsson) backed up by East Asian catch-uppers (Samsung, LG). Many European producers were driven out of market (Philips, Siemens, Alcatel, Sagem) due to intense competition, slow growth rates and declining margins. Those who survived did so generally thanks to heavy investment into R&D.

⁹⁷ www.hoovers.com and www.hoovers.co.uk

Concentration ratio (CR 4)⁹⁸ for four major manufacturers of mobile phones says Nokia together with Motorola, Sony Ericsson and Samsung has between 70 % and 80 % of global market share. Industry growth is equal to 0,19 % (change between 2005 and 2006)⁹⁹

As growth rates of industry are slowing, competitors are forced to compete over existing market share. Therefore, product life-cycles are shortening as new models are being thrown to market in shorter periods in order to attract existing customers. Therefore, production life-cycle is also shortening to avoid overcapacity in production. Significant investments into R&D and innovation process are needed when fighting over existing customers.

Brand perception is very good as key producers invest a lot to brand awareness. Nokia was evaluated as most valuable non-US brand (6th global most valuable brand)¹⁰⁰. Nokia and also Samsung and Motorola are evaluated well in Fortune's 500 Global Companies¹⁰¹.

The Rule of Three holds in case of mobile phone manufacturers industry. Industry has three main competitors and market share of Nokia is less than four times higher than one of Samsung. If we would extend this rule to four companies, Nokia would not have market share less than four times higher than Sony-Ericsson. Than (according to the Rule), shakeouts are inevitable. Surviving rivals have to grow faster than the market, eventual losers will have a negative cash flow if they attempt to grow and all except the two largest rivals will be losers. If we recall development in industry in last years we can conclude that this was roughly development which preceded current state. All Nokia, Motorola and Samsung and Sony-Ericsson grew faster than market, several other

⁹⁸ US Census Bureau (May 2006): Concentration Ratios, Manufacturing Series

⁹⁹ <http://finance.yahoo.com/q/in?s>

¹⁰⁰ See more in Top 100 Global Brands 2006 by Newsweek

¹⁰¹ Fortune's Global 500 Companies 2006

companies were driven out of the market due to negative cash flow and Nokia was clear market leader (see table 4.3).

Table 4.3: Market Shares in Mobile Phone Manufactures Industry 2005 - 2006

	2006 Market Share	2005 Market Share
Nokia	34,10%	31,80%
Motorola	21,30%	17,50%
Samsung	11,60%	12,30%
Sony-Ericsson	7,30%	6,10%
LG	6,30%	6,60%
Other	19,40%	25,60%
Total	100%	100%

Source: IDC Mobile Phone Tracker, 2007

Data showing Sales, Net Income and n. of Employees in 2006 also declare Nokia as a clear market leader with highest sales, net income (both either in terms of growth and relatively low number of employees compared to Motorola).

Table 4.4: Sales, Net Income and n. of Employees in 2006 (in mil. USD)

	Annual Sales	Annual Growth	Net Income	Annual Growth	n. of Employees	Annual Growth
Nokia	54,292	34,10%	5,644	33%	58,874	6,10%
Motorola	42,879	16,40%	3,661	-20%	69000	1,50%
Samsung*	23,291	0,90%	1,879	-13,50%	128000**	4,10%
Sony-Ericsson	8,607	-3,30%	0,421	-2,20%	5000	0%

*data for Samsung derived from cumulative statements for Samsung Electronics group

**data for whole Samsung Electronics group

Source: www.hoovers.com, sections of each company

4.3.2 Barriers to entry

Barriers to entry into mobile phone manufacturers industry are relatively high. Intellectual Property Rights (IPR) for are concentrated in hands of few current producers. Also, brand awareness of biggest players in the market is high and many customers are diffident toward new brand. For any new entrants it would require immense marketing expenditures to establish its brand in industry and acquire appropriate technology. This would be possible if some revolutionary innovation would be launched into market which would attract many customers and have a disruptive effect on current technology. But this is unlikely because current main producers (Nokia etc.) are also technology leaders in the industry. However, distribution channels (most of mobile phones are sold via mobile phones operators) are relatively easily available. But this effect is rather overcome by two preceding effects.

To summarize, barriers to entry are relatively high due to cost advantage of current producers, IPR, advanced brand identity, high capital requirements to enter the market and sophisticated know-how and R&D owned by Nokia and its main competitors. Contrary, distribution channels are relatively easily available. Exit market is possible for moderate costs via selling assets to competitors (Siemens, Philips) or transforming them to relative industry (Sagem).

4.3.3 Threat of Substitutes

Currently there is no major threat of substitutes in mobile phones industry. Any other product which would provide instant voice and text transfer for moderate costs, various additional fun and practical services, no significant geographical and place restriction in using and freedom of movement and accessibility is unavailable. Mobile phones also become essential accessory of customers' everyday life.

The only possible threat is growing market of second hand mobile phones. As product and production life-cycles shorten, a lot of usable mobile phones are available in the market for fewer prices and therefore attract some customers who prefer used ones to new products. Mobile phone manufacturers fight with these substitutes via faster R&D

development which makes used phones sooner technologically obsolete. This strategy is effective only to certain level.

4.3.4 Buyer Power

As significant volume of mobile phones manufacturers' output is purchased by operators and retail chains as a bulk, buyers' power is intense. Buyers' information about available products and their differences are easily accessible and complete. Therefore, producers have to offer lower prices or technological advancement over their rivals. On the other hand, there are only four main manufacturers in the market which serves between 70 % and 80 % of world market. Therefore, availability of substitutes for operators and retail chains is also restricted. This state is ideal for Nokia which can as a market leader with highest profits offer lower prices for technologically superior products and amortize necessary R&D costs via scale of their production.

4.3.5 Supplier Power

Numerous specialized suppliers of Nokia have arisen in Finland especially during 90's partly as a result of Nokia's steep growth. Nokia tended to keep production of specialized and crucial technology in Finland and to import basic and standard parts of mobile phones. Therefore, range of sophisticated suppliers emerged in Finland while many of them were directly raised by Nokia. Thus, the mutual dependence is vital for both parties. Neither Nokia nor its suppliers is directly motivated to use bargaining power in common relation under this condition.

4.4 Summary

Based on Five Forces analysis before, I assume that under existing conditions Nokia will stay in position of global market leader in mobile phones manufacturing industry

followed by Motorola. I predict that one of following producers (Samsung, Sony-Ericsson, LG) will be consequently driven out of the market due to tailing effect of stabilization of industry which arose because of slowdown in industry growth rates and intense competition over existing consumers. Industry will become even less diversified.

Nokia will continuously benefit from scale of its production, brand awareness and leading market share which are positively projected into Nokia's margins and net profits which consequently allow sustaining growing R&D expenditures which are necessary for Nokia to keep market leader position.

Nokia will subsequently more and more rely on combining various services¹⁰² and new possibilities into its mobile phone products in order to compete over existing customers. Competitive advantage of Nokia will be more focused on product development, which would allow combining and connecting existing technology to more possibilities.

I see small threats in Nokia's maybe sometimes slower reaction to changing standards and in adopting new trends. We have seen that Nokia was a bit reluctant in adopting 2nd generation (GSM) standard even if later become market leader in this field. Small distrust towards new trends in the beginning of their life-cycle has been characteristic for Nokia during its history. Also, being the market leader might be giving Nokia a bad image, similar to Microsoft in software industry. Such an image is generally badly perceived by customers when launching new products.

Nokia should also search more aggressively market possibilities in regions where mobile phones industry is still growing, including India, China and other countries. At last, small threat can be seen in some efforts of major operators to construct and sell their own (usually cheaper) mobile phones under their own brands and thus lessen their dependency on the dominance of Nokia and other main manufacturers.

¹⁰² Development or improvement of new services such as real time internet browsing, video transfer, access to more services via mobile phone and enhanced compatibility with other ICT products and computer hardware.

Besides mentioned threats and under existing conditions (if no unpredictable development or industry shock occurs in mobile phones manufacturer industry), I don't see any significant reason or possible development which would threat Nokia's market leader position in next five years.

5 The role of Nokia in Finnish Economy and Innovation System

5.1 Introduction

Nokia plays a significant role in Finnish economy. Nowadays, its turnover¹⁰³ is nearly as high as the whole Finnish state budget.¹⁰⁴ Its impact is so prevalent, that some journalists even started call Finland “NokiaLand.”¹⁰⁵ This impressive growth of course drew attention of experts and raised many questions. Its deeper understanding has become point of interest of many economists and entrepreneurs in order to learn a lesson from Nokia’s success. This success is even more fascinating if we consider that Nokia is world leader in technologically intensive (hi-tech) industry which requires significant investment, especially into R&D sector. It is not usual for companies based in small country to be a market leader in technology intensive (hi-tech) industry.¹⁰⁶

As we have seen in chapter Nokia history, Nokia has grown significantly during last years, reflecting also economic growth of Finland. Considering relative size of Finland (approximately 5 million of habitants), it is clear that the growth of Nokia couldn’t have been isolated within Finnish economy. In reality, Nokia has impacted hundreds of its business partners and suppliers. Many Finnish companies are directly or indirectly linked to Nokia. Besides business partners, Nokia has close cooperation with universities,

¹⁰³ Of course this aspect doesn’t say much about the real performance of Nokia; it just expresses the importance of Nokia in Finland.

¹⁰⁴ ALI-YRKKÖ, J., PAIJA, L., REILLY, C. & YLÄ-ANTTILA, P. (1999). Nokia .A Big Company in a Small Country, ETLA

¹⁰⁵ For example: BBC News (2001): Charting the Rise of Nokia

<http://news.bbc.co.uk/2/hi/business/1505703.stm>

¹⁰⁶ Based on Fortune’s Global 500 Companies Ranking commentaries and statistics

<http://money.cnn.com/magazines/fortune/global500/2006/>

research institutions and other public sector organizations. In this chapter, role of Nokia in Finnish innovation system¹⁰⁷ will be analyzed.

What is logic of this analysis? Nokia, as a dominant Finnish and global company in the field of mobile phones, plays crucial role in innovation system in Finland. On one side, Nokia invests and contributes to Finnish innovation system. On the other side, it benefits a lot from it. Let's take a closer look. Nokia, as a global technological leader in the field of mobile phones, spreads the latest technology on its business partners and suppliers, research institutes and universities. In the same logic Nokia benefits from excellent educational system, government R&D support or skilled labor force. This guild has proven itself as a very useful one and merits particular attention. Therefore, this chapter is draw up in two subchapters. First one describes and analyzes what Finland invested into Nokia's growth during its history. Second one similarly examines what Nokia returns to Finnish economy, with main focus on contributions to Finnish innovation system.¹⁰⁸ Before we proceed to analysis we will examine what is an impact of Nokia on Finnish GDP, exports etc.

¹⁰⁷ In this work, as an innovation system will be considered cooperation between private companies, universities, research institutes and government bodies in invention and diffusion of innovations.

¹⁰⁸ The main data source for this chapter is work: Jyrki Ali-Yrkkö, Raine Hermans (2002): Nokia in the Finnish Innovation System, ETLA. However, due to out date of this work and further invalidity of many data (due to changes in calculation by Finnish Ministry of Finance etc.), data from this work has been exempted, updated and recalculated by author of this thesis on base of new methodic provided by Ministry and analysis has been further extended.

5.2 Nokia's impact on Finnish GDP, exports and overall R&D expenditures

Table 5.1: Impact of Nokia on selected economic indicators of Finland (in %)

Year	Nokia/GDP	Nokia/Exports	Contribution to GDP	
			Growth	Real GDP
1990	0,5%	4,8%		
1991	0,3%	3,9%	-0,1%	
1992	0,5%	5,0%	0,1%	
1993	0,7%	6,3%	0,2%	
1994	0,8%	7,5%	0,2%	
1995	1,1%	8,6%	0,3%	3,90%
1996	1,2%	9,6%	0,1%	3,70%
1997	1,8%	11,7%	0,5%	6,10%
1998	2,5%	14,1%	0,8%	5,20%
1999	3,2%	17,7%	0,8%	3,90%
2000	4,0%	20,7%	1,4%	5,00%
2001	3,4%	20,7%	0,0%	2,60%
2002	3,7%	21,2%	0,4%	1,60%
2003	3,9%	18,7%	0,3%	1,80%
2004	3,0%	18,6%	-0,2%	3,70%
2005	2,9%	17,2%	0,1%	2,90%
2006*	3,0%	17,5%	N/A	5,50%

Source: Statistics Finland, Finnish Ministry of Finance, own calculations (* estimates)

As we can see in the table, Nokia's contribution to Finnish GDP has grown steadily over time. From 0,5% in 1990, right before restructuralization of Nokia, to its peak in 2000 when the impact equaled 4 %. Last year the contribution of Nokia to Finnish GDP is estimated on level of 3 %. If we take a look on Nokia contribution to GDP growth each year, we see that it varied over time. In year 2000, when Finnish economy grew 5 %, we

conclude that Nokia's effect on GDP growth amounted to more than one third that year (this data excludes Nokia's contractors, suppliers and business partners).

Nokia's effect on Finnish exports is also vast. From only 4,8% in 1990 it amounted to 20,7 % in years 2000 and 2001 and even to 21,2 % in 2002. Currently it is estimated that Nokia accounts for 17,5 % of total Finnish exports (estimates for 2006). This data also refers only to Nokia's own exports and excludes exports via Nokia's business partners and contractors.

If you recall Table 3.1 from chapter 3, Ali-Yrkkö (2001, p. 73) shows that in the year 2000 approximately 43-47 % (based on methodic used) of total R&D private sector expenditures in Finland was invested by Nokia. If we employ the same mathematical routine for year 2006, we receive interval 41-45 %. This slowdown is due to faster growth of private sector R&D expenditures which grew more rapidly than R&D spending of Nokia in recent years.

But the most interesting findings concerning R&D funding come from figures in private sector R&D spending which are invested abroad. Ali-Yrkkö (2001, p. 73-4) shows that in year 2001 Finnish private companies spent on total 3,5 billion EUR in R&D outside Finland. Out of this amount whole 3 billion EUR was spent by Nokia. Therefore, in year 2001 86 % of all Finnish private companies R&D spending invested abroad were spent by Nokia. If we employ same methodic for year 2006, we discover that this ratio is still very high, about 79 %. Therefore, the significance of Nokia's position in Finnish economy is vast.

Strong position of Nokia in Finland also causes a fact that share of private R&D sector funding is in Finland largely predominant compared to public R&D funding, which is significantly smaller than it is usual in other advanced countries (USA, UK, France). However, empirical evidence of this observation is rather problematic. At first, it is unsure what exactly to consider as a still public R&D expenditure and what already belongs to private R&D spending. Also, many governments support financially also

private R&D projects, usually through some government business agencies (i. e. Tekes in Finland). Also, some countries finance military projects via private companies (USA) what causes international comparison of sector R&D spending rather problematic.

5.3 Investment of Finland into Nokia ('s success)

In this chapter we will examine particular investment and effects in Finland which were primarily intended to support Nokia. The most important are R&D funding, cooperation with universities and availability of skilled labor force.

5.3.1 Public funding of Nokia's R&D

In Finland, government supports R&D funding of private companies via its National Technology Agency (short name Tekes (from Finnish)). Tekes is part of the Ministry of Industry and Trade (MTI). This agency was established in 1983. Before 1983, Finnish government supported private sector R&D directly via MTI. Tekes was established in order to improve the funding channels, bring it closer to private sector and make money transfer and funding process more transparent and sophisticated. Support takes form of grants and loans. According to Tekes webpage¹⁰⁹, main area of support are ICT and telecommunication sector, where in period from 1983-2005 directed 39 % of public R&D expenditures support. R&D projects supported from Tekes must fulfill two basic eligibility criteria. Part of its budget must be always covered from company's own sources. Second criterion is that project must be always long-term based, usually in three years cycle.

Ali-Yrkkö (2002, p. 8) tries to summarize Nokia's R&D expenditures. This table was exempted, updated, recalculated and further extended by author to following form:

¹⁰⁹ www.tekes.fi

Table 5.2: Nokia's R&D activities – private and public funding (million EUR)

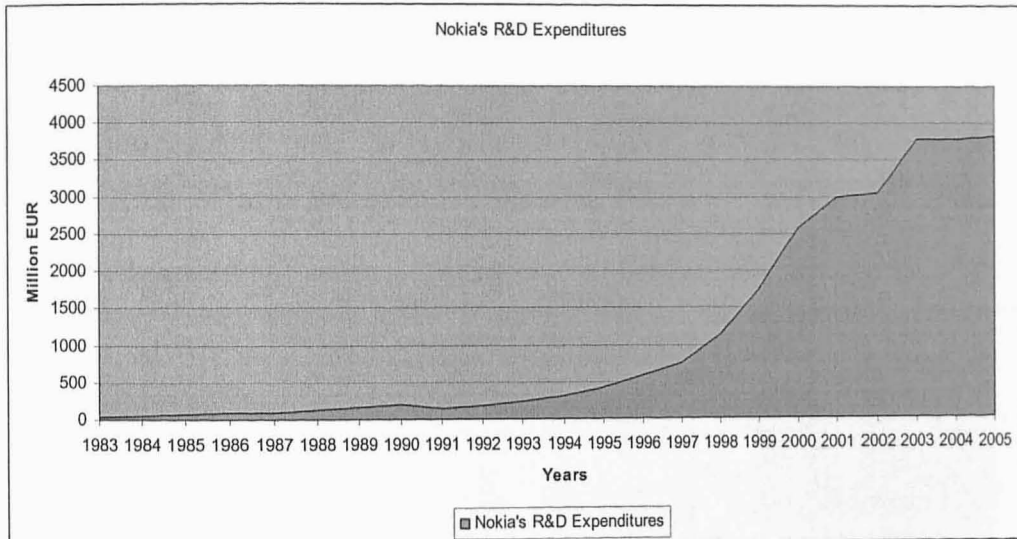
Year	Nokia's R&D Expenditures	% of net sales	Tekes R&D Funding	% of Nokia's R&D Expenditures
1983	44	3,8%	2,8	6,4%
1984	59	3,8%	4,7	7,9%
1985	76	4,1%	1,3	1,8%
1986	90	4,5%	3,8	4,3%
1987	97	4,2%	4,3	4,5%
1988	132	3,6%	6,0	4,5%
1989	158	4,2%	3,0	1,9%
1990	194	5,3%	5,0	2,6%
1991	155	6,0%	7,8	5,0%
1992	185	6,1%	9,5	5,1%
1993	245	6,2%	12,2	5,0%
1994	317	6,3%	10,7	3,4%
1995	422	6,9%	10,8	2,6%
1996	586	8,9%	10,3	1,8%
1997	760	8,7%	12,3	1,6%
1998	1140	8,6%	13,2	1,2%
1999	1740	8,9%	18,0	1,0%
2000	2562	8,5%	7,8	0,3%
2001	2985	9,6%	8,0	1,6%
2002	3052	10,2%	6,5	1,3%
2003	3788	12,8%	8,7	1,4%
2004	3776	12,9%	3,8	0,6%
2005	3825	11,2%	8,3	1,3%

Source: Tekes statistics, Nokia Annual Reports 1983-2005, Ali-Yrkkö (2002)

As of December 31, 2005, Nokia employed 20 882 people in research and development in 26 countries, representing approximately 36% of Nokia's total workforce. R&D expenses totaled EUR 3 825 million in 2005, an increase of 1% from 2004 (EUR 3 776 million). R&D expenses represented 11.2% of Nokia's net sales in 2005, compared to 12.9% of net sales in 2004.¹¹⁰

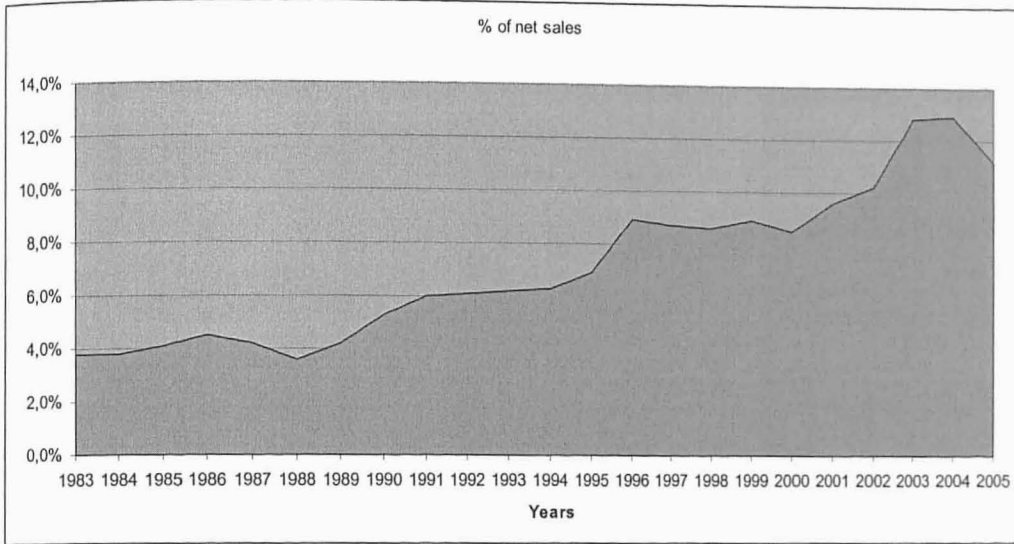
We can conclude that Nokia's R&D expenditures have grown continuously over the time from 1983 up to 2005. The only exception (drop) can be seen in years 1991 and 1992. This is due to general crisis of Finnish economy (recall from chapter 3). Already in 1993, R&D spending recovered to level higher than in 1990 (prior to crisis). The biggest increase can be seen between years 1997 and 2001, when growth of Nokia was fastest.

Table 5.3 Nokia's R&D Expenditures 1983 - 2005



¹¹⁰ Nokia's Annual Report 2005, <http://www.nokia.com/A4126496>

Table 5.4: Nokia's R&D Expenditures 1983 – 2005 as a % of Net Sales



Source 5.3 and 5.4: Author's graph calculation based on Table 5.2 data

We can see that R&D spending of Nokia increased nine times between year 1995 and 2005 and even fifty times during last twenty years, between 1985 and 2005.

Table 5.5: Tekes R&D Funding

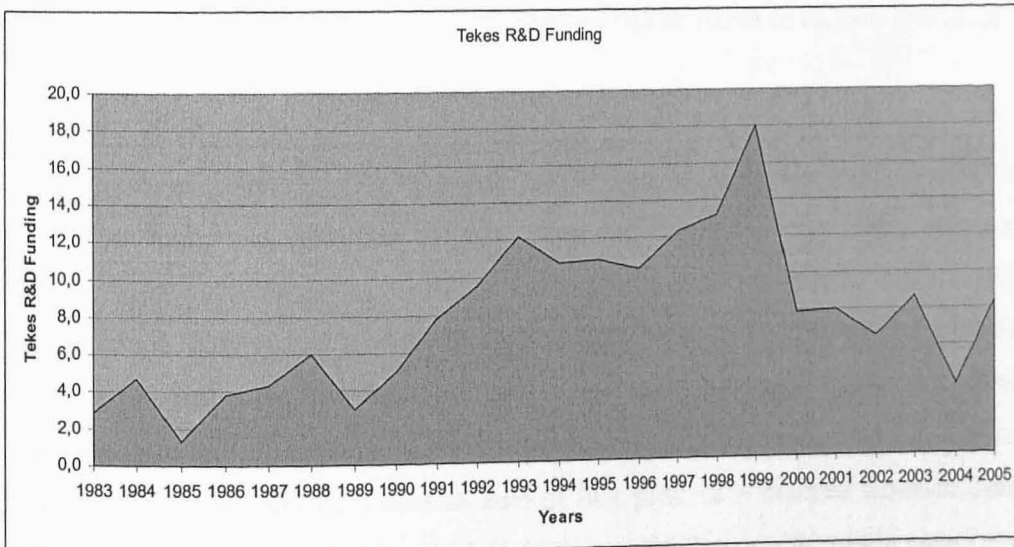
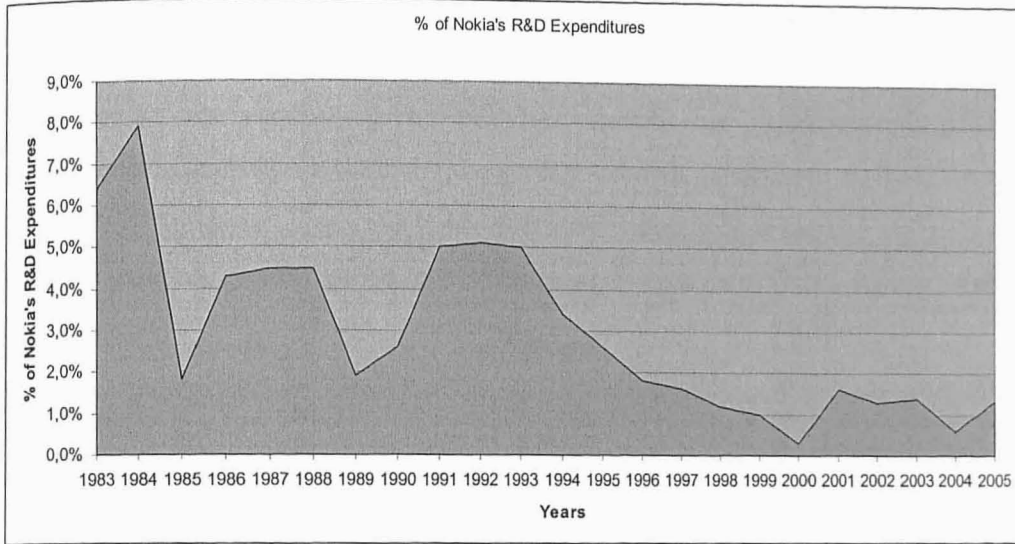


Table 5.6: % of Nokia R&D Expenditures financed by Tekes



Source 5.5 and 5.6: Author's graph calculation based on Table 5.2 data

Share of public funding of Nokia's R&D activities has varied over time. We can see that Tekes funding was highest in two periods. First peak is in 1993 (in this year Tekes funding was higher than ever before, growing steadily during two preceding years). At the end of 1993 Nokia (together with Finnish economy) was recovering from crisis. Nokia research department was able to sustain its research activities thanks to increasing funding during crisis time. Tekes funding therefore helped Nokia to recover and catch up rapidly when the crisis was over.

Second peak of Tekes funding of Nokia can be seen in 1999 when the international growth and expansion of Nokia was one of the fastest. In this time Nokia undertook internal restructuralization in order to managerially and logistically accommodate transformation into global industry-leading company. Therefore, the need for outside financing has grown because major part of free cash was directed into restructuralization. Thus increased part of R&D budget was financed by Tekes. However, Table 5.6 doesn't confirm this observation as it does in case of first peak. It is because however Tekes funding of Nokia has increased in 1999, Nokia's own R&D expenditures has grown even

more significantly (see in table 5.3). That's why the percentage expression in table 5.6 doesn't reflect increase in Tekes R&D funding which can be seen in Table 5.5.

Therefore, we can conclude that public R&D funding has decreasing role in Nokia growth (see table 5.6). Despite the decreasing trend, it significantly helped Nokia to overcome two difficult times. First one was during economic crisis and second one in time of internal transformation of Nokia and its turn into global industry-leading company.

5.3.2 Availability of skilled labor force

As we have seen in previous section, growth of Nokia's R&D expenditures in second half of 90's was enormous (see table 5.3). The significant growth has created a big demand for skilled labor force, especially in fields of telecommunication engineers and ICT experts. But since Finland is rather small country (about 5 million habitants), sources of skilled labor forces has dried up very quickly as Nokia grew more and more rapidly. It created a shortage of technically skilled labor force in Finland.

In order to overcome the absence of labor force, Nokia tightened its cooperation with universities. Because of the lack of available R&D labor force, Nokia brought significant part of its basic research on university field. In addition to research activities, it served as an important recruitment form.¹¹¹ During 90's, especially the second half, Nokia started huge recruitment events across all technical universities in Finland and put an increasing pressure on opening new technical study domains in all Finnish universities. Also, as Nokia was becoming more and more successful, lot of students started to see its future in Nokia (and telecommunication companies in general) and demand for technical domains at universities have thus increased. Finnish universities reacted swiftly and opened many new technical domains. But since the average time from enroll to graduation of students

¹¹¹ Ali-Yrkkö (2002, p. 12)

in Finland is on average 5-7 years, the gap persisted anyway. Ali-Yrkkö (2002, p. 12) interviewed several R&D specialists from Nokia who commented existing situation:

Especially during these times after the mid-1990's we (at Nokia) had very frequent recruitment and then all one could get was students about to graduate, or even third or fourth year students, with whom we usually or almost every time ended up with thesis work here.

We do have 43 nationalities here (at Nokia Research Center) and quite many of them have come through university networks and university cooperation.

5.3.3 Finland – Test Laboratory for Nokia¹¹²

In chapter 3 we have seen that Finland has undertaken variety of steps in favor of telecommunication sector. Finland, together with other Nordic countries has established NMT standard for mobile phones network. It was first open standard for mobile phone communication in the world. Also, Finnish telecommunication market was never monopolized. In fact, a lot of independent local telecommunication providers have coexisted together since the beginning of telecommunication industry. Therefore, this industry has always been very competitive, from which the whole industry subsequently benefited.¹¹³

Thus, Finland (together with Sweden, Norway and Denmark), has become a “test laboratory for mobile phones industry” (Ali-Yrkkö 2002, p. 13-14). First open (NMT) mobile phones network in the world was launched in these countries. Finland also played a crucial role in financing and developing GSM standard, which become a successor of NMT standard and it is used until today. Radiolinja was a first company in the world which launched a GSM network.

¹¹² (Ali-Yrkkö 2002, p. 13-14)

¹¹³ Collective of authors (2005): The Finnish Mobile Cluster – Evolution that Led to a Revolution, Invest in Finland

We can summarize following factors:

- Very competitive telecommunication industry (due to many independent companies)
- Fully deregulated telecommunication industry (no major state company as in other countries)
- Finland - first country to launch NMT and later GSM mobile phone networks in the world
- Leading role in telecommunication R&D

These factors have created a good test field for Nokia and significantly accelerated and facilitated Nokia's growth and later its global success as a mobile phone market leading company.

As factors which were aimed primarily to support Nokia we have identified following:

- Tekes R&D funding and cooperation
- Swift reaction of Finnish universities to increased demand for technically educated graduates

5.4 Contribution of Nokia to Finnish Innovation System

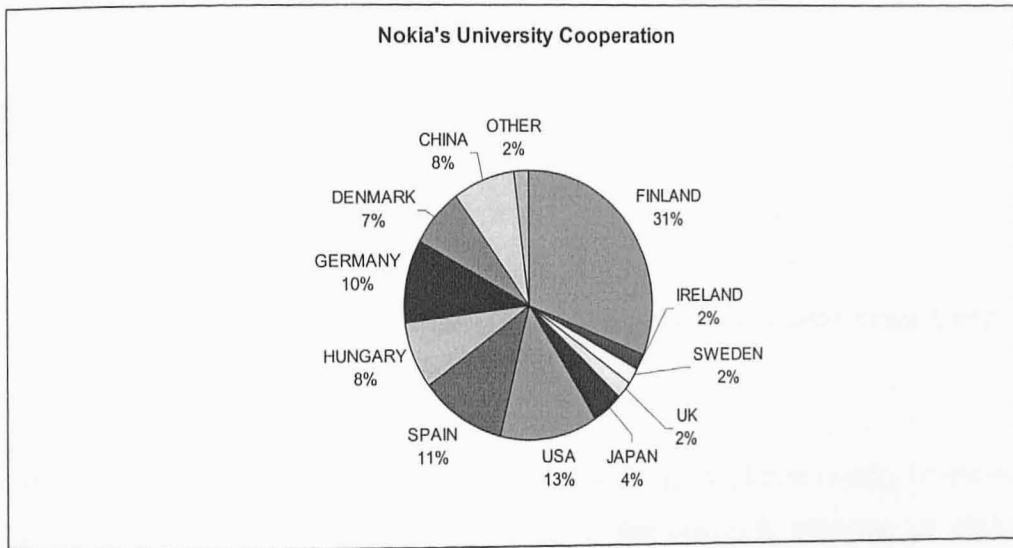
5.4.1 Cooperation with universities

"Nokia currently cooperates with more than 100 universities in 24 countries. In last year, activities have grown also in Africa or countries such as Romania, and Nokia has also established new networks with universities in Pakistan.

Nokia's goal with its university relations is to strengthen cooperation with Nokia and universities working together at the same premises. Nokia continuously focus on evaluating the benefits of such collaborative projects and then aligning its attention with the universities where its presence has had the most impact."¹¹⁴

Nokia cooperates mostly with universities in Finland (31 %), USA (13 %) and Spain (11 %) ¹¹⁵. Table 5.7 summarizes Nokia's university cooperation by geographic division.

Table 5.7: Nokia's University Cooperation



Source: Juha Ylä-Jääski (2002), updated by author

We can see that 73 % of Nokia's R&D cooperation with universities is conducted together with universities from European Union. Therefore, almost ¾ of Nokia's R&D output from interaction with universities has its origin in Europe.

Nokia cooperates mainly with technical and mathematical (or natural sciences in general) faculties. The cooperation is usually bilateral, meaning directly beneficial for both sides. Know-how is diffused from universities to Nokia and vice-versa. The usual model of

¹¹⁴ <http://www.nokia.com/A4359288>

¹¹⁵ Juha Ylä-Jääski (2002): Nokia's Cooperation with Universities, Research, Technology Management

cooperation (which is used in Finland) assumes Nokia to provide funds, objective of research and basic expertise and know-how. Universities put in place its human capital to develop existing know-how and reach the objective. In other words students in various degrees, usually in masters or doctoral studies (where part of the project represents their doctoral research) and tutors (professor in charge of leading particular project) as well as labs and research capacities. If objective of research is reached (or some alternative objective of research which has proved itself as useful and therefore able of commercialization), it is passed to Nokia's ownership. University which co developed new innovation doesn't possess any commercial and intellectual property rights to existing innovation (cannot raise patent claim, sell innovation or part of it or pass innovation on other institutions).

But in case innovation is not yet able of commercialization, university does possess rights to exploit innovation in further research and university activities if an agreement to switch project to open innovation standard is granted by Nokia (what usually is). University can use developed expertise (material or intellectual) in other research or pass new innovation on other institutions or companies.

Part of Nokia's strategy is also to directly hire students involved in university co research (with Nokia) when they graduate. Thanks to this approach expertise of student (developed because of university co research funded by Nokia) passes directly to Nokia. Therefore, students in whose development Nokia invested don't leave for other companies, but most of them end as Nokia's employees. In Finland, most of research runs with Universities of Technology in Helsinki and Tampere, and with the University of Oulu. See more detailed list of most important cooperation universities in Table 5.8.

Table 5.8: Selected Nokia's cooperation universities divided by country of origin

Finland

Helsinki University of Technology

Tampere Univ. of Technology

The United Kingdom

Imperial College

The University of Strathclyde

University of Oulu

University of Surrey

Denmark

Technical University of Denmark

Aalborg University

Germany

University of Dortmund

Aachen University

Sweden

Linköping University

The Royal Institute of Technology

Japan

University of Tokyo

Tokyo Institute of Technology

The United States

Massachusetts Institute of Technology

University of California, Berkeley

Texas A&M University

Stanford University

China

Beijing Univ. of Posts and Telec.

Tsinghua University

Thailand

Asian Institute of Technology

Hungary

Budapest Univ. of Techn. and Econ.

Source: Ali-Yrkkö (2002, p. 29)

As seen in Table 5.7, outside Europe Nokia cooperates mostly with US universities (13%). The most important partner is MIT (Massachusetts Institute of Technology). Cooperation is similar to model employed in Finland, with exception for commercial rights of developed innovation. In general, US universities do claim commercial and intellectual ownership rights (or co-ownership) of research results done on their ground and using their capacities. As results, Nokia's research activities with MIT (and other US universities) always assume split of intellectual property rights (co-ownership) to research output.

Thanks to this bilateral cooperation approach, universities wherewith Nokia cooperates are able to stay at the top of technological development in given field. This is important

for their attractiveness and prestige. Universities publish dissertations, academic publications and can economize research results which are not directly commercialized by Nokia by further development or by passing them on other companies.

5.4.2 Nokia's cooperation with companies

Cooperation with private companies doesn't represent only production activities, but also R&D projects. Let's consider both R&D and production cooperation. Nokia directly employs 58 874¹¹⁶ (data for 2005) persons worldwide, out of which 38 652 in Finland. It is estimated that roughly 20 000 persons (Ali-Yrkkö 2002 p. 15) is employed by Nokia's first-tier suppliers network who works with products delivered to Nokia. Assuming Finnish workforce counts 2 614 thousands persons¹¹⁷, then Nokia's share on Finnish employments is over 2.2 %. It is considered that Nokia's multiplier effects on employment are manifold and cannot be readily quantified.¹¹⁸

Cooperation of Nokia with universities which was described in previous chapter usually involves also private companies. Nokia together with its partner universities, research institutions and companies forms clusters and works in developing, testing and diffusing of new innovations. Therefore, know-how developed during the innovation process flows from one party to other and creates positive externalities from R&D, specifically consumer surplus effect¹¹⁹ and R&D effect¹²⁰ (refer to Romer (2006): *Advanced Macroeconomics*, p. 118-119, 3rd Edition). IMD¹²¹ institution regularly evaluates competitiveness of countries¹²² and main factors contributing to competitiveness. Two of

¹¹⁶ Source: Nokia's Annual Report 2005, p. 5

¹¹⁷ Source: Statistics Finland: http://www.stat.fi/ajk/tiedotteet/v2007/tiedote_010_2007-03-20_en.html

¹¹⁸ Source: Collective of Authors: *Nokia: A Big Company in a Small Country* (2000, p. 27)

¹¹⁹ Firms licensing or co developing ideas from innovator obtain some surplus, since innovators cannot engage in perfect price discrimination, thus it is a positive externality from R&D.

¹²⁰ Innovators are generally assumed not to control the use of their knowledge in the production of additional knowledge. Innovators are assumed to earn returns on the use of their knowledge in goods production, but not in knowledge production. Thus the development of new knowledge has a positive externality on others engaged in R&D.

¹²¹ www.imd.org

¹²² IMD World Competitiveness Yearbooks

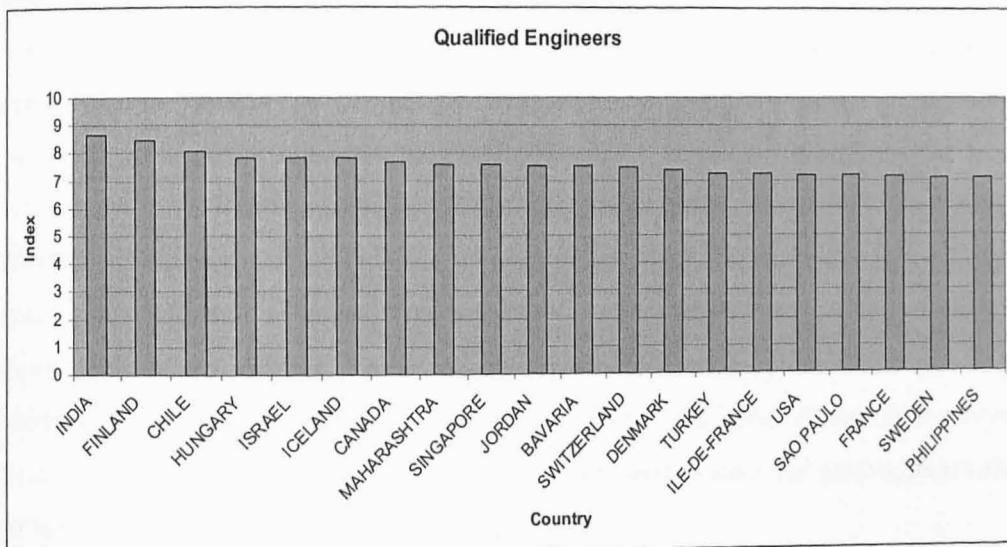
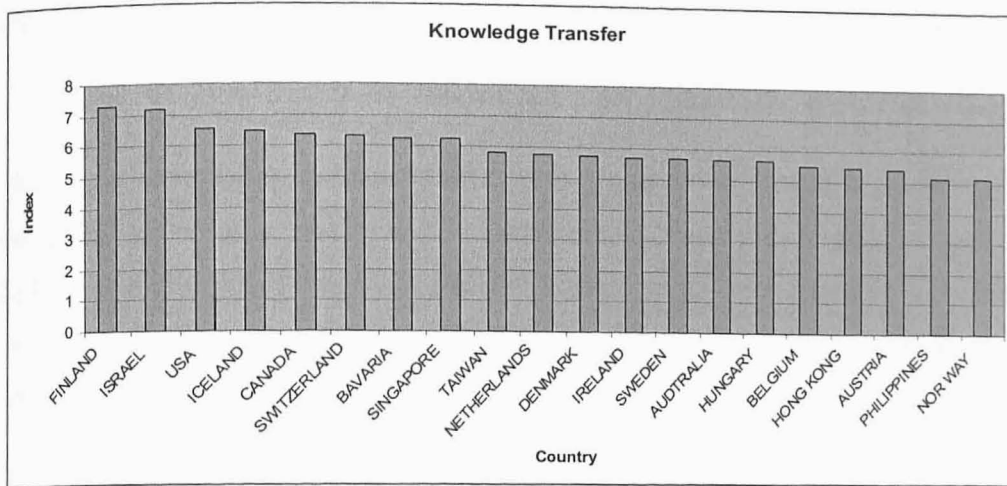
these factors are knowledge transfer¹²³ and availability of qualified engineers. According to the report 2005 by IMD, companies in Finland have very good access to qualified engineers and Finland's system of knowledge transfer between universities and companies is the most highly developed in the world.¹²⁴ (see Table 5.9)

Table 5.9: Knowledge Transfer and Qualified Engineers

Knowledge Transfer		Qualified Engineers	
1	FINLAND	7,31	INDIA 8,64
2	ISRAEL	7,19	FINLAND 8,46
3	USA	6,55	CHILE 8,06
4	ICELAND	6,47	HUNGARY 7,82
5	CANADA	6,38	ISRAEL 7,82
6	SWITZERLAND	6,33	ICELAND 7,8
7	BAVARIA	6,25	CANADA 7,69
8	SINGAPORE	6,24	MAHARASHTRA 7,58
9	TAIWAN	5,83	SINGAPORE 7,56
10	NETHERLANDS	5,76	JORDAN 7,53
11	DENMARK	5,75	BAVARIA 7,52
12	IRELAND	5,7	SWITZERLAND 7,48
13	SWEDEN	5,68	DENMARK 7,37
14	AUSTRALIA	5,64	TURKEY 7,22
15	HUNGARY	5,64	ILE-DE-FRANCE 7,21
16	BELGIUM	5,51	USA 7,2
17	HONG KONG	5,45	SAO PAULO 7,18
18	AUSTRIA	5,43	FRANCE 7,11
19	PHILIPPINES	5,15	SWEDEN 7,08
20	NORWAY	5,14	PHILIPPINES 7,07

¹²³ Definition of knowledge transfer: Within a modern, knowledge driven economy, knowledge transfer is about transferring good ideas, research results and skills between universities, other research organizations, business and the wider community to enable innovative new products and services to be developed. Source: www.ost.gov.uk

¹²⁴ See more in Collective of authors (2005): The Finnish Mobile Cluster – Evolution that Led to a Revolution, Invest in Finland, p. 7



Source: IMD World Competitiveness Yearbook 2005, author's graph calculations

Cooperation of Nokia with private companies has changed significantly during its history. History of Nokia's cooperation with private sector as will be described here serves as a typical example of successful cooperation which evolved over time. Ali-Yrkkö 2001, p. 74 identifies four steps in development of cooperation with private companies. These steps don't exclude each other, in reality they inosculate with each other, for our analysis they serve as reference points.

Cooperation between Nokia and private companies evolved from pure subcontracting in manufacturing (phase 1), partnership in manufacturing (phase 2), R&D subcontracting (phase 3) to R&D partnership nowadays (phase 4).

Phase 1 (subcontracting in manufacturing) was typical for 80's. Nokia's subcontracted companies served as a "stabilization" of manufacturing capacity, especially in times of higher demand which Nokia was unable to cover in its own capacities. They also balanced variation in production caused by business cycle. In 80's, most of these companies were based in Finland.

Beginning of 90's meant two new realities for Nokia. At first, mobile phones sector started its global boost which was caught by Nokia. This meant a significant increase in mobile phone equipment production and therefore sudden increase in producing capacities. At second, subcontracting and outsourcing of production has become to be seen as an alternative for in-house production rather than just mean to stabilize variation of manufacturing capacity. More and more companies started to outsource its production rather than perform it in-house. This trend was further supported by political changes in Eastern and central Europe, China and India where new market possibilities were seen. Nokia searched and established long-term partnership in production (Phase 2). It evolved from outsourcing of basic parts and additional equipment to more and more sophisticated parts with focus on long-term and stabile partnership.

Global mobile phone sector has grown significantly during 90's. Nokia's world sales were growing. Competition was becoming more and more tight. This put new requirements on production side of Nokia's business. Life-cycle of mobile phone products was shortening as many new products were put in market in shorter periods in order to gain an edge over competition. Moreover, there was an acute need to distinguish product life-cycles from production-equipment life-cycles.¹²⁵ Therefore, Nokia started to focus more on reorganization of its production chain. Nokia extended its cooperation to more and more supply partners in order to assure match of product life-cycles and

¹²⁵ Ali-Yrkkö 2001, p. 75

production-equipment life-cycles. Also, increased number of production has been outsourced to specialized assembler centers which serve more customers using the latest technology production lines and whose answer to changing demand is the swiftest.

Long term production partnership allowed many companies in Finland and in the world to develop their technology and mainly trust between Nokia and its partners. Trust between key supplier and partners come from proven and successful long-term based cooperation (continuing of phase 2). An important aspect of trust is confidence in exchanging confidential information between Nokia and partners. Confidence that no information leakage will occur and that agreed objective of cooperation will be put into practice on time.

Companies which satisfied these conditions have become key partners for Nokia. The growth rates of these companies have been very rapid. Ali-Yrkkö 2001, p. 76 shows that regarding net sales 75 % of these companies have grown faster than 20 % per year. This reality has very important multiplication effect. With growth of these companies, network of their suppliers is supposed to growth also creating a wide network of additional suppliers. Also, in order to become key suppliers for Nokia, company has to be big enough. Therefore, pressure is made for key suppliers to consolidate its own network of suppliers on their own. This is directly beneficial to Nokia because managing wide network of suppliers is time consuming and logistically demanding. Therefore, key suppliers of Nokia are directly motivated to consolidate its own network of suppliers in order to stay key supplier of Nokia. Therefore, widening of Nokia's network suppliers has a positive effect on Finnish economy.

This model of cooperation raises a question about dependency of these companies on Nokia and telecommunication sector. In other words how much can decrease in one affect the others? However, as cooperation is further widening and companies are more interconnected, the risk of default is decreased as dependence on Nokia as an only customer is no longer valid. Therefore, we can conclude that Nokia has served as an incubator for many Finnish and world companies which technologically stay at the top

and which evolved into strong and successful companies able to survive also without Nokia.¹²⁶

Nokia further deepened its cooperation with its key suppliers. When the trust between Nokia and supplier was established, Nokia engaged these companies to R&D process. To start with, some basic R&D projects have been outsourced (Phase 3) to key suppliers or other minor companies with which Nokia had a long-term successful cooperation record. Before, innovations which were developed in Nokia's R&D capacities or together with universities were later manufactured as a product in in-house production capacities of Nokia or outsourced in manufacturing capacity of other company. Later, R&D departments of these companies were outsourced to develop new products which were later marketed as Nokia products. Therefore, R&D aspect in cooperation with private companies was introduced.

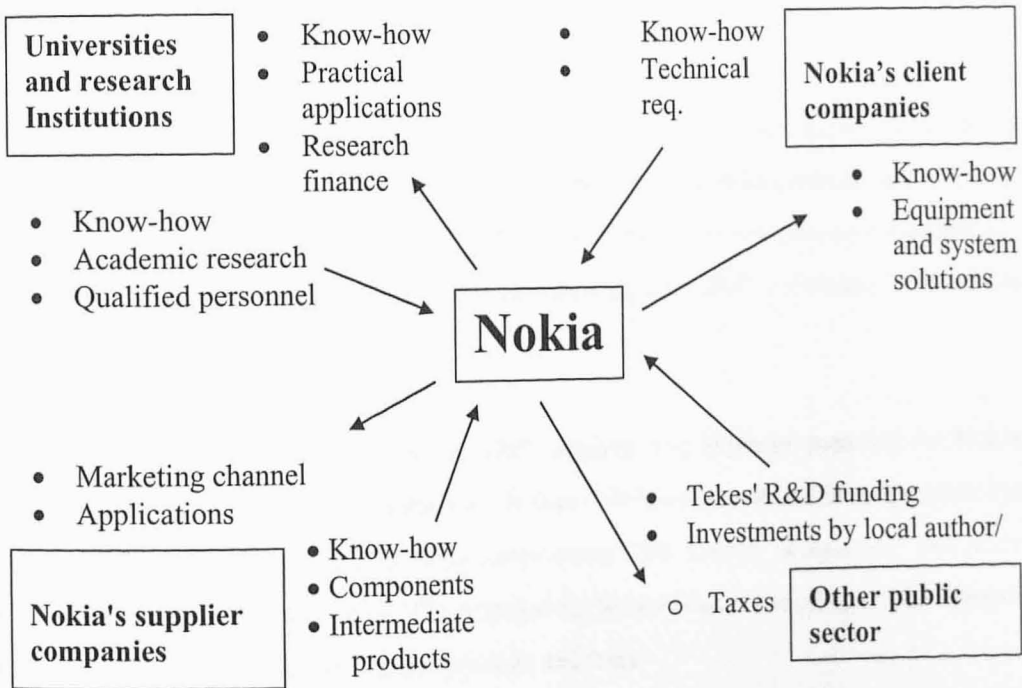
Now, the cooperation between Nokia and its suppliers was extended also to R&D co-projects, where Nokia not just outsource some R&D projects, but directly involves in co-development. Usually, as a third party in this process serve universities or research institutions. Thus, Nokia develops new products together with its suppliers, partner companies, research institutions and universities. Therefore, current situation can be described as Phase 4 – R&D partnership. The three-side cooperation (also called cluster) was further strengthened by government policy implemented via Tekes agency. This policy imposes on every company which demand public R&D funding fulfillment of one necessary condition. In order to receive R&D funding from state, private company must engage in R&D process for which it asks public funding a university. Therefore, R&D project of private company in which no university is involved cannot receive a public funding from Tekes. This condition meant other significant motivation for Nokia to engage universities into its R&D activities (see more in Ali-Yrkkö 2002 p. 18).

¹²⁶ Nokia cooperates with hundreds of companies worldwide, thus any empirical evidence is rather problematic and that's why it is omitted in this work.

5.5 Summary

Nokia's impact on Finnish economy is significant. Estimates for year 2006 says that Nokia accounts for 3 % of Finnish GDP and Nokia's share on Finnish total exports counts for 17,5 %. If we consider R&D expenditures as a share of GDP, total 3,4 % of GDP is represented by R&D expenditures¹²⁷. Out of these 3,4 % total 0,9 % is Nokia's contribution. Nokia, even when considered more broadly, has a significant position in the Finnish information and communication cluster's innovation system. Nokia operates in the cluster as both a user and a producer of innovation resources. Table 5.10 depicts Nokia's position and relations in the national innovation system.

Table 5.10: Nokia in the Finnish Innovation System¹²⁸



¹²⁷ Source: http://www.research.fi/en/input/R_D_expenditure/R_D_expenditure_table

¹²⁸ Source: Ali-Yrkkö 2002, p. 27

‘Regarding the innovation system, parties central to Nokia are universities, research institutions, other public sector organizations, and Nokia’s suppliers and client companies. The key factors in the innovation system are the transfer of know-how, learning, and the quest for innovation. If the system functions well, the interaction of these factors reflects on the economy in the form of employment, exports, business profits and public sector tax income’¹²⁹.

Public funding of R&D (Tekes) played an important (although decreasing) role in Nokia’s success. We have demonstrated that it supported continuity of Nokia’s R&D projects during two difficult moments in Nokia’s history: crisis in the beginning of 90’s and during Nokia’s inner restructuralization into company able to operate effectively on global level. We have also seen that Nokia received standard public R&D support available to all companies and didn’t receive any special support which one might expect when considering importance of Nokia in Finnish economy.

Nokia’s role in Finnish innovation system is carried through (in addition to financial flows) education, other companies R&D activities, diffusion of know-how and learning. Cooperation includes private companies (R&D activities and producer-user cooperation (open innovation)), universities and research institutions (R&D activities) both within Finland and outside the country.

Universities have performed numerous R&D projects with essential meaning for Nokia and which meant world top technology in its time. We have seen that this cooperation has functioned very well in Finland (also cooperation with private companies) and were directly beneficial for both sides. The prerequisite for successful cooperation are sense of mutual benefit, long-term proven cooperation and trust.

‘Know-how and competence has transferred between companies and universities, which has enabled learning for both parties. Latest theoretical knowledge has been passed onto Nokia and other companies through universities. The business sector has been able to

¹²⁹ Source: Ali-Yrkkö 2002, p. 27

provide practical applications, where theoretical knowledge and basic research have been utilized in business.¹³⁰

Nokia has put an increasing demand for graduates from technical fields and natural science faculties in Finland. Many new mainly technical faculties were opened in Finland because of an increased demand both from Nokia and other companies and because of new students seeing ICT and technical fields newly as an attractive ones (thanks to Nokia and successful telecommunication sector). Nokia also supported and recruited major part of those graduates later, especially into its R&D units.

Nokia has brought up a wide network of its suppliers and partners. Its cooperation started from pure subcontracting of production in 80's to real R&D partnership nowadays. Nokia benefits directly by balancing its product and production life-cycles of its products, acquiring components of latest technology and possibility to focus on key activities when part of production and R&D is provided by its partners. Nokia offered to its partner companies know-how and expertise and served as an incubator for many of them. Also, Nokia served as an international and domestic marketing channel what helped them to diversify its client portfolio that Nokia wasn't the only client. Thus their ability to sustain variation in Nokia's sales or hypothetical telecommunication sector overall decline was further reinforced by decreasing its dependence on Nokia.

Nokia chooses its partners from private sector and universities based on their capacity to stay ahead in development and to be on the top in their fields. Currently Nokia cooperates with hundreds of private companies and more than 100 universities all around the world what provides a lot of possibilities to choose from. It is also evident that Nokia's production and R&D partnership will rather grow outside Finland in the future because domestic growth possibilities are exploited to advanced level and possibilities to growth are more easily available outside Finland.

¹³⁰ Source: Ali-Yrkkö 2002, p. 29

6 Global Success of Nokia

6.1 Introduction

This chapter builds upon findings summarized in previous chapters and tries to answer following questions: how innovation policy helped Nokia to become a market leader in mobile phones industry? What is behind global success of Nokia in the field of mobile phones? How company coming from relatively small country succeeded in emerging into market leading firm in technologically intensive industry?

Many entrepreneurs and economists have brought numerous different theories. Is it rather because of suitable microeconomic environment, or good macroeconomic conditions? Or it's the secret code contained in favorable aspects of Scandinavian Model or rather in elaborate Finnish government policies and support? Or can the success be due to EU ascension of Finland or it is just pure success of only Nokia's strategy and innovation policy? Attentive reader must now feel that it was rather combination of all these.

6.2 Role of deregulation and EU

Telecommunication sector in Finland was never monopolized. In reality, hundreds of small telephony providers competed with each other in fully deregulated market, while in the rest of Europe¹³¹ telecommunication sectors were traditionally dominated by major state telecom company (Deutsche Telecom, British Telecom etc.). Deregulation lasted until the end of last century in the EU when the latest member allowed competition in its telecommunication sector.

¹³¹ Besides some other counties (such as Sweden) whose telecommunications sector were also fully deregulated from the beginning

Credit of deregulation of telecommunication sector in Europe belongs to EU policies. After numerous proposals and recommendations from the European Commission which started already in 80's the European Telecommunications Standards Institute (ETSI) have been established in order to pursue deregulation and free competition in telecommunication sector in EU.

Besides deregulation the biggest success of ETSI has been that it has carried through the establishment of unique and common 2G standard in mobile telephony – the GSM in 1992. The GSM which has become unique standard allowed creation of common and compatible mobile phone network in EU. We have seen that the predecessor of GSM, the 1G standard called NMT, was the first mobile phone network ever and was launched in Scandinavian countries as a first common mobile phone network in the world. Therefore, Nokia which has had significant and unique experience with delivering and developing infrastructure and mobile phones for NMT network since 1981 took advantage of new GSM standard very quickly. Then, the whole EU mobile phones market was open for Nokia, which had compared to its competitors significant know-how in mobile phone telephony.

Therefore, ETSI has brought and still brings favorable conditions for Nokia to expand in EU which was further reinforced when Finland joined the EU in 1995. It meant a clear head start for Nokia and catalyzed its early expansion.

ETSI still continue harmonizing EU policy of telecommunication sector, for example, in decision 128/1999/EC ETSI has set that new 3G (follower of 2G - GSM) standard becomes UMTS. However, these actions might contrary be seen as restraint of free competition from the EU since more different 3G standards are available. UMTS standard is preferred by Nokia and therefore favorable to Nokia, especially in case when non-European producers specialize in different 3G standards as UMTS is not world widely accepted (in example Motorola specialize in TDMA standard which is supported in its home country, USA). Thus, position of for instance Motorola on EU market when

UMTS is widely launched in EU can be endangered and possibly harmed by indirect action of EU.

6.3 Favorable market conditions in Finnish market

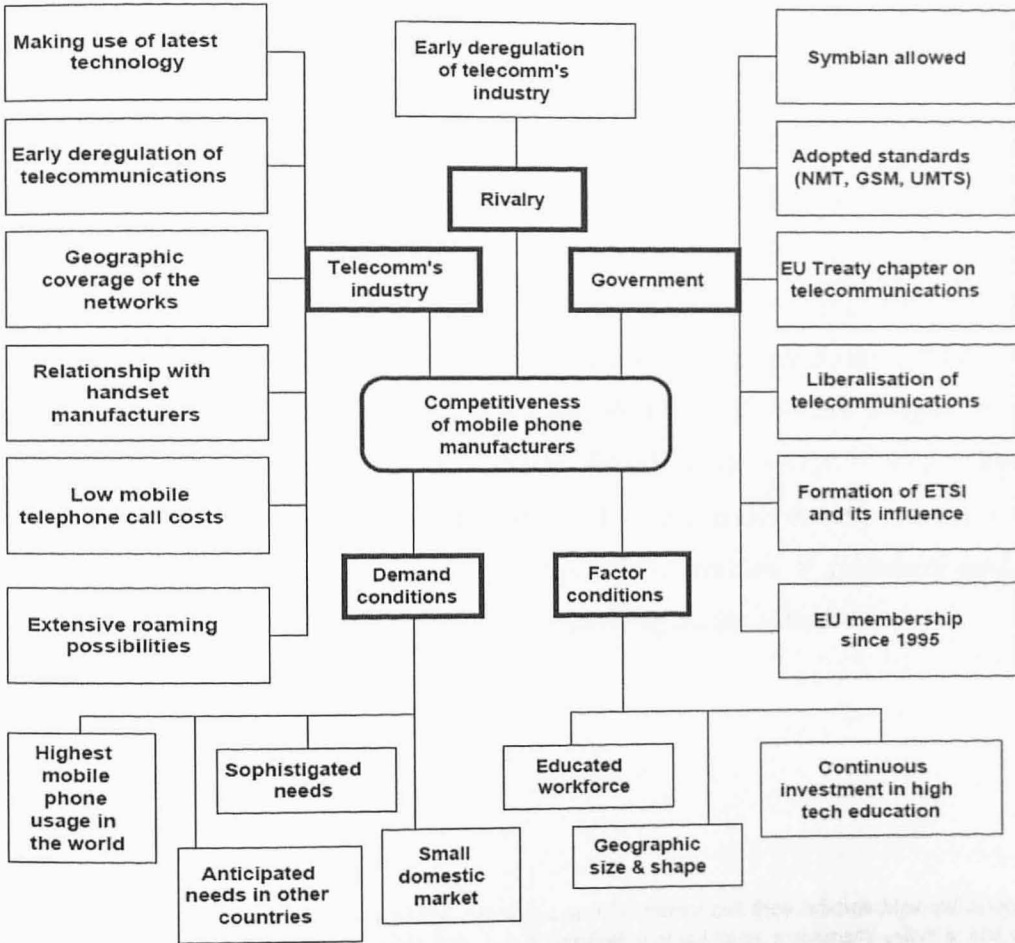
Because of the early deregulation of Finnish telecommunications sector and a lot of independent competing companies, related industries in Finland have been in international comparison competitive from the very beginning. Also, for the same reason Finnish customers in telecommunication market have been quite sophisticated and demanding. Therefore, Nokia had to be very competitive when supplying products to its home market (and subsequently to Scandinavian NMT network users). Thus, when GSM were introduced in EU, Nokia was not only technologically advanced company, but also competitively operating firm what facilitated its fast expansion to EU market which were considered as less sophisticated compared to Finnish market. Therefore, when GSM was introduced, EU customers have increased demand for Nokia mobile phones as they were the most sophisticated and technologically advanced.

The quality of the microeconomic business environment in Finland has allowed Nokia to establish competitive advantage over its rivals and thus facilitated achieving global success later. The Finnish government together with EU regulators has been able to establish a stable and predictable economic, political and legal environment for Nokia and related industries. The Finnish business environments combined with the EU legal policies has facilitated emergence of competitive advantage in telecommunication sector and as a result Nokia succeeded globally.

6.4 Determinants of Nokia's success

Finnish government together with EU regulators has helped to create the competitive advantages in Finnish market which Nokia was thanks to its sophistication (management, operational, strategy) able to translate into global market leadership in mobile phones industry. Table 6.1 summarizes the determinants of Nokia's success in the view of Diamond Model.

Table 6.1 Determinants of Nokia's success (in the view of Diamond Model)



Source: von Hellens, P. (1999, p. 47)¹³²

¹³² von Hellens, P. (1999) "Connecting People" and "Make Yourself Heard", A dissertation for the Master of European Business and Law, Lund University, Sweden

6.5 Nokia's policies driving its success

The mobile phone market is constantly changing. Such a development is supported by innovations that understand customer demand. Company whose products best answer and in shortest time meet the changing consumers' demand is a market driven company. Nokia is a typical example of such market driven company which strongly focus on innovation.

There is no need to innovate if the resulting products are commercially insignificant. Whether the new breakthrough, idea or just novelty will become innovation depends strongly on business model¹³³ of a company. Thus, value of an innovation depends on the business model.

Business model of Nokia is very valuable and represent to some extent substantial part of Nokia's global success. Nokia in order to meet swiftly consumers' changing demand brought in some strategies which allow it to commercialize many of its new inventions. Nokia brings products on market when there is demand for them, not products they have technology for. Thus, at Nokia new technology development follows a signal from market that such a product would be desirable. Time from the scratch of idea to final product must be very short¹³⁴. This strategy and business model directly requires and relies on fast innovation system and put competitors to position of permanent catch-uppers which in order to succeed must rely on identifying market niches.

¹³³ A business model is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams.

¹³⁴ This strategy is characteristic more for product development products and related services of mobile phones. Of course strategic projects and new primary technology projects (such as new transfer standards etc.) run also in long-term.

Nokia fragmented its production portfolio in order to segment global market as much as possible and created many new markets¹³⁵. By high fragmentation of its product portfolio, Nokia increased satisfaction of customers. With new and innovative products Nokia dominates categories and become ubiquitous. Such an attitude helps to use its own brand to sell new products and help penetrate new markets. This meant a necessity to increase operational efficiency to assure that products will get to its customers when they are desired and in adequate quantity to meet the demand. It also put increased requirements to brand awareness and design.

In order to increase business expertise and improve internal response to signals coming from market, Nokia nowadays widely adopted an open innovation strategy. Open innovation work on give and take principle. Nokia release some new ideas and innovations¹³⁶ (on no IPR coverage) even before their commercialization to wide and free usage to customers, universities, suppliers, competitors, start-up developers, R&D institutions and others. These parties (if interested) further extend, modify, adapt existing product to its needs.

Many advantages and drawbacks of open innovation are visible at first sight. The biggest disadvantage is that originator of idea or innovation (Nokia) doesn't fully control commercialization of this new invention and therefore the possible cash stream from it. But this is not always the case. Open innovation brings in external ideas and uses external business models. Users and companies usually brings in market various extensions, additional products and services which further increase attractiveness and thus sales and profits of original innovation. Even more, release as open innovation an expected new product also means a valuable marketing.

Open innovation strategy of Nokia of last years brings in a greater effectiveness of R&D and sometimes allows commercializing ideas or innovations which were sitting in labs

¹³⁵ Nokia for instance through its sophisticated design and user-friendly attitude created teenagers' market of mobile phones.

¹³⁶ The most typical example is software products of Nokia; they are easily distributed in form of open source. But it can be also in form of hardware and mobile phones technology; these are distributed in form of detailed documents, including manual, specifications and photos.

for a long time. Also, it significantly increases chances to meet market demand and find new market possibilities. It is too soon to evaluate real impact of open innovation strategy in long term since it is rather new concept. But at Nokia, it becomes in more and more cases principal strategy for many products rather than a solution for innovations and ideas which appeared in dead-end.

Nokia's today industry dominance is rather behavioral, not structural. Nokia strongly relies on upstream innovation (open innovation, strategic partnerships and sophisticated supplier's network), strict market fragmentation, segmentation and brand awareness and continuously improves its strengths.

"As important as Nokia's historical strategies may be to illustrate its dogged persistence and innovation and bold first mover strategy, they explain little of Nokia's success. Nokia's 'secret code' cannot be found in its historical strategies but in its strategic history."

Jorma Ollila 2001, CEO of Nokia

7 Conclusions

Nokia is a global giant coming from small open economy. It counts for 3 % of Finnish GDP and even 17, 5 % of Finnish total exports (estimates 2006¹³⁷). It has led many experts to ask whether Finland has become a one sector, or even one company country within the single European market. Hence, even that Nokia is a dominant player of Finnish ICT cluster, it is not the only one.

There is no sense in pretending that Nokia's current global market leader position can be easily explained and factors which enabled this development simply identified. There is still too much chance behind, serendipity and other aspects which economical and social science cannot yet describe.

This paper tempted to put Nokia's fabulous development and success into background of globalization, competitiveness, innovation, EU integration and national policies and identify and describe links among these factors which shaped an environment in which Nokia did succeed in excellent manner.

All through the paper analysis tries to underline role of innovation in this process and to offer pieces of knowledge and formulas to better understand importance and power of innovation in current economical world. Besides others it tries to provide insight in various forms of Nokia's innovation policies and shows how they evolved over time.

Nokia succeeded to transform itself in short time from nearly bankrupt and highly diversified conglomerate into modern technology-intensive, focused market and innovation driven global market leader company. We have argued that Finnish government together with EU regulators enabled creation of unique conditions in Finnish market which Nokia was thanks to its sophistication (management, operational, strategy) able to translate into global market leadership in mobile phones industry. Even more, this

¹³⁷ See more in page 66

position is if no unpredictable development in mobile phones market occurs rather strong and firm.

Paper showed that among major factors contributing to Nokia's success was:

- Early liberalization of the telecommunications market
- Intense competition in Finnish telecommunication market
- Demanding and advanced customers
- Introduction of the Nordic Mobile Telephone (NMT) which created single integrated mobile phones system
- Industrial and technological policies of Finland
- EU regulations of telecommunication sector

These created favorable conditions in Finnish market which Nokia was able thanks to strong focus on upstream innovation (open innovation, strategic partnerships and sophisticated supplier's network), strict market fragmentation, segmentation and brand awareness transform into global market leading position which has high probability to be sustain in following years.

But has Nokia had only a positive impact on Finland and telecommunication cluster? Are there any possible shortcomings? Some are sometimes troubling about impact of a single sector boom in the economy. Is the booming industry crowding out other potential growth industries by attracting too many resources? It seems not the case since telecommunication industry is rather knowledge-driven. We have demonstrated that boom of telecommunication sector and Nokia's rapid growth induced growth in other sectors through technological spillovers and other positive externalities. The increasing rather than the decreasing returns prevail. Even threat of negative effects of dependency on a single industry is not relevant. Paper showed that Nokia's impact in cluster helped to raise network of flexible and adaptable ICT companies able to switch its focus on other industries if necessary.

In less than decade Nokia has become a market leading global company with a distinguish innovation policy strategies. It has operation in more than 170 countries, cooperates with more than 100 universities all over the world and about 500 companies within the supplier and partner network is directly related to Nokia. The current challenges for Nokia are 3G network and related services. It is a continuous effort to integrate more and more information, services, media and technologies into mobile phones of third and maybe following generation what creates completely new possibilities. Examination of this area would be an interesting topic for another research.

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