

**JYVÄSKYLÄ UNIVERSITY SCHOOL OF BUSINESS AND ECONOMICS**

**STRATEGIC TECHNOLOGY MANAGEMENT OF  
NOKIA CORPORATION 2003-2013:  
FAULTY CHOICES AND THE COLLAPSE OF  
THE HANDSET BUSINESS**

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**Master's thesis**

**International Business and Entrepreneurship**

**February 2015**

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## ABSTRACT

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<b>Subject</b>	<b>Type of work:</b>
Entrepreneurship	Master's Thesis
<b>Time (Month/Year)</b>	<b>Number of pages</b>
02/2015	73+6
<b>Abstract</b>	
<p>This extended case study aims to analyze the strategic technology management of Nokia Corporation – how and why Nokia failed to ensure the position at the forefront of a disrupted mobile communications market between 2003 and 2013. For this research a total of 13 knowledgeable informants have been interviewed, representing industry experts, third-party developers, subcontractors and ex-Nokians with various functional backgrounds, ranging from software experts to business management and research. The analysis suggests that the technological, organizational and industrial factors are interconnected and causally linked to overall performance of Nokia Corporation.</p> <p>This study extends the path-dependency literature by providing an empirical example of a company whose crucial path-breaking technology choices were prevented because of established power-relations and dominating technology. It looks further to the theories of industry dynamics and market disruption, which in Nokia's case resulted with the establishment of the new dominant design as a result of convergence of mobile communications, Internet and digital services. This study provides empirical evidence to the radical industry transformation when both core activities and core assets became obsolete. One of the main managerial implications point to the significance of the core technology expertise in the top management layer for the successful technology strategy and technological transition.</p>	
<b>Keywords</b>	
Technology management, strategy, Nokia, mobile communications, Symbian	
<b>Location</b>	
Jyväskylä University School of Business and Economics	



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# 1 INTRODUCTION

In a joint Nokia and Microsoft press conference on September 3, 2013, Nokia's Chairman of the Board and interim CEO Risto Siilasmaa described the decision to sell all of Nokia's Devices & Services business as a rational but emotionally difficult choice. Nokia was losing its most precious line of business that once brought worldwide fame and success to Finland. The audience was confounded – though a similar decision was anticipated, it was still hard to comprehend what was happening.

Merely 5 years ago Nokia was getting very close to its ultimate goal – seizing 40% of the global handset market leaving its closest competitors far behind. How did this situation arise that from being a market dictator Nokia became laggard and eventually disappeared from the handset market it once created?

This extended case study aims to analyze the strategic technology management of Nokia Corporation – how and why Nokia failed to ensure the position at the forefront of a disrupted mobile communications market between 2003 and 2013.

The case is extremely complex; therefore the narrative is constructed through three different angles. The main argument in this research is that technology choices of the market leading companies are made as a sequence of several explicit and implicit variables. First, the resources and capabilities determine company's potential for production, innovations and learning. Second, technology choices as all strategic decisions are heavily influenced by market fluctuations, changes in competitive landscape, especially in technology intensive and rapidly evolving industries, such as mobile communications industry. And finally it is important to look at how organizational structures and management interact with the technology stack company owns and the environment it operates in.

Multi-theory approach used for this research draws upon examples of Danneels's (2010) extended case study on Smith Corona – formerly one of the World's leading manufacturer of typewriters, Jacobides's (2007) near-war study

between Greece and Turkey in 1996, Alison's (1971) paper on the Cuban missile crisis, Harvey's (2012) analysis of Al Gore's politics and the 2003 Iraq war, etc.

This work also extends previous studies on Nokia Corporation, for example business model transformation analysis between 1987 and 1995 by Aspara et al (2011), strategy-making during the industry downturn between 1997 and 2003 by Carral & Kajanto (2008), strategy and development of Nokia mobile phones by Leinbach & Brunn (2002), strategic agility and dynamics by Doz & Kosonen (2008) etc.



## 2 THEORY BACKGROUND

### 2.1 Strategic technology choice

When analyzing the strategic decision making it is important to understand the essence and the significance of a technology deployed. The key technology can be seen both as a resource and as a force of change in the whole industry. External and internal forces shape the ways the senior management deals with technological discontinuities and increased competition. Thus, the strategic decision making is a complex action that requires extraordinary managerial capabilities. For the technology-intensive companies the competitive advantage lies in company's innovative or superior products, processes and know-how as well as flexibility and fast decision making.

Technology can be described as a unique scientific principle based platform, on which firms produce particular devices and products to meet certain customer needs (Sood, Tellis, 2005). Therefore, technology choices have very significant and long lasting effect for overall performance and strategy of the company (Eggers, 2014).

Strategic technology choice answers to two fundamental questions: which technological solution will be the winning one (Kretschmer, 2008) and when is the right time for the technological solution to enter the market (Christensen et al, 1998). Both issues bring substantial challenges to the senior management of the firm: investing on the losing technology diminishes firm's ability to catch up with the competition once a new dominant design is established (Eggers, 2012).

Betting on the right technology is as important as the strategic entry timing or the window of opportunity. Companies entering the market before the establishment of a dominant design will be left with obsolete skills and competences once the design is established (Christensen et al, 1998), but on the

other hand, companies waiting too long to enter the market will have difficulties to accumulate the knowledge for technology creation (Eggers, 2014). Therefore the timing of the commitment to the winning technology is extremely important when dealing with technological discontinuities.

## 2.2 Theoretical framework

The multi-theory lens used for the theoretical argument of this research draws on several concepts regarding firm's inner capabilities and resources, industry variables and internal variables (see Table 1). The theoretical argument as well as analytical narrative is constructed accordingly. Strategic decision making, especially one that involves technology, is extremely complex and requires comprehensive analysis. Thus, such multi-theory approach was chosen to thoroughly analyze the events.

**TABLE 1** Theoretical framework and the main concepts used

Perspectives	Inner capabilities	Industry variables	Organizational variables
<b>Main concepts</b>	<p>Path dependence (Mahony, 2000)</p> <p>Dynamic capabilities (Teece et al, 1997)</p>	<p>Industry evolution (Anderson &amp; Tushman, 1990; Barnett &amp; Hansen 1996)</p> <p>Radical transformation (McGahan, 2004)</p> <p>Disruptive technologies (Christensen, 1997; Adner, 2002)</p>	<p>Matrix organization (Ford &amp; Randolph, 1992)</p> <p>Managerial cognitions (Tripsas &amp; Gavetti, 2000; Christensen et al, 1998)</p> <p>Organizational learning (Levitt &amp; March; 1988; Szulanski, 1996)</p>

First step of the analysis was to identify the inner capabilities and historical practices of the firm. Although company's technology stack and past performance is essential to justify the turn of events from a firm's perspective, it is not sufficient enough to explain why certain events happen or did not happen. One company cannot sustain the market leadership and dictate the market trends, especially in technology intensive markets, thus it is crucial to see the whole industry as an environment the firm operates in. Market transformation and industry evolution are strong variables determining the course of the company's strategy – whether the company evolves parallel with the industry or its core assets are drifting apart from industry's needs. Finally, the third pillar of organizational variables is used to explain how organizational structure and managerial competences affected the process of industry

transformation and resource alternation in response to changed competitive environment.

### **2.2.1 Path-dependence and the capabilities of the firm**

The selection of winning technologies and transition from old to new technologies is among the most popular topics in the strategic management literature. Scholars studying path-dependence theory argue that technology development is pre-determined on a firm's resources and capabilities and the success depends on internal technological, organizational and managerial processes (Teece et al, 1997) that company has mastered throughout the history. However, Tripsas & Gavetti (2000) argued that inertia and complementary assets can actually prevent or in some cases facilitate the transition between old and new technology.

Path-dependence approach explains business model transformation as a set of decisions in the past that are still relevant and influence the future decisions of the firm. For example, Valorinta et al (2011) analyzed path dependence with a focus on intraorganizational power relations and technological development. One of the key findings in this research was that power interests and technological systems create a self-reinforcing process and might prevent the path-breaking change that is necessary to create a new strategic approach. This situation might be extremely dangerous for established businesses if existing capabilities are insufficient to respond to rapid technological changes.

There are several approaches on how contingent historical events can affect the sequence and final outcome of events. For example, self-reinforcing process is a sequence of events when initial decisions induce further development in the same direction with a little possibility to stop or reverse it, whereas reactive sequence implies that each event in a sequence is both a response to precedent event and a cause of subsequent event (Mahoney, 2000). Though the relationships between different events might be different the underlying assumption remains that the change and progress is often determined by the decisions made and processes mastered in the past.

Taking the technology decisions into consideration, it is important to note that firm-specific conditions more often lead to new technology creation and adoption, or on the contrary - technology rejection. From a resource-based point of view it can be the long-time winning technology which is feared to be cannibalized by the new technology. This situation usually happens when new dominant design is introduced as a substitute to the existing technology (film cameras vs digital cameras, cassette players vs CD players, etc).

The technological knowledge is many times path-dependent and cumulates in a firm over time (Barney, 1991; Bettis, Hitt, 1995). Therefore theory on organizational inertia is also quite widely attributed as a firm-level obstacle for adopting a new technology. This approach stems from a path-dependant theory and argues that mature organizations suffer from resource rigidity and routine rigidity which prevents them from investing and changing the patterns

and practices that underlie those investments (Gilbert, 2005). In many cases organizational inertia is a self-reinforcing process and especially threatens the survival and adaptation of mature and well established firms.

However, fear of cannibalizing the existing market share is not the only reason for rejecting a new technology. Management literature stream on organizational learning theories argues that knowledge is created and learning accumulated over time and it is a unique asset (competitive advantage) of a company. Therefore the conclusion can be drawn that established firms suffer from inability to adopt the new skills that are necessary for embracing the new technology (Adner, 2002) due to the old prevailing technology and inability or unwillingness to transfer the knowledge and competences.

When a company is faced with changing environment the presence of strong dynamic capabilities allow smooth and successful transformation (Danneels, 2010). This in particular means the ability of a firm to respond to market changes with a rapid and flexible product innovation, which is led by management capabilities to coordinate and organize effective utilization of firm's internal and external resources (Teece et al, 1997).

Capabilities accumulated in a traditional technology many times prove to be incoherent with new technology development (Anand et al, 2010), therefore constant innovation can assure timely entry to a new market and accumulation of useful knowledge. Complementary assets, according to Teece et al. (1997) can help to achieve a smooth transition to new technology, however later on Eggers (2012) argued that complementary assets can only moderate but not overcome a process of new knowledge creation.

As discussed above, incumbent firms very often follow path-dependent set of practices and procedures which might also prevent them from bringing radical innovations to the market. Therefore, in most cases a new dominant design is introduced by a new entrant and not the established old market player (Danneels, 2010), because established organizations simply lack the organizational flexibility to incorporate the new technology. In times of a dramatic technological change strong and decisive leadership team is crucial for tactical and effective decision making (McGahan, 2004).

It is commonly agreed by scholars as well as management experts that the competitiveness in nowadays ICT market lies in controlling a competitive platform (Cusumano, 2010). Strong platform and attractive ecosystem to back it up allows a company to win the consumers and fast-forward the technology development. Platform itself is seen as a standard basis for technological development; however it is not only described as a technology development tool but more as a product of interrelations and interactions between the ecosystem partners (Kenney & Pon, 2011). The question remains, however, how firms are able to use these advantages and built knowledge when markets are disrupted and nature of the competition is fundamentally changed.

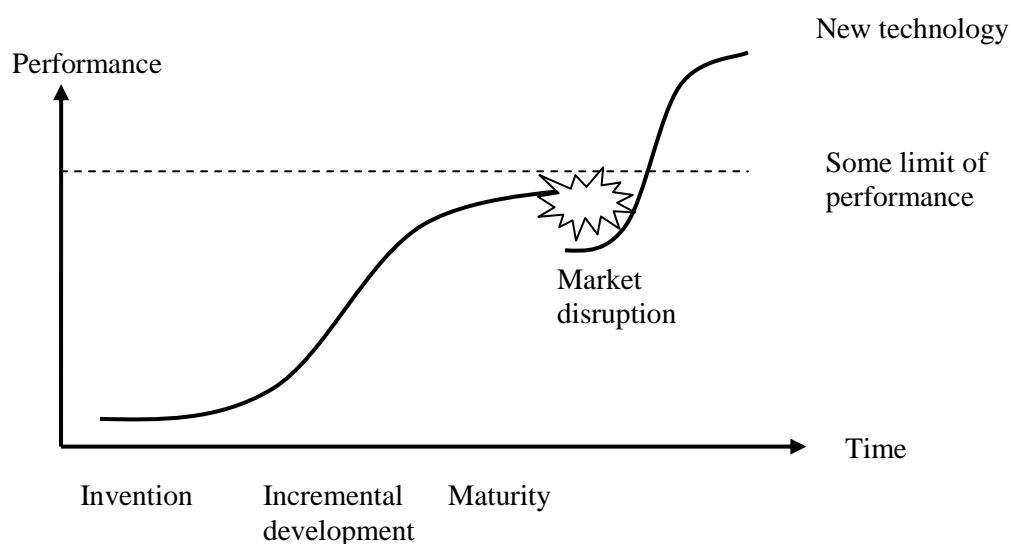
## 2.2.2 Industry evolution

Technological change has been commonly recognized as a major cause of industry changes (Christensen, 1997). Discussion on the technology evolution is usually distinguished between the two major concepts: gradual, incremental evolution and rapid, discontinuous change.

Such model was developed by e.g. McGaham (2004) in order to identify the nature of the industry change - whether it is threatening industry's core activities, core assets, both, or neither of those. Depending on the industry change trajectory companies must align their strategies, whether that means investing in incremental growth, business diversification or even abandonment of the existing business. Following the proposed rationale, the telecommunications industry has experienced radical transformation in 2000s when both the core activities and core assets became obsolete.

The radical change is the most dramatic and threatening change in the industry, when the existing established technology is challenged by a new alternative, usually referred as disruption or disruptive technology. Disruptive technologies are those that introduce a completely new technological solution, however target the same mainstream consumers and address the same consumer needs as the established technology. In their early phases, disruptive technologies are inferior to the established ones, however evolving at the faster pace than the mainstream technologies create the situation of market disruption as we know it (Christensen, 1997; Adner, 2002).

Dynamics of technology development usually follows an *S-curve* pattern (see Figure 1):



**FIGURE 1** A simple model of a market disruption and technological discontinuity

After launching a new technology, its performance is increased through incremental innovations. It is typical for a new technology to develop fast during the incremental development phase both technology-wise and also in gaining popularity and commercial success. As a product reaches maturity,

growth slows down and the saturation limit is reached, when some level of performance cannot be overcome because it is either impossible or not worthwhile to implement the changes. As it usually happens, slowdown of technology development creates a vacuum which is soon filled with a new radical innovation and hence the market disruption. It is important to note, that usually before a new dominant design is established it is inferior compared with the existing developed technology in terms of performance. However, the development of new design follows the same S curve and soon reaches and exceeds the set performance limits.

Industry evolution is not necessarily a linear process. Anderson & Tushman (1990) suggest that technological discontinuity creates a vacuum and uncertainty until the new dominant design is established. The incremental growth ends when the product maturity and performance levels are reached, creating yet another technological discontinuity. Due to this cyclical nature of technology development, companies are constantly challenged and therefore evoke organizational changes. Companies are forced to rethink their strategies as they become pioneers or threatened by substitute technologies, competitive environment changes dramatically; also they should decide whether to adopt the emerging standards (Anderson & Tushman, 1990), which is many times the most important decision – betting on the right emerging technology, especially in the early stages of development.

The emergence of disruptive technologies is evident and repetitive. However, the question prevails why the discontinuity appears and what are the conditions and critical factors for a radical change. Radical industry change can be determined by the supply-side factors, such as firm capabilities and the competitive environment. Breakthroughs on the supply side mean improved products or processes that improve, replace or compete with the existing technology. In this case firms are the driving force of the innovation to optimize the production, extend product portfolio etc.

The demand power in many cases is a stronger argument why firms innovate and especially why the major breakthroughs happen. Demand power shapes the window of opportunity and affects firm's willingness to innovate which in turn accelerates the competitive dynamics in a certain market (Adner, 2002). Demand-based perspective is a rather common approach in the mainstream strategic management literature to explain market disruptions and emergence of new dominant designs. Demand-driven competition is the driving force to innovate alternative technological solutions or processes (Anderson & Tushman, 1990). Therefore market disruptions are most of the time observed in mainstream consumer products – such as mobile phones, for example.

When faced with a market disruption companies must develop capabilities to both shape and respond to technological evolution (Anderson & Tushman, 1990). There are two winning solutions when markets are disrupted – to either be an initiator of the change, or delay the adoption of the emerging standard until the uncertainty period of new dominant design creation is

resolved (Kretschmer, 2008). In both cases company has to show great level of flexibility and dynamism, which is also reflected in its organizational structure and strategy.

Radical transformation is extremely dangerous for companies relying extensively on business ecosystem partners and alliances, because usually the underlying ties are broken and rivals can become allies in order to acquire new competences and ensure position within and across industries (McGahan, 2004). Extensive network and good relationship with business ecosystem partners is extremely important and gives a competitive advantage to the company pursuing a new technology (Kapoor & Lee, 2013) therefore it can also be addressed as a complementary asset. Building on that, the distinctive dynamic capabilities can be expanded by blending the internal company resources and external resources (Mathews, 2003) that can be acquired from the business ecosystem.

### **2.2.3 Organizational and the decision making environment**

Identifying the trajectory of an industry evolution is difficult and requires strong managerial cognitive abilities and decisive power. Once the industry's trajectory is identified, company's strategy must be aligned with it in order to survive in a changed business environment (McGahan, 2004).

Although the inertial development of capabilities most of the time is determined by path-dependence, Tripsas & Gavetti (2000) argued that in order to respond to radical technological changes the role of managerial cognitive abilities is crucial, especially in directing the organizational learning and capability development processes. Path-dependant strategic choices are connected through causality and sometimes they are dependent on the variables that decision makers have no or very little influence on (de Rond & Thietart, 2007). Inertial incremental path-determined changes are sufficient only when environmental conditions and organizational competences require little or no strategic change (Zajac et al, 2000), therefore the path-breaking choices are extremely difficult to, first of all, to commit to, and later on to plan and perform.

Some authors analyze managerial perceptions and competences as the main factors influencing the technology evolution and innovation within a company (Moenaert et al, 2010; Mitchell et al, 2011). Managerial involvement determines the development of the new capabilities, therefore the success lies in not only the inertial development, as might be claimed by path-dependence theory experts, but also managerial cognitions of development process and technological environmental changes (Tripsas, Gavetti, 2000). This means that technology development and learning are interconnected with decision-makers' abilities to foresee the situation and model the new strategic approach.

Earlier research on rigid disk drive industry by Christensen et al (1998) has also proved that firms' survival in the disk drive industry was based on managerial choices rather than environmental factors beyond the managers' influence zones. This assumption also relates to the window of opportunity concept which basically consists of the right time and the right circumstances

for certain action: it is that particular point of time when all – managerial cognitions, market situation and inner firm capabilities – merge and result in a successful strategic action.

Early theory on organizational learning argued that learning in the organization stems from routines and historical path of the company, thus is path-dependent (Levitt, March; 1988). It is important to note that organizational learning emphasizes the knowledge, routines and culture that prevail in a company despite the change of personnel. Organizations learn from their past experience as well as experiences of other organizations; the information stored is applied in the future events and shape the direction of the organization. Thus, the ability to transfer the best practices internally ensures sustainable competitive advantage (Szulanski, 1996) within a company.

For this reason, the choice of organizational structure is crucial to provide smooth communication channels between units and ensure thorough exchange of practices and knowledge. The organizational structure of a firm has a significant influence to the decision making, power distribution, dynamics and flexibility of the company etc. It is important to note the main features of a matrix organization because it will help in understanding the chain of command and general worth methods of Nokia organization.

When a technology is relatively simple and changing slowly, the traditional functional structures work well. However, as the mobile industry started to evolve rapidly, industries started to converge and technology involved not only the hardware production, as it was in the 90s, but also rapid development of software, services, ecosystems etc, and most importantly – integration of various features. Therefore, as the main technology of the company becomes so complex and highly interdependent between disciplines, technical expertise and innovations (Ford & Randolph, 1992), matrix structure can provide the flexibility, communication and innovation flow across the structures. Also, matrix structure eases the information flow and communication between the units and functional teams, as the levels of hierarchy lessen, so therefore advantages of such organizational structure are obvious.

The most common universal attributes of any matrix organization are the overlay of traditional hierarchy, multiple lines of authority and certain project teams working of specific tasks for finite time periods (Ford & Randolph, 1992). For example, employees might report to two or more reporting managers from different functional and operational structures (Cummings, 2004). The implementation of this organizational structure allows fast and flexible formation of various project teams from members of various backgrounds and specialties – and this in principle became the way to form product programmes in Nokia, thus increase of the knowledge diffusion and organizational learning.

Gathering people from various units might lead to team management and group dynamic challenges, as people have different backgrounds and work habits (Ford & Randolph, 1992), especially if we consider a diverse and multinational company, such as Nokia. Various issues may obstruct the



communication or create tensions – starting from different professional backgrounds to diverse cultural backgrounds.

## **2.3 Research question**

In a phenomenon driven research there is usually lack of sufficient and plausible existing theory as well as empirical evidence. Thus, a research question is usually broad and gives a researcher flexibility to investigate the topic comprehensively (Eisenhardt, Graebner; 2007). It is important to note that the purpose of this research is to develop a theory based on the empirical evidence from the Nokia case.

This thesis aims to answer the questions of how and why the strategic technology management of Nokia Corporation failed to ensure the position at the forefront in a disrupted mobile communications market. In order to understand this, a breakdown of three more focused research questions have emerged: what were the technological capabilities in Nokia's disposition, how has the industry evolved and how the competition affected Nokia's performance, and finally – what were the perceptions and decisions made by the senior management of the company.

In order to answer these complex questions a multi-theory case study research setting is used. Theory and analysis is built upon an empirical data collected via available public sources and validated during open in-depth interviews with Nokia insiders, industry experts and partners. The three pillar narrative aims to provide a comprehensive view of the situation and explain the complexity of the decision making.

### 3 RESEARCH CONTEXT

Nokia Corporation was chosen for this case study research as a unique and interesting example to illustrate decision making process and strategic technology choices of a market-leading corporation facing challenges and disruptions in a market it operates in. Historical facts and company description is built based on company's annual reports, press releases and other public sources. The focal period of this research is 2003-2013, and the narrative follows the chronological order of events.

Nokia Corporation was the world's leading mobile phone company and the market frontrunner for several decades. The origins of the company date back 150 years ago to rubber and wood industry, however the history of the modern Nokia company, as we know today, began in 1967 when Nokia Corporation was formed by merging three Finnish companies: Nokia AB (a wood-pulp mill founded in 1865), Finnish Rubber Works Ltd (a company producing rubber boots, tires and other rubber products founded in 1898) and Finnish Cable Works Ltd (a producer of telephone and power cables founded in 1912).

After the fusion, Nokia set its focus to telecommunication industry and manufacturing of electronic devices. In 1982 Nokia introduced the world's first car phone for the Nordic Mobile Telephone analog standard which marked the beginning of mobile communication era. That same year the first fully-digital local telephone exchange in Europe was created by Nokia's engineers.

Another major breakthrough in mobile communications industry was in July 1, 1991 when the GSM standard for second generation (2G) digital cellular networks was adopted as the European digital standard. Consequently, the first GSM call was made with a Nokia phone in 1991 in Finland, and in the same year Nokia was selected to provide GSM networks for other European countries.

With this major breakthrough in mobile communications industry Nokia saw the market potential, therefore the decision was made to focus entirely on

telecommunications business and become a market leader in every major segment. Mobile communications evolved rapidly throughout 1990s and 2000s and Nokia was able to capture that growth and maintain global market leader position up to the year 2008 (see Table 2).

**TABLE 2** Key data of Nokia Corporation and Mobile Phones business unit

<b>Nokia Corporation</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Net sales (in millions EUR)	29 533	29 371	34 191	41 121	51 058	50 710	40 984	42 446	38 659
Operating profit (in millions EUR)	4 960	4 326	4 639	5 488	7 985	4 966	1 197	2 070	-1 073
Operating profit %	16,8	14,7	13,6	13,3	15,6	9,8	2,9	4,9	
Basic earnings per share (eur)	0,74	0,69	0,83	1,06	1,85	1,07	0,24	0,5	-0,31
Employees	51 359	55 505	58 874	68 483	112 262	125 829	123 553	132 427	130 050
Global mobile device market share	38%	32%	33%	36%	38%	39%	34%	32%	26%
<b>Mobile phones business unit (Devices &amp; Services business unit since 2008)</b>									
Net sales (in millions EUR)	20 951	18 507	20 811	24 769	25 083	35 099	27 853	29 134	23 943
Operating profit (in millions EUR)	5 927	3 768	3 598	4 100	5 434	5 816	3 314	3 540	884
Operating profit %	28,3	20,4	17,3	16,6	21,7	16,6	11,9	12,2	3,7

The success of Nokia is heavily attributed to the success of the concurrent Symbian operating system. Roots of Symbian Ltd originate from Psion company found in 1980. In June 1998 Symbian Ltd was established as a private independent company and the operating system Symbian OS was introduced. At that time, owners of the company were Nokia, Ericsson, Motorola and Psion.<sup>1</sup> *Nokia 9210 Communicator* was the first Symbian OS phone released in 2000 and shortly after that the licensable platform S60 was made available.

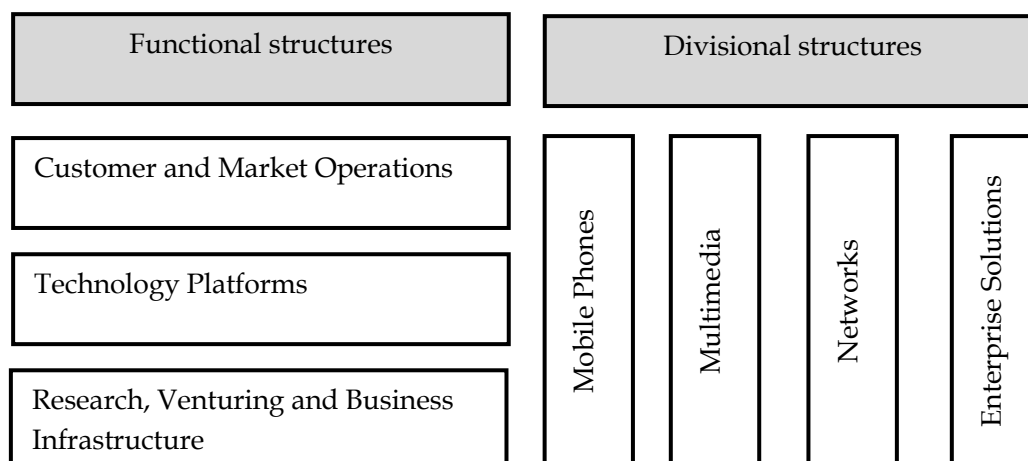
### 3.1 2003-2007

The period of 2003-2007 marks the great success and rapid growth of Nokia Corporation. Due to the major breakthrough in telecommunications industry Nokia saw an opportunity to become a market leader in major global markets and with the strong leadership team, guided by the CEO Jorma Ollila, was able to do so.

<sup>1</sup> [http://developer.nokia.com/community/wiki/Symbian\\_OS](http://developer.nokia.com/community/wiki/Symbian_OS) [Retrieved 2.2.2014]

The analysis period starts with the organizational reform effective from the beginning of 2004. The main reason for creating horizontal groups was to increase Nokia's operational efficiency and ensure strong economies of scale. Such new organizational structure proved to be effective in order to meet the needs of various customer segments - the strategy of extensive market segmentation that Nokia has implemented.

The company was now reorganized into four business units which were supported by three cross-divisional horizontal groups that support the business groups: Customer and Market Operations; Technology Platforms; and Research, Venturing and Business Infrastructure (see Figure 2). Each business unit had a clear strategy and targeted different market segments, whereas functional horizontal groups were "designed to increase Nokia's operational efficiency and competitiveness and to maintain our strong economies of scale" (Nokia Annual Report, 2003, p. 27). In other words, functional groups provided the support for all the projects run by different departments.



**FIGURE 2** Organizational structure of Nokia, effective 2004.01.01

The main strategic focus of the company during this period was to expand in mobile voice market and consumer multimedia business, such as imaging and games. Nokia has identified corporate markets and services to enterprises as another important segment.

Extensive segmentation has led to successful market penetration in all consumer segments. For example, in 2004 Nokia has introduced 36 different mobile device models (Nokia Corporation Annual report 2004, p. 31) and 49 new models in 2006 (Nokia Corporation Annual report 2006, p. 31), ranging from low-cost to high-end price range and wide variety of additional features. By the end of 2005 Nokia has identified 11 different product categories for different market segments. Market penetration showed remarkable numbers -

Nokia sold its billionth phone - Nokia 1100 - in Nigeria already in 2005<sup>2</sup>, in 2008 global market share reached 39% and currently Nokia has sold more than 130 billion of mobile devices.

As a technology intensive company, Nokia has invested extensively to Research and Development (in 2004 37% of Nokia's staff was working in R&D). Dozens of mobile devices released every year, fast changing consumer preferences for additional features and settings required intensive input and innovation. Therefore, annual R&D expenses accounted for 10-13% of the net sales during 2003-2006 (Nokia Corporation Annual report 2006, p. 76). Due to the convergence of various features and rapid evolution of mobile devices, already in 2005 a smartphone product category was identified in the strategy of Mobile Phone business unit of Nokia Corporation (Nokia Corporation Annual report 2005, p. 28).

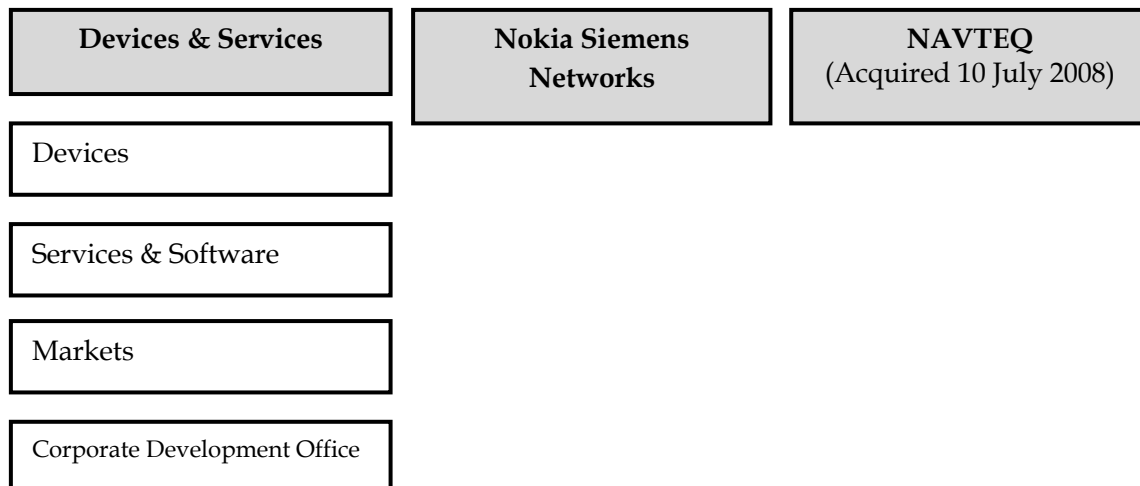
New concept meant that the new generation mobile device is able to run computer-like applications such as e-mail, web browsing and enterprise software, and can also have built-in features, such as music players, video recorders, mobile TV and other multimedia features. Nokia soon recognized that smartphone device and software platform development is the new path for mobile communications industry. As a result, in late 2004 Nokia introduced its first touch-screen Symbian OS powered smartphone Nokia 7710 that may be called an early prototype of today's smartphones (Nokia press release, 2 November, 2004), however due to several technological flaws was not made commercially available.

Company continued to swell and year 2006 marks the shift in the company's strategy. The management, guided by a new leader and CEO Olli-Pekka Kallasvuo, saw that the success of the company might be threatened by maturing mobile device market and therefore identified the need to diversify company's activities. New strategy included expansion to consumer Internet services and network solutions, as well as increase in professional and enterprise services besides the existing mobile device market strategies.

In 2007 Nokia's Networks business unit was separated from the rest of the business groups and combined with Siemens carrier-related operations to form a new business segment - Nokia Siemens Networks (Siemens AG press release 19, June, 2006). The rest of the business units together with horizontal functional groups were combined into an integrated business segment - Devices & Services (see Figure 3). Later on in 2008 acquisition of NAVTEQ Corporation created a wholly-owned subsidiary of Nokia - separate business segment which provided mapping and other location-based content and services (Nokia Annual Report, 2007).

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<sup>2</sup> <http://www.independent.co.uk/news/business/analysis-and-features/microsoft-buys-nokia-150year-history-of-finnish-company-with-humble-beginnings-8795907.html> [retrieved 31.1.2014]



**FIGURE 3** Organizational structure of Nokia, effective 2008.01.01

Nokia has well identified its strategic capabilities in order to build the competitive advantage. One of the main assets that company managed to create is the consumer engagement and brand recognition by being present in several consumer segments and investing rather extensively to sales and marketing. For example, sales and marketing expenditures in 2006 accounted for 8,1% of the net sales and due to this Nokia became 6<sup>th</sup> most valued brand in the world (Nokia Corporation Annual report, 2006). Technology and architecture was also the crucial factor for Nokia's success - most of the technology was invented and developed in-house, intellectual property accounted for 11000 protected patents and only 20% of the production was outsourced. Last but not least, extensive distribution channels and effective supply chain enabled Nokia to launch so many new devices every year and distribute them to more than 150 countries.

In 2006 Nokia also made efforts to engage its consumers by offering downloadable online content through Nokia Content Discoverer service, and Nokia Music Recommenders (which later on evolved to Nokia Music Store). These were some examples of Nokia's early attempts to build a functioning Symbian ecosystem.

During the period on 2003-2008 Nokia has made more than 15 acquisitions of various software companies in order to expand its in-house knowledge and ensure solid development of its Mobile devices and software platforms<sup>3</sup>. For example, in 2003 Nokia acquired Sega.com Inc in order to enhance online games and multiplayer technologies; 2008 marked the successful acquisition of NAVTEQ company - a leading provider of comprehensive digital map information, which led to successful development of Nokia maps, navigation and location based services, etc.

<sup>3</sup> <http://www.nokia.com/global/about-nokia/investors/acquisitions-and-divestments/acquisitions-and-divestments/> [retrieved 29.1.2014]

### 3.2 2008-2011

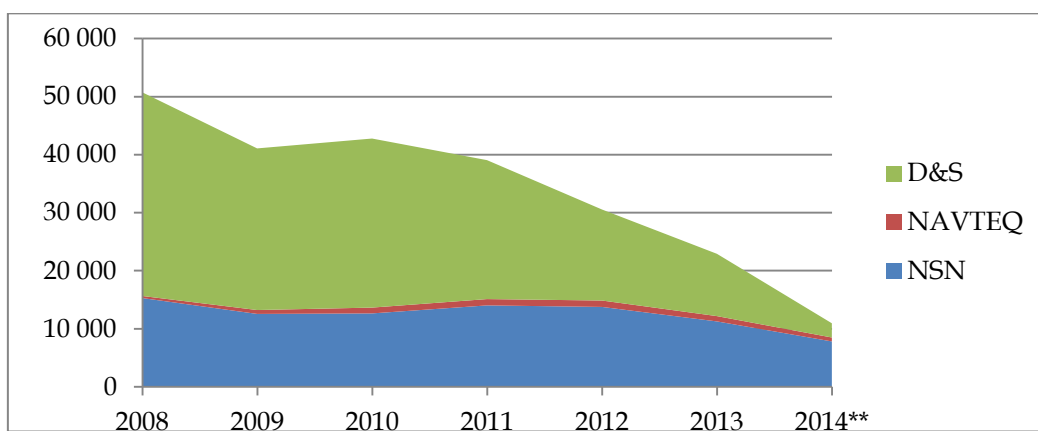
Towards 2008 many changes happened in mobile communications industry as well as Nokia Corporation. After the introduction of Apple's iPhone in 2007 and Google's announcement to form Open Handset Alliance for developing standards of mobile devices and, most importantly, Android OS, the situation in the market started to stir up.

Nokia has identified emerging new market segments and admitted that one of the major threats for the Corporation is the failure to identify the new market segments that are most advantageous to focus on (Nokia Corporation Annual report, 2008). The company has realized that successful past performance in established markets does not guarantee success in emerging segments.

Nokia's flagship smartphone device N95, released in spring 2007, managed to outsell its rivals, primarily the first generation iPhone. Although Symbian powered device did not offer such exciting UI as the iPhone did, its core strengths laid in technological superiority, such as better camera, Bluetooth and 3G connectivity, GPS features etc.

Since 2008 company had 3 reportable business segments: Services & Devices, NAVTEQ and Nokia Siemens Networks. Services & Devices business unit combined three former mobile device business groups - Mobile Phones, Multimedia and Enterprise Solutions - and the supporting horizontal groups. The Devices & Services group had three units - Devices, Services and Markets. Company's top management believed that the new structure will increase efficiency and fasten the development processes.

In 2008 Devices & Services business unit accounted to almost 70% of company's net sales. By 2013 unit's revenues contracted almost 3 times, however still accounted to more than 40% of the total revenue. The revenue structure of Nokia's business units is presented in the Figure 4:



**FIGURE 4** The revenue structure (net sales, M€) of Nokia's business units: Devices & Services, NAVTEQ, NSN

\*\* 2014 3Q data

NAVTEQ Corporation was acquired on July 10, 2008 and became reportable business unit of Nokia Corporation. The acquisition was successful and gave Nokia the comprehensive knowledge of digital map information and related location based content and services. Due to this technology Nokia was able to develop and introduce automotive navigation systems, mobile navigation devices, Internet based mapping applications, etc. (Nokia Corporation press release July 10, 2008).

In 2008 Nokia reached the highest market penetration with 39% of mobile device market share, however the economic slowdown, mobile device market maturity and newly emerged market segments and competitors changed the competitive landscape in a few upcoming years.

Main competitors that developed the operating system software at that time included Apple, Google, Microsoft, Palm and Research in Motion. In 2008 Apple's flagship device iPhone 3G was released as well as the first Android powered smartphone - HTC Dream. These devices were not marginal smartphones anymore and made serious claims to Symbian market share.

In 2008 Nokia's top management made a decision to acquire the full ownership of Symbian Ltd. which still was the world's leading smartphone software at the time, (Nokia Corporation press release December 2, 2008). Symbian OS became fully open source and available royalty-free since February 2010.

Nokia has dedicated its full power to developing feature-rich mobile devices and started selling off its side business lines, such as enterprise software development business, security appliance business, Symbian Professional Services, etc (Nokia Corporation Annual report, 2009). Also, in order to fasten the time devices are developed and ready for the market, it was decided to significantly reduce the number of smartphone models. However, Nokia still continued its segmentation efforts in devices and software platforms (Series 30, Series 40 and Symbian OS platforms were developed simultaneously).

Nokia still leveraged its efforts to build up a functioning and attractive ecosystem and launched public version of its OVI store as a direct answer to Apples App Store and Google Play Store in the beginning of 2009.

In 2009 the official Nokia position was: *"We believe that we will be able to improve the user experience of Symbian with the release of Symbian<sup>3</sup> targeted for mid2010, <...> Before the end of 2010, we expect to release Symbian<sup>4</sup>, with a further redesign of the user experience intended to simplify interaction and layout, bring content to the fore and deliver a fast and consistent user interface"* (Nokia Corporation Annual report 2009, p. 71).

Despite the lost market share in the high-end sectors Symbian OS still retained the market leader position in low-end mobile device market. The industry has evolved from being product based and, to quote Nokia's CEO at the time, Olli-Pekka Kallasvuo, *"The industry competition now is about ecosystem and business models"*<sup>4</sup>. Market has shifted from device oriented to platform

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<sup>4</sup> <http://gigaom.com/2010/04/08/nokias-ceo-on-the-challenges-promise-of-the-new-mobile-industry/> [retrieved 31.1.2014]



oriented and it became impossible for Nokia's Symbian OS to compete against Google's Android and Apple's iOS ecosystems and therefore the whole Nokia Corporation became at risk. In only two years operating profits have shrunk more than 40% and by 2011 company already was loss-making.

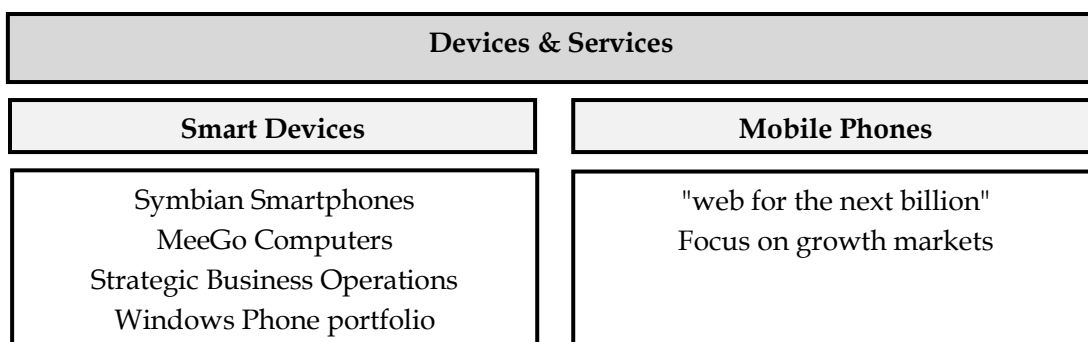
In 2010 Nokia prepared another "iPhone" killer – flagship model N8 which was the first device to run on improved Symbian<sup>^3</sup> OS and for the first time offered built-in upgrading possibility (upgrade version Nokia Belle was released in 2012). The device had capacitive touch screen, 12-megapixel camera and other outstanding technological features (Nokia press release, 30 September, 2010).

Moreover, in February 2010 Nokia and Intel officially announced plans to build a new winning software platform MeeGo that would support multiple hardware architectures (Nokia press release, 15 February, 2010).

In the fall of 2010 Stephen Elop has been appointed as a new CEO to lead the company. Former head of Microsoft Business Division reformed the Executive Board management team and the structure of the company, splitting Devices & Services business unit into separate Smart Devices and Mobile Phones business units (Nokia Corporation Annual report, 2010). The division clearly pointed to the new strategic direction – to regain leadership in the smartphone market and to retain the market leader position in the mobile phone business.

The collaboration between Microsoft and Nokia increased and the decision was not long to come – on February, 2011 companies announced plans "to form a broad strategic partnership that would use their complementary strengths and expertise to create a new global mobile ecosystem" (Microsoft press release, February 10, 2011). The decision was made to adopt Windows Phone operating system as the primary smartphone platform for Nokia devices for 3 years.

In February 2011 Nokia's management announced many major changes for the company. First of all, it was officially announced that Nokia is "entering a broad strategic partnership with Microsoft to build a new global mobile ecosystem and Windows Phone would serve as Nokia's primary smartphone platform" (Nokia press release, February 11, 2011). This was followed by organizational reform to separate Devices & Services business to separate business units (see Figure 5):



**FIGURE 5** New operational structure of Devices & Services business unit (effective April 1, 2011)

At the same time the development Symbian and MeeGo platforms was discontinued. The development of Symbian was outsourced to Accenture and further investments in MeeGo terminated after the launch of first and only MeeGo flagship device - N9 in September 2011.

Nokia has released its first Windows Phone powered smartphones in autumn 2011 under the Lumia brand as a direct competitor products to Android devices and Apple's iOS featured smartphones (Nokia Corporation press release, October 26, 2011).

After 2 years of close cooperation between Nokia and Microsoft, in September 2013 companies announced that Microsoft will purchase all of Nokia's Devices & Services business, license Nokia's patents, and license and use Nokia's mapping services (Microsoft press release, September 3, 2013).

The events described above including both the events in Nokia and in the whole industry are compared and summarized in a simplified timeline (see the Appendix 1).

## 4 METHOD

### 4.1 Method choice

Usually, existing literature focuses on one particular issue at the time, e.g. companies surviving market disruptions, path-dependence, building the dynamic capabilities etc. Analyzing one phenomenon is insufficient for a valid theory building, therefore it is crucial to support the arguments with an existing literature (Eisenhardt, 1989). In order to have a comprehensive analysis of the issues at stake, a single-theory approach is not sufficient. This study requires a breakdown of several theories from distinctive fields to explain a complex decision making and strategic management under volatile circumstances. Thus, the theory discussed above raises a challenge to find the empirical evidence that support all the theories within a single case.

A certain phenomenon can be best explained through the inductive in-depth qualitative study which is built on the existing literature (Jacobides, 2005). Inductive research is explorative and data driven and allows gaining new analytical insights from the empirical evidence. Having a pre-determined theory would help to analyze one of the issues at stake, however preordained theoretical perspectives might limit the findings and induce certain biases (Eisenhardt, 1989). Therefore, for this research theory was adjusted together with the analysis of the empirical data (Eisenhardt, Graebner; 2007) as the new evidence had emerged during the process; consequently each of the theoretical sections was supported by empirical findings as an iterative process.

This paper presents an in-depth qualitative case study which portrays the strategic technology management of a world leading mobile company and the technology choices in a turbulent environment. The object of the case study is Nokia Corporation and its handset business line during the time period between 2003 and 2013.

The case study approach is widely used as a research strategy in many science fields. It is especially viable as a research method in early stages of research because it can provide a comprehensive view on a certain topic and most importantly, support it with a rich empirical data (Eisenhardt, 1989). A new phenomenon can be analyzed and empirically grounded, which allows building up a novel theory. This research is a single-case study; therefore its purpose is to thoroughly describe the existing phenomenon which can prove or discard existing theories and hypotheses. In order to build a new valid theory, a multi-case approach would typically be more advantageous (Siggelkow, 2007).

A multi-theory approach has been chosen in order to construct the theoretical baseline for this extremely complex case. Methodology and theory building draws on examples of Danneels's (2010) extended case study on Smith Corona – formerly one of the World's leading manufacturer of typewriters, Jacobides's (2007) near-war study between Greece and Turkey in 1996, Jacobide's (2005) study on vertical disintegration in the mortgage banking industry, Alison's (1971) paper on the Cuban missile crisis etc. Examples of afore mentioned case studies have strong empirical validity, therefore they were chosen as methodological examples for this paper.

The Nokia case was chosen for finding empirical evidence to support the theory discussed above. Case of Nokia is a fascinating example of a company operating in the fast-evolving industry and experiencing both unprecedented success and dramatic downfall in less than 10 years period. Though Nokia case has been studied extensively – Leinbach, Brunn (2002), Carral, Kajanto (2008), Valorinta, Schildt, Lamberg (2011), Aspara et al (2011), Lamberg, Laukia, Ojala (2012), etc. – in many cases the technology portfolio management is separated from the analysis of company's corporate strategy.

## **4.2 Data collection and analysis**

Following a methodological example of inductive case-based study by Jacobides (2005), a sketch of the theoretical framework was constructed prior to collecting the empirical evidence, however theory was not imposed and served more as a guideline rather than a fixed framework. During the research process new empirical facts presented new theoretical concepts therefore theoretical framework has been altered several times.

Theory which is developed using an extended case study had its strengths in novelty and empirical validity, which is induced by strong interlinking between literature and empirical evidence (Eisenhardt, 1989). Therefore, significant and reliable evidence is the essence for drawing plausible conclusions and building a novel theory.

A valid data is extremely important for a case-based research; thus, two types of data were used for this study. Primary data was collected during the year 2014 by conducting open in-depth interviews with knowledgeable informants. Secondary data was obtained from public sources, such as scientific

publications, Nokia's annual reports and investor information, official press releases, newspapers, internet blogs and websites and other publicly available sources. Nokia is a well known company and has received a lot of public attention and media coverage internationally. The focal period of the research is 2003-2013.

Prior to collecting the empirical evidence for this research, the main data information for the case setting (description) was collected from the public secondary sources. The preliminary timeline of events was drawn which set the foundation for preliminary interview questions. The main literature background at the time was built on theories of path-dependence, resource-based view of the firm and concept of dynamic capabilities. Therefore, the first round of interviews focused on broad topics, such as creation and acquisition of Symbian OS, Symbian architecture and development network, Nokia's homegrown technologies, innovations, Nokia's presence in the US and Europe, organizational reforms etc (see the Appendix 2).

Case study research is a highly iterative process and data collection is usually altered by new emerged evidence or ideas that arise during the process; therefore it is typical to go back and forth in data collection and analysis (Eisenhardt, 1989). After the first round of interviews new evidence started to emerge - for example, flaws in the decision making architecture, imperfect organizational structure, importance of Nokia's relationship with network operators, development of MeeGo, the importance of competitors and industry evolution etc. Thus, the interview questions were adjusted to include these newly emerged topics to validate or disprove the new evidence (see the Appendix 3). In particular, interview topics were broadened in terms of industry competition (competing operating systems and companies) and internal politics (transition of CEOs and management teams, decision making and corporate culture).

Open in-depth interviews are one of the most efficient ways to gather rich empirical data for the case-based research (Eisenhardt, Graebner, 2007). To supplement the preliminary data, total of 13 open in-depth interviews have been conducted: two industry experts, two third-party developers and subcontractors and 9 ex-Nokians from corporate, middle-management and non-supervisory levels have been interviewed. The selection of informants represents wide range of functional backgrounds: engineering, software development, academic and business. Also, several informal conversations and consultations with independent software experts and app developers took place in during the research process (see the list of informants and the interview details in the Appendix 4).

Interviews were extremely rich in data; length of an interview varied from 35 to 95 minutes, exceeding 60 minutes on average. Transcribed interview material amounted of nearly 200 pages of data. Interviews with Finnish informants were conducted in person; Skype video call option was used for the informant residing in the USA. Respecting the privacy and confidentiality of the informants, no names are given after the direct quotations. Interviews remained

confidential and were coded and managed using the *Atlas.ti* computer program for qualitative data and research. Based on the interview topics, 37 different code names were created in 3 code families to filter the results and ease the analysis.

There were adjustments and variations to the interview questions and topics discussed due to the different backgrounds of informants - industry experts or software developers shared their knowledge only in their areas of expertise, as well as ex-Nokia's discussed the corporate culture and internal politics from their own personal experiences. This allowed gaining comprehensive knowledge about the topic because informants represented different viewpoints while discussing the same issues. Also, the informants had freedom to discuss issues they felt were the most important or they had the best insights on. Interviews were retrospective and some mistakes in facts and dates might have happened, therefore all of the facts mentioned in the interviews were validated according to the secondary data.

## 5 ANALYSIS

The above history and case setting describes the phenomenal decade of Nokia's existence. Analysis starts with unprecedented success period until 2008, handset market share almost reaching the ultimate goal of 40% and sales exceeding 50 bn Euros. The 2009 turning-point was followed by chaotic downfall which resulted in rapid loss of market share, massive lay-offs and finally, the sell-off of Nokia's Devices & Services unit to Microsoft corporation in 2013. As the mobile devices were the most significant business line of the company, this research is focused only to hardware and software development of Nokia's handset business.

The analysis part of this thesis was developed as an iterative process going back and forth in scientific literature and empirical data. The empirical data collected during the research process confirmed the assumption that the strategic technology management can be interpreted as a result of three major factors: (1) the capability stack of the company, (2) the industry evolution and (3) the organizational variables and decision making. In order to keep the argument flow consistent, the analysis part is structured accordingly.

All of the sections are interlinked with each other and follow the chronological order of events. Facts and opinions reflect the empirical data collected during the research process - mostly interviews with credible informants, but also publicly available information sources. No names or other information that could be used to identify the informants is disclosed in order to protect confidentiality, therefore direct quotations are assigned to functional groups of informants (e.g. Ex-Nokian, Industry expert, Developer etc.).

## 5.1 Nokia's inner resources and technology stack

Nokia was one of the leading corporations regarding the innovations and expenditure for Research and Development, spending 10-13% of net sales to its R&D departments all over the world. In early 2000s the technological capability of Nokia lied in its superb hardware designs and logistics. Towards the end of 2000s the increasing importance of competitive software was slightly underestimated, which in the end caused severe problems for the whole technology development. In this case, the mobile software development defined the progress of the whole industry, therefore in this research software capabilities and their integration with superb hardware designs are discussed as a centerpiece of the technology development.

### 5.1.1 Symbian software platform

The unprecedented success of Nokia lies with the Symbian operating system, which was the most successful and world leading mobile software platform in mid- and late-2000s. Due to the Symbian OS and flawless hardware Nokia was able to introduce best performing smartphones and enjoyed the market penetration of 39% (2008). However, events from the recent years show that Symbian failed to use the first mover advantage it had built and was replaced by new software platforms and ecosystems.

It is important to understand that the originally Symbian was an externally created operating system that first was acquired by a larger industry group and then solely by Nokia. Soon after the first devices with Symbian OS hit the market and received positive feedback Nokia realized the potential this operating system had, and the only way to secure its development was to become a sole owner of the OS. Symbian was the most advanced mobile OS for embedded devices at the time, very efficient and low power-consuming mobile software platform. Therefore in 2008 Nokia acquired full ownership of Symbian Limited and initiated plans to create independent entity that will lead the development of the platform further (Nokia Corporation Annual report, 2008).

They bought Psion <...> and Symbian Foundation was established after that. So at the time it looked like a very wise move but you have to remember that the competition was calm basically. But yes, it was a blessing and a curse, because it was already an old operating system. (Industry expert)

In 2007 Nokia deployed several software platforms for its devices: Series30, Series40, S60 on Symbian OS and Maemo, and S60 was the world's leading smartphone software platform. During 2007-2008 Nokia made plans to further develop S60 by adding touch screen functionality, sensoring techniques,



etc and, most importantly, by providing tools to manufacturers to create S60 applications.

Nokia basically had 3 platforms for different smart devices and then it was much later decided <...> that everything will be based on Series 60. And that's in the sense funny because some of the Series 80 and Series 90 might have been much better suitable as a platform than Series 60, which was a good UI but it wasn't a good platform. (Ex-Nokian)

The debate over the choice of S60 platform as a basis for Nokia's smartphone development is still going on – according to several experts, later versions of S80 or S90 would have been better suitable since they were tailored for touch-based devices. However, Nokia had put extremely high resources to development of S60 and it was the most widely deployed operating system at the time, so it was chosen for further smartphone development.

Despite the fact that Symbian OS was very resource-efficient, reliable and worked extremely well with early smartphone devices and later on the devices for the developing markets, there were serious factors that held back the development of Symbian, for example limitations of creating apps and absence of app-store, fragmented ecosystem, etc. (zdnet.com, 2013). Also, before being acquired by Nokia, Symbian Limited was licensed not only by Nokia but also other phone manufacturers and network suppliers and had to comply with their regulations accordingly. Under the ownership of Nokia, Symbian ecosystem started to overcome these obstacles, however changes took too much time and efforts were not as effective.

Industry experts, ex-Nokians and developers interviewed for this research unanimously agree that the biggest flaw of Symbian OS was fragmented architecture. Symbian was never designed to support multiple devices or integrate different features at the same time, which created severe problems for the whole Nokia's software development.

The architecture of the Symbian software was not modular and therefore the devices were tightly coupled together with the specific release of software. The biggest difference between Symbian and the most popular operating systems today, such as Android or iOS, was that the device development was driving the platform development – the product-specific software was in many cases only compatible with that certain device.

Built-in software upgrade function was not available (the first Symbian *Anna* update of Symbian^3 was available only in 2011), as well as developing and selling different parts of software. This way of organizing the software development reflected in the organizational structure as well, which made the decision making extremely complicated and slow, not to mention the extensive resources it required.

<...> if you want to develop some small thing into the software it has links into the different parts of the architecture. And you need to involve so many organizations and get so many “yes” decisions so you would be able to proceed. So it was either impossible or very slow. (Ex-Nokian)

Coupling the software and device development may have led to perfectly tailored software for a certain device, however towards the end of the 2000s it proved to be inefficient and too resource-intensive structure. Tightly wired and coupled development and matrix organizational structure led to a situation where no one in the organization was able to speed up the development process independently.

Complex organizational structure and slow technology development resulted in constant delay of new products. The speed of delivery dramatically decreased as the company grew bigger and in the end it took 2 to 3 years for a new product to reach the market. Due to feeling incapable to speed up the development process many individuals lost the sense of urgency and got caught in “procedures of official meetings between units, discussions that would require an agreement or a consensus agreement on many things beforehand” (Ex-Nokian).

Nokia wasn't lacking the innovation, or the ideas, or even knowing what to do. It was just totally incapable to deliver it – what it knew it was supposed to deliver. (Ex-Nokian)

Symbian software development got caught in so-called binary break when the new release of software was not backward-compatible with the old software, therefore nothing that had been developed previously worked with the newer Symbian software version. Therefore, working on Symbian platform became extremely frustrating not only for Nokia's own engineers but also the external developers and subcontractors, which Nokia relied extensively on. Not knowing which version of the software is going to be used next created uncertainty and somewhat divided the developer community.

<...> it was very difficult to develop applications, generic applications for the Symbian platform. Because there were so many product-specific releases and product-specific software that it was not at all sure that when you developed an application it works across the whole Symbian product portfolio. (Software developer)

From the developer perspective, developing applications on Symbian OS was not substantially harder than on iOS or Android, for that matter. Nokia developer community grew until 2008 and involved some 8500 developers, of which some 2500 were independent subcontractors or individual developers (Research Institute of the Finnish Economy, 2014). However, after the 2008 the

situation changed dramatically and as the more attractive open-source systems became available Nokia was not able to retain its developer community.

Afore mentioned factors, such as device-specific releases, uncertainty, and constant delays demolished the confidence the developers had in the Symbian OS. The undergrowth of companies and individual developers, providing Nokia with new ideas and technology was essential for Nokia. Finnish companies, such as Digia, Ixonos, Tieto, Elektrobit, Symbio and several smaller ones accounted for significant amount of software development (Research Institute of the Finnish Economy, 2014), both Symbian platform and applications on top of Symbian.

The developer problem partially explains yet another major issue why Symbian did not prevail - Nokia failed to provide functioning Symbian ecosystem. However, there are more reasons, like the fragmented architecture of Symbian, which was never developed to support multiple devices at the same time. Developing Symbian applications was labor-intensive process and putting even more resources to create an ecosystem for an OS that was already becoming obsolete was probably too costly thing, even for a company like Nokia.

Nokia had many efforts from early on to create a functioning ecosystem. Nokia offered various services for its consumers through with Club Nokia and Nokia Entertainment Services in early 2000s. For example, consumers were able to subscribe astrology or weather information, order news alerts, also download ringtones and customized wallpapers etc.

Nokia Content Discoverer was announced in June 2006 - yet another attempt to build something similar to today's app stores for Nokia's S60 and S40 devices (Nokia press release, June 2006). Nokia Content Discoverer allowed users to browse and download through *a collection of shopping mall "stores"*, which were managed by their own network operators. This initiative explicitly involved cooperation with network operators, which in turn was in many cases complicated, slow and did not offer as good monetizing schemes for developers.

One notable example of Nokia attempting to directly attack Apple's iTunes ecosystem was Nokia Music Recommenders service, launched in 2006 and later transformed to Nokia Music Store (Nokia press release, September 2006). The idea of Music Recommenders was to provide users with unique and customizable music content by offering a wide variety of music selections and professional recommendations made by music professionals. Nokia even managed to attract a famous rockstar David Bowie to lead the project.

*Ovi* services were probably a most valid attempt to engage third-party developers, operators and other partners and create a service Nokia customers were looking for. However, it never reached the popularity such as Apple or Google could. One might argue that Nokia introduced ecosystem concept too early - in 2007, when *Ovi* was launched, Internet and downloadable content was not as popular as it became few years later. However, the content lacked simple consistency and usability and with increasing popularity of more

attractive competing ecosystems it became extremely difficult to grow Ovi both content-wise and user-wise. Also, lethal damage was done due to very slow delivering speed – Ovi was launched more than a year after it was officially announced, and in a rapidly evolving market this means losing not only the consumer interest but developer and partner engagement as well.

The early ecosystem creation included extremely close cooperation with the network operators, which partly explains why Nokia's efforts were not consistent and successful. In early 2000s Nokia relied heavily on the cooperation with the operators, however, with the rise of the Internet-based services and ecosystems it became apparent that operators are not able to provide that kind of services. Nokia and the operators were constantly bickering as to whose prerogative it was to create online stores, applications and downloadable content, etc:

The only difference what Steve Jobs understood is that neither Nokia, nor operators understand software. Nokia was pretending, all the operators were pretending. All the operator's CEOs were calling to Ollila or Kallasvuo that "Nokia, do not do a product which has an application store". <...> Typical telecommunication ecosystem behavior that operator is the king. And operator pretends to be a king on things it does not understand either. (Ex-Nokian)

As the industry dynamics changed after the iPhone revolution, the power of the network operators decreased dramatically. Downloadable applications and content for Nokia's Symbian, MeeGo and Series40 mobile devices became available at the Nokia Store. In March 2012, the store offered more than 100 000 applications and was attracting more than 13 million downloads a day (Nokia Annual report, 2011) as opposed to millions of applications in iOS app store or Google Play store and billions of download count.

Nokia's management realized the value of the downloadable content. The main obstacle for generating more user content was that Symbian OS was not an open-source system and it required loads of legal procedures for external developers to bring their apps to the market. In 2009 Symbian Foundation was established to make the platform available open source and royalty-free<sup>5</sup> and shortly after that the Symbian OS became fully open-source. Also, plans to release the upgraded version (*Symbian^4*) by the end of 2010 were made. Symbian Foundation is believed to be Nokia's last attempt to open up Symbian ecosystem and engage developers and other partners. However, extremely complicated coding, lack of success stories and blurry future of the Symbian OS was not appealing to the developer community anymore.

Symbian ecosystem was driven by the manufacturers and the operators. While the other ecosystems which then emerged were

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<sup>5</sup> <http://licensing.symbian.org/> [Retrieved 1.2.2014]

dominated by the applications and the service developers. That was the fundamental difference. (Ex-Nokian)

From the fall of 2010 Nokia had a full control of the Symbian software development. Moreover, in 2010 Nokia joined the partnership with Microsoft in order to provide Microsoft's Office suite to Symbian smartphones (Nokia Corporation Annual report, 2009). This marked the beginning of closer cooperation between the two companies in order to build more competitive devices in the smartphone market.

The end of Symbian era came in February 11, 2011 when Nokia announced joining forces with Microsoft and making Windows Phone its primary smartphone platform. However, Nokia still continued to leverage its investments to Symbian and officially shipped the last Symbian device in the summer of 2013. In 2011 Nokia has outsourced the development of Symbian to management consulting company Accenture which is supposed to keep maintaining the OS until 2016 ([www.pcworld.com](http://www.pcworld.com), 2013).

Symbian was one of the most successful mobile operating systems in mobile history, reaching 70% of the smartphone market in 2006. Nokia, of course, had a great influence to this success coupling the secure and robust software with superb hardware designs. However, as Symbian was created to comply with the telecom standards and not with the modern Internet protocols, the Symbian software eventually became obsolete. With the rise of iOS and Android Symbian was quickly removed from the throne and Nokia was in desperate need for a new software platform to answer to the increased competition.

### 5.1.2 MeeGo

MeeGo is a Linux-based, open-source software platform, announced in 2010 and created by merging Intel's Moblin and Nokia's Maemo platforms. MeeGo was expected to be a winning platform in the smartphone market and a direct competitor to Apple's iOS and Google's Android (Nokia Annual Report, 2011).

The development of MeeGo originated from OSSO (Open Source Software Operations) team that was created in 2005 in Oulu, Finland with a purpose to investigate the alternatives for Symbian. After 2 years project evolved to Maemo software platform, which in 2010 was merged with Intel's Moblin to create the MeeGo OS.

Upon the creation, MeeGo was conceived as a software platform running on high-performance multiple embedded devices combining Internet, computing and communication experiences, visually rich graphics, multitasking and multimedia capabilities and the best application performance<sup>6</sup> (Intel press release, 2010). MeeGo had a clear mission to solve the ecosystem problem and support multiple devices.

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<sup>6</sup> <http://www.intel.com/pressroom/archive/releases/2010/20100215corp.htm> [retrieved 11.9.2014]

According to the manager of the Nokia Devices in 2007-2010 Kai Öistämö, the fundamental difference of the MeeGo strategy was to develop one flagship phone to the market per year<sup>7</sup>, as it became a common practice with today's leading companies, Apple or Samsung (in the high-end consumer market). As discussed above, Symbian software was tailor-made for each specific device – product-specific releases required extensive resources and were time consuming, because in many cases coding started almost from the scratch. The twist with the MeeGo would have been extensively utilizing the open-source ecosystem, when ready-made middleware components would be available from an open-source market and by utilizing them the time-to-market would be significantly improved.

The foremost successful Nokia smartphone powered with MeeGo OS was a model N9 released in September 2011. The N9 smartphone was the anticipated answer to increased competition and Nokia's attempt to win back the smartphone market. Nokia N9 even had its own dedicated website – *swipe.nokia.com* – that emphasized all the distinctive features and applications the device had.

Nokia N9 ecosystem was supported by combined Nokia and Intel ecosystem – the Ovi Store, Forum Nokia developer support. However, the development of N9 took more than 2 years and by the time it was released Apple had already introduced the fifth generation iPhone 4s, iOS version 5 and iCloud services<sup>8</sup> (Apple press release, 4, October 2011).

Symbian was hoping that MeeGo would come earlier and MeeGo was hoping that Symbian would last longer and it kind of neither happened. And there was a clear mismatch of what was needed in the market and what was available from Nokia. (Ex-Nokian)

There are several opinions why this inadequacy happened. On one hand, Symbian devices were still selling extremely well, especially in developing economies, therefore MeeGo or any other software platform might have been felt as cannibalization of existing Symbian market share. On the other hand, Nokia was betting to utilize Android ecosystem as part of the MeeGo because both platforms were Linux-based. Android compatibility was reached only in 2013 by the Jolla company, whose operating system *Sailfish* is a successor of MeeGo OS (Jolla press release, 16, September 2013). All Android applications could be run directly on *Sailfish* OS without any modifications<sup>9</sup>, however this was still impossible with MeeGo. Although Nokia attempted to position MeeGo as a licensable platform, it did not receive substantial interest from other manufacturers. Due to the fact that by the time MeeGo was commercially available Symbian developer community has somewhat scattered, it would

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<sup>7</sup> <http://taskumuro.com/artikkelit/the-story-of-nokia-meego> [retrieved 11.9.2014]

<sup>8</sup> <https://www.apple.com/pr/library/2011/10/04Apple-Launches-iPhone-4S-iOS-5-iCloud.html> [retrieved 11.9.2014]

<sup>9</sup> <http://www.jollatides.com/2013/09/16/jolla-press-release-160913/> [retrieved 11.9.2013]

have required tremendous efforts from Nokia to create an attractive and well functioning ecosystem.

The cooperation with Intel is often addressed as a short-sighted move as it is believed that Intel's inability to develop LTE (a standard for 4G mobile communications) networks and LTE compatibility, focusing on WiMAX technology instead (which later on turned out to be inferior to LTE and that determined the choice the network operators made when building their 4G networks) made it complicated for Nokia to compete in 4G markets and especially in the USA.

The initial development of the MeeGo involved a relatively small amount of people, however as the development progressed more resources were transferred from Symbian to MeeGo development, the bureaucracy as well as number of project teams increased. As it usually happens in the organizations, as soon as the organizational levels are formed, projects lose their swiftness and the development process slows down. The development of MeeGo ran simultaneously with the Symbian development, and therefore it was highly resource consuming for Nokia, given the fact that these two platforms were not the only initiatives Nokia's R&D was investigating.

Nevertheless the MeeGo platform was a positively accepted initiative, and the device Nokia N9 was called a pinnacle of MeeGo development, the program, as well as Symbian, was discontinued. The top management announced they were entering the strategic partnership with Microsoft and chose Windows Phone as a primary platform in February 2011, which meant that all of Nokia's own OS development programs were to be cancelled.

It is obvious that in mid-2000s Symbian became obsolete and incapable to compete in high-end smartphone markets. However, it was still selling extremely well in emerging markets and low-end segments. MeeGo, on the contrary, looked very promising and perspective, and the top-management's decision to discontinue its development after the release of N9 device was disappointing for many Nokia's employees and mobile software experts. Nokia was not able to fight smartphone war on its own anymore and needed a stronger alliance.

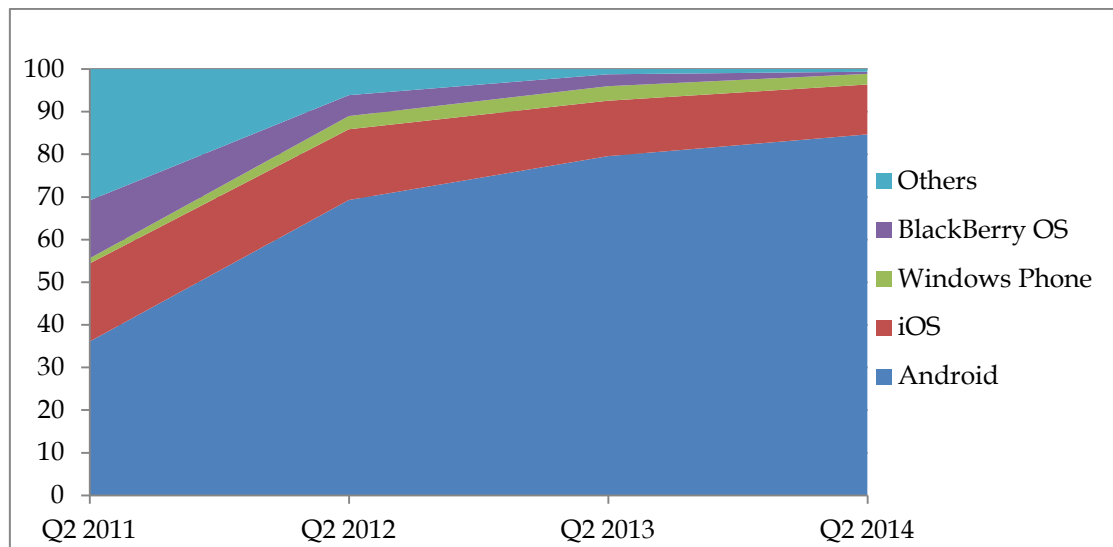
### **5.1.3 Alternatives**

Throughout the years Nokia has accumulated a substantial capability in terms of hardware production and logistics. Nokia enjoyed the fastest time-to-market time and optimized production. However, in the end of 2000s the nature of the competition changed. Hardware designs were not as critical anymore as was the software on the device.

As discussed above, Nokia extensively exploited two options: leveraging its Symbian operating system and building on new MeeGo capability before turning to Windows Phone platform in 2011. The question remains, however, what would have been other alternatives and why were they dismissed, if even considered. iOS and S60, Blackberry platforms are not included in the comparison because of being either closed proprietary platforms (iOS,

BlackBerry) or technologically inferior to the existing alternatives in the high-end sector (S60).

The question whether the Windows Phone platform was the best option is still debated and there is no clear consensus among the opinions. There were clearly other alternatives that were extensively studied by the Board and the senior management of Nokia. Industry experts and ex-Nokians interviewed for this research have named at least few different scenarios, however it is always much easier to speculate in hindsight.



**FIGURE 6** Global OS market share (share of unit shipments; low- mid- high- end sectors).  
 Source: IDC, 2014 <http://www.idc.com/prodsero/smartphone-os-market-share.jsp>

Android OS in 2011 accumulated 36,1% of the global smartphone market (Figure 6) and its market share doubled during the 3 years period. Today Android accumulates almost 85% of the global market share, although it is due to the penetration in low and ultra low-end market segments in developing economies. In 2011 the largest Android vendor was Samsung, as it is today, although the platform was licensable and also used by other manufacturers, such as Huawei, HTC, Lenovo or LG.

iOS is an exclusive operating system developed by Apple company and accounts for almost 12% of the market share (2014) mostly in the high-end sector. It is an open-source platform, however only available for Apple's devices. Similar pattern applies to BlackBerry OS that was used only on BlackBerry devices, however programmed with a closed code. Of course, the possibility existed to acquire a small platform and develop it with Nokia's own resources, as it happened in the past with Symbian. However, it would have required enormous software development capabilities and also, it would not have solved the ecosystem problem that Nokia was already suffering from, as it was discussed above.

Although the discussion that the Nokia's own operating system Symbian was becoming obsolete and new platform for high-end phones was needed



started already around 2006, the actual decision happened only years later. Already then Symbian was considered as robust and reliable software for low-end and medium-end devices, however Symbian was insufficient to compete in high-end market and Nokia's management saw that from early on.

The development of Symbian – Nokia's own operating system – was not viable anymore as the platform was morally outdated. The decision not to proceed with MeeGo, another OS developed by Nokia as a replacement for Symbian, is still controversial and highly debated. One of the official reasons for abandoning it seems to be the developer community that was diminishing:

<...> they were not a software company and they didn't have confidence in their own ability to develop the Maemo platform into a stable one. Because it was not only the technical performance of the OS itself, it was their ability to attract developers. (Ex-Nokian)

Also, running two home-grown platforms at the same time – Symbian and MeeGo – would have been too heavy cost to bear, given the fact that Symbian development was already too cost-consuming. The strategy for having two separate platforms for low-end (Symbian) and high-end devices (MeeGo) was also considered as an alternative, however the risk of developing two operating systems in-house and fighting on two fronts at the same time seemed challenging.

Therefore, choosing one of the best developed operating systems at the time was a logical move. By looking closely to the alternatives that existed in the market at 2011, it is obvious that Android or Windows Phone platforms were the two tangible external options available.

A few experts have already expressed their concern about the Android OS because of becoming fragmented – in 2013 15 different versions of Android were available on numerous different devices of different vendors<sup>10</sup>. Android might simply grow too big and because of that the developer community might become fragmented and then it would be extremely difficult to avoid backward-compatibility problems, or cross-platform compatibility issues, the same as Symbian had.

If Android would have been selected, Nokia would have definitely become the quality leader, far better than Samsung or HTC or any other vendors utilizing the software. However, the top management was trying to avoid becoming a software-agnostic hardware vendor at all cost.

Company's management saw all the risks arising with Android OS – already in 2010 one of Nokia's top managers Anssi Vanjoki made it clear<sup>11</sup> that choosing Android OS would have only solved short-term problems and would have not provided any solution for long-term strategic problems that company

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<sup>10</sup> <http://www.theguardian.com/technology/2014/aug/22/android-fragmented-developers-opensignal> [retrieved 15.9.2014]

<sup>11</sup> <http://www.engadget.com/2010/09/21/ce-oh-no-he-didnt-anssi-vanjoki-says-using-android-is-like-pe/> [retrieved 24.9.2014]

was facing. It turned out to be a somewhat correct insight, based on the short-term success and long-term losses of companies such as HTC, Motorola or Sony. Clearly betting on the universal OS is not the way to differentiate and avoid “permanently low profitability”.<sup>12</sup>

Windows Phone platform, developed by Microsoft was eventually selected as a primary smartphone platform for Nokia’s devices in 2011. Windows Phone was made an exclusive platform for Nokia’s devices for 3 years period. Although the decision was somewhat controversial, most of the experts interviewed agree that it was a logical choice.

<...> the only alternative was the old archenemy Microsoft that had to get a credible platform to go into the market. It wasn’t the perfect decision but in many ways it was the only decision that they could do. (Industry expert)

Although Microsoft did not have the outstanding market share in the mobile market, it did definitely possess the software muscles to push the development forward. Also, Microsoft had a strong presence in the enterprise sector which might have been seen as an advantage for Nokia to win back the corporate customers.

#### 5.1.4 Hardware

Nokia had set an example to many technology companies in terms of process optimization and product cost management. For many years Nokia enjoyed extraordinary hardware designs, optimized production, superb logistics, and it still does. Nokia still holds most of its patents in handsets and devices, 2G, 3G, LTE networks etc, being one of the biggest players in the patent wars<sup>13</sup>. However, most of the know-how was accumulated in the hardware production and infrastructure.

Nokia was trying to create the best user interface and user experience by providing the best hardware, however the rise of Internet content and applications was grossly underplayed. Thus, towards the end of 2000s it was felt that Nokia’s hardware development exceeded the software progress:

<...> little bit going back to 2004-5-ish, people loved the hardware, they felt that Nokia was really bringing the lightest and smartest-looking and interesting-looking phones <...> but it was paired with the operating system that lost all the usability that Nokia had (Industry expert).

<sup>12</sup> <http://www.ft.com/intl/cms/s/0/bc0e1db8-c027-11df-b77d-00144feab49a.html#axz z3EDyKpk5H> [retrieved 24.9.2014]

<sup>13</sup> <https://gigaom.com/2012/04/17/meet-the-mobile-patent-kings-samsung-and-nokia/> [retrieved 15.9.2014]

As its strength lied in hardware designs and logistics, Nokia had an option to become solely a hardware manufacturer, in other words operating system agnostic. However, the management tried to avoid it at all cost – Nokia had spent a lot of recourses building up software know-how, also outsourcing software development to subcontractors.

It is worth mentioning that Nokia has always had a grip on newly emerging technologies. This is no surprise, due to the large amounts of product programs going on and extensive investments in research and development. For example, Nokia had touch-screen phones or tablets in its product portfolio way before its competitors did.

Nokia's first touch-screen phone model 7710 was released in the fall of 2004, and was a rather impressive and innovative device in the market. It was a true multimedia smartphone with resistive touch screen and handwriting recognition, Internet browser, an integrated music player, video playback, streaming and recording, a megapixel camera with 2x digital zoom, FM radio, email functionality, USB and Bluetooth wireless connectivity for PC synchronization and so forth (Nokia press release, November 2, 2004). It was clearly a prototype of today's smartphones, however it never reached the mass market.

As it happens with new technology, the particular device had many flaws in technological performance. First movers or innovators rarely receive positive feedback for the early prototype products, especially when the technical specifications are lower than of the product already in the market; but as the iPhone proved, technological inferiority is not an obstacle to disrupt the market.

It was big, it was ugly and you tried to speak with it with the tilted way [laughs]. I would say that it wasn't about the touch UI. The touch UI wasn't the problem and again I say that Nokia's strength was hardware design and the modeling of the phones. And that particular model [7710] was just disastrous, in that way that it just didn't appeal to the mass market. (Developer)

The 7710 model did not align with the mainstream Nokia strategy and was built on Series 90 operating system. However, Series 60 being the most advanced and widely deployed platform at the time for the non-touch user interfaces was chosen to further develop the touch-functionality instead of Series 80 or Series 90.

Nokia had developed the touch-screen functionality to a great extent; however it was relying too long on resistive touch screen functionality. Resistive touch screen responds to a push of a finger or stylus and is usually made with layers of plastic and glass. Although it is still widely used and has many advantages, it lacks sensitivity, multi-touch support and sharpness as opposed to the capacitive touch-screens<sup>14</sup>.

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<sup>14</sup> <http://techexplainer.wordpress.com/2012/04/02/resistive-vs-capacitive-touchscreen/>  
[retrieved 20.08.2014]

Though the resistive hand-writing recognition was developed specifically for Chinese users, it was still too narrow market for Nokia. Nokia was not particularly strong in capacitive touch screen technology and based on somewhat perplexing user feedback the development of touch-screen UI was not made a strategic priority at that point of time.

## **5.2 The new competitive landscape of the mobile communications industry**

The emergence of smartphone industry can be described as both market disruption and convergence-based evolution. On one hand, smartphone as a new generation device with built-in Internet access and applications provided improved user experience compared with regular cellular phones. On the other hand, it can also be argued that smartphones resulted from the convergence of early PDAs, Internet services and cellular mobile phones, therefore this question is particularly interesting for those analyzing industry evolution.

The technology disruption and the emergence of new strong market players caused severe problems for Nokia – smartphone market that was dominated by Symbian devices in only few years was occupied by Apple and Android, leaving Nokia in a follower position. Also, other external factors, such as cooperation with network operators and other ecosystem partners, were important element shaping the competitive situation in 2000s.

### **5.2.1 Industry evolution and new dominant design**

Empirical findings from this research show that mobile communications market disruption in 2007 followed the textbook market disruption pattern – original iPhone, launched in 2007, was technologically inferior to many of the devices in the market; however with focused and fast paced development it took only few years for a new generation smartphones to become a new dominant as we have at this day.

In the past patents and physical barriers used to be the most effective means for protecting the new technology, however nowadays it has proved to be inefficient (Bettis, Hitt, 1995), which means that new technologies are created and adopted faster and many times with no or very little legal restrictions. This is also due to an increase in software and other knowledge-intensive production which is easier to transfer and imitate. Nokia had innovations and technologies way ahead of their time, however did not leverage the first mover advantage:

Originally all these inventions that relate to smartphone as far as the data transmission technology is concerned, they were done

<...> in Tampere. Also Apple and Samsung have a lot to thank to the work that the people in Tampere did. (Ex-Nokian)

During the 1990s and early 2000s Nokia Corporation was an indisputable market leader in mobile communications industry. The 90s “logistics crisis”, matrix organizational restructuring in 2003 and other organizational changes led to process optimization which was so far the most successful in the mobile industry. For many years Nokia enjoyed the most cost-efficient and fastest time-to-market production of mobile devices. Broad cooperation with local R&D centers, universities and research institutions contributed to the successful diversification strategy that led to extensive penetration in all market segments in both developed and developing markets.

The shift in the industry happened when software became the dominant element of the mobile device. During the 90s and early 2000s the hardware designs were evolving rapidly and Nokia was able to provide the most advanced phones to the market – integrated FM radio, music player, colorful screen, camera etc. Towards the mid-2000s downloadable content started to become more important, although in the beginning it was only the customized ringtones or screen savers, which now seem preposterous. However, that marked the shift in the consumer preference and paved the way to the rise of customized software content, or as it evolved today – the applications. Thus, as good as the hardware designs were, they lost their functionality if not coupled with attractive software.

There was a revolutionary power of the iPhone because it has turned the picture upside down, that people were willing to accept different type of devices and different type of thinking from computer maker, from an IT vendor like Apple, than they were willing to accept from a trusted, reliable, sometimes boring handset maker, such as Nokia. (Ex-Nokian)

As the tendency was back in the days, the new mobile device was evaluated through the certain specifications that Nokia was optimizing at the time. Regarding those specifications, the original iPhone was an inferior device to Nokia devices that were already in the market – it did not have 3G, very poor camera, if no camera at all, low battery life etc. On paper it looked as a marginal and inferior device, also the sales numbers in 2007-2008 were not nearly as good as with Nokia devices:

<...> at Nokia when we were seeing this competitor coming to the market, people understood that this is going to be the future, but then they were seeing the sales figures for the first year and they were thinking that “we have the right strategy – we are selling hundreds of millions and they are selling peanuts”. (Ex-Nokian)

The hardware design and the trusted brand name of Nokia was the biggest advantage at the time, also very attractive for certain market segments, especially in the emerging markets. The convergence between the mobile and IT industries started in developed countries, namely the USA and European markets, therefore it was crucial to be present in high-end sector in order to keep up with the competition and innovations.

The business that Nokia was involved in with Symbian phones being sold all over the world and being extremely popular and profitable in emerging markets overshadowed the arising problems in the high-end sector. Although it was apparent that the convergence is already happening, the outstanding sales numbers created that impression of Nokia being “too big to fail”, and still being at the forefront of current mobile trends.

And this was exactly what happened in Nokia that we knew exactly that Internet will be the dominating platform and that services will drive the business. We had a lot of understanding on how it would happen, but the businesses as they were, were so lucrative in that particular time that it didn't leave space to sufficient strong investment in the Internet space. That would have led to real success in the same way as Android and iOS were able to do that.  
(Ex-Nokian)

Soon enough Android became low-cost operating system and could offer same, if not better, features as Symbian for a lower price. At the high-end sector Apple's iOS was dominating and it became extremely hard for Nokia to choose the correct market position. Though Nokia was enjoying sufficient sales in the low-end sector, was not willing to give up the position in the high-end market.

The real revolution of the iPhone was not bound with the original devices - they were technologically inferior to existing mobile devices in the market. The real disruption was brought by completely new overall user experience and defined the digital services. iPhone provided the complete package - high usability and customized content, which later became coupled with fairly competitive hardware. Most importantly, iPhone smartphone became an integral part of an extensive ecosystem of applications and digital services that Apple provided.

Nokia believed that by coupling the devices with Symbian software will solve the compatibility issues. Looking from a retrospect, that might have been one of their biggest mistakes, because as discussed above, the Symbian OS was not designed to support multiple devices or provide a functional ecosystem, not to mention the binary break or lack of backward-compatibility which in turn were obstacles for cross-platform applications or operating system updates that users were looking for. So coupling the device with morally outdated software was just one piece of the problem.

Another issue became obvious with the rise of customized software or downloadable applications. As soon as they were introduced to the mass

market in the late 2000, they became widely accepted by the consumers. The logic behind downloadable content was that it was not necessary to make a precise decision anymore of what functionalities a phone should have – it was all possible due to the wide range of app-stores and variety of applications. With the rise of applications Nokia's segmentation strategy became wasteful, especially in terms of brain power and resources that were spent on each and every product and speed of delivering new products. This reflected in the business models that companies had – Apple still has a strategy of delivering one product at the time, therefore the company had much less resources but much higher focus compared with Nokia, that was developing numerous different devices at the same time and not delivering properly on any front.

Competitor companies, such as Apple or Google, soon realized the value of developer community as an external source of innovation. Applications developed worldwide could respond to various consumer needs in various markets; by flexible monetizing schemes and reduced amount of legal paperwork those companies became attractive to independent third-party developers as well as subcontractor companies. It is fair to say that Nokia did not share the Symbian code until 2010 and still the source code was not opened fully; on top of that the other problems were various legal procedures, delayed release dates and uncertainty of the platform itself. Therefore it is logical that many developers preferred iOS or Android over Symbian.

<...> if you look at the successes of Supercell and Rovio, they were all based on the fact that they abandoned Symbian as a development platform and started to develop for Apple and Android subsequently. (Industry expert)

Towards the end of the 2000s new competitors turned the tables for Nokia. Nokia experienced loads of negative publicity both in Finland and internationally. Fighting against negative social pressure, bearing the responsibility of being the biggest Finnish company and complying with national expectations raised some additional pressure for company's management. However, that is the burden of every large player in any market – being scrutinized and assessed in much thorough ways.

It all adds up to the fact that the industry change happened very quickly with the revolutionary force of Apple's innovative smart phone designs. The convergence of IT and mobile industries peaked with the rise of applications and downloadable content. The value of developer community (subcontractors as well as third-party developers) became crucial as it evolved to be the source of innovation and response to growing customer needs. Nokia's case is that the devices were coupled for too long with closed Symbian OS, Nokia did not manage to build up strong relationship with the developers and ignored the signs of the industry for too long, although the sales and production volumes were still high, especially in the emerging markets.

### 5.2.3 Network operators

While talking about the industrial changes and external environment, it is necessary to note the role of the operators in the mobile business. Nokia was a telecom company from the very beginning, thus it maintained close cooperation with the network providers in Europe and rest of the world. Nokia has been heavily involved in developing GSM standards, 3G and later on 4G networks; therefore the cooperation with the operators was unavoidable.

In the beginning of 2000s Symbian ecosystem was driven by manufacturers and operators, while the competing ecosystems that emerged later on were dominated by the applications and service providers. With the rise of the 3G standards the operators were in the dominant position in the market. Nokia relied heavily on the operators as ecosystem partners, however it turned out that network providers were unable to offer services and applications and therefore lost the dominant power in the market.

It is also worth noting that there were negotiations and games behind the curtains in terms of mobile network standardization. Europe, USA, China and other market segments had different standards, and in order to be present in those markets, devices had to comply with specific requirements from the operators.

For example, the USA did not adopt the GSM standard which was the default global standard for mobile communications and also a predecessor of the 3G standard. Nokia was heavily involved in development and standardization of the GSM, therefore owned an extensive patent portfolio which was widely used in Europe. Instead, the US adopted CDMA standard, development of which and manufacturing of components was dominated by large US companies (e.g. Qualcomm). Therefore entering the US market was fairly complicated due to the different standardization and technological requirements from the operators, but also because of the dominance of the US players. When 3G network became widely available, the US again adopted different standardization scheme CDMA2000 in which Nokia again did not have a very strong patent portfolio.

Operators (e.g. AT&N, Verizon, T-Mobile, Vodafone) were in control of the device market due to various certification and compliance procedures in Europe, USA or any other markets, therefore in the early 2000s the operators were the channel to the consumers. Although Nokia was a consumer device company, the devices were never sold directly to the consumers – the operators were acting as a distribution channel. It is important to remember that in early 2000s sales of mobile devices were more subject to sales assistants and displays at the sales points than they are now, thus the operator power came not only in controlling the device supply but also the marketing and end sales.

<...> it mattered much more what type of a deal you had with the operator and the marketing force that the operator had than it



matters now. Now people mostly rely on second-hand information on the devices, or they rely on the overall perception about certain devices much more than what they did in there [past] <...> in the store you had much more opportunities to actually direct the consumer purchasing options than you have today. (Ex-Nokian)

The operators had had a significant impact of the overall perception and sales of a certain brand of devices. They could select which features and applications to promote – in other words drive the consumer preferences. However, this setting changed dramatically when Apple entered the US market and turned the power relations upside-down. Apple created a sophisticated brand name and highly desirable product and due to the high demand of the product, consumers became the power which was driving the industry.

<...> they [Apple] created such a demand that the operators were ready to destroy some of their cornerstone parts of their customer relationship, which was for the first time in history of mobile – they were willing to give a revenue share. And also Apple wasn't greedy. (Industry expert)

However, this kind of strategic move probably would not have succeeded in Europe because it was a very fragmented market with dozens of different operators and regulations in each country. Obviously, the requirements were not the same and adjustments and tweaks had to be made so that the devices would meet the regulations for every particular segment. Whereas the US market was somewhat monolithic and therefore Apple was able to get outstanding sales numbers and grow the ecosystem very quickly, although penetrating other markets outside the US was not as fast.

The success of Apple company lies not only in superbly balanced devices and new innovative services, although is fairly determined by that. Apple also brought a different business model with regards to operators. In short, Apple's entry strategy was to select one operator per country, so that this particular operator would have the exclusive rights to sell Apple devices. Normally the operator would be the most attractive one in the market so therefore it would start to market the devices very strongly. That created a huge competitive advantage and win-win situation for both the operator and Apple company – Apple got additional marketing and the operator got exclusive devices that bring the competitive edge in the market.

Apple iPhone was not fulfilling the requirements from the operators. So the functionality that Apple offered was not according to technical specifications that the operators wanted. But they offered totally different type of a user experience and that was the reason why operators, or *AT&T* especially, wanted to give them an opportunity. (Industry expert)

Even though the consumers would have the subjective right to choose the operator, in many countries they did not require that option. Original Apple iPhone carrier in the US market was *AT&T*, only later on (2011) joined by *Verizon* and *Sprint* companies. The business model Apple implemented during that proprietary period was the key corner stone for their success.

There was such a hype around iPhone at the time when it was introduced to the market. So it's not just technology, it's very much the question how do you introduce your products and services to the market place and whether you can find an attractive solution and applications and revenue sharing agreements with the key stakeholders. (Ex-Nokian)

It is fair to say that Nokia saw the future trends, had enough technological capability and talent, had big ambitions and means to win the smartphone market. However, knowing the trends and betting on power and success achieved in the past is not enough to win in the disrupted markets. Now the ball has to be passed onto the top management of the company – managerial perceptions and competences were a centerpiece of the strategic technology management of the Nokia Corporation.

## 5.3 Internal politics & governance

### 5.3.1 2003-2006 Jorma Ollila and Matrix reorganization

Jorma Ollila is one of the most famous Finnish executives, who devoted most of his professional career to Nokia. He started at Nokia in 1985 as a Vice President of International Operations and continued his way up, when in 1992 was appointed President and Chief Executive Officer of Nokia. During 1999-2006 Ollila was a Chairman and Chief Executive Officer of Nokia, and continued as Chairman on the Board until 2012<sup>15</sup>. In 15 years Jorma Ollila managed to turn the struggling industrial company to world-leading corporation that was closely reaching its ultimate target of 40% global mobile device market share.

In 2003 company was challenged by several competitors, such as slim and appealing Motorola's RAZR phone or cheap component producers in Asia, which resulted in a drop of market share from 35,8% in 2002 to 30% in 2004 (McCray et al, 2011). However, Nokia's management, led by Jorma Ollila, took firm decisions to restructure the company and optimize the production, which resulted in significantly reduced costs and time-to-market, and also increased the spectrum of devices produced. New decentralized matrix structure brought positive changes and helped to boost Nokia's sales. Company's Chairman and CEO Jorma Ollila in 2004 said: *"We are energized by our reorganization into four*

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<sup>15</sup> <http://www.forbes.com/profile/jorma-ollila/> [retrieved 24.9.2014]

*business groups, which better reflect our strategy to expand mobile voice, drive consumer mobile multimedia and mobilize enterprise solutions"* (Nokia press release, 2004).

Product programs run by different business units were supported by horizontal groups and that was believed to be less time and cost consuming process. The effect was startling – only in 2004 Nokia released 36 new mobile devices for all its market segments. The Technology Platforms horizontal group was responsible for most of technological development – Series 60, Series 40, Symbian OS, cameras, audio components and other hardware and software parts.

The reorganization was necessary because the old system proved to be inefficient when company grew larger and started to reach the limits as a global company with a classical structure it had – not only geographically, but also expanding along the value chain. However, as good as it looked on in theory, the employees of Nokia were in fact frustrated with the organization and horizontal decision making. The reasons for that lay in somewhat scattered chain of command when flattened organization decreases levels of hierarchy. In some cases employees felt they have no influence over important decisions or vice versa – some less significant things were over-influenced and negotiations consumed too much effort. Forming cross-functional project teams is very productive and effective way of moving forward, but as long as it is supervised and led by a strong chain of command, which is very clearly documented in a classical organizational structure, however there was a lack of it in a new matrix system:

<...> we decided to become a global company that would be open to those new ideas and therefore we introduced this matrix organization. But in practice it became very difficult to implement. Because people tend to think still in terms of hierarchy, they tend to think in terms on silos and in their own terms and agendas and it's difficult. It fights against some of the basic things how people behave. (Ex-Nokian)

Cross-functional organizational structure can create negative effects for an organization. For example, it might create tensions between functional and project managers, scatter authority and responsibility lines. This appears not only on the management level, but also at the execution level where employees might end up with more than one functional supervisor and become frustrated with reporting and fulfilling the requirements. Also, matrix brought some new working practices, for example forming virtual teams and working remotely, forming decision-making teams based on a certain problem or forming project teams in a temporary fashion etc.

The speed of delivering products and services to the market was one of the biggest problems Nokia had faced. With dozens of product programs constantly going on, product-specific software designs and wide diversification of market segments, there were a lot of resources used, and restructuring was

intended to ease the communication between units and therefore increase the delivering speed. However, the scattered chain of command required more meetings and agreements which in turn resulted in longer procedures. Also, matrix is believed to have catalyzed the fragmentation of Symbian as different units of Nokia started to create certain characteristics for the Symbian operating system, meaning that different product programs needed adjusted software which resulted in product-specific software releases coupled with certain devices.

I would say that [organizational structure - SL] wouldn't have been a problem if there would have been enough coordination between the different business units. So there was no sufficiently strong technological leadership in a context where the different business units were driving into different directions. (Ex-Nokian)

Gradually the technology development started to evolve to different directions and business units were more and more concerned about the process optimization. By 2006 Nokia had a clear cost advantage in mobile device production compared to all the competitors due to successful process optimization and superb logistics. However, it was strongly felt that the company's top management was drifting further away from company's key competitive advantage - innovative technology - towards business management and optimization.

Lack of centralized technology development control led to an increased internal competition. As mentioned above, there were dozens of product programs running at the same time, thus it is not surprising that some might have targeted the same market segments and customer groups.

<...> it was funny at the certain point of time that the smallest and the lightest phone was developed in the Enterprise Solutions business unit, not in the Mobile Phones or Multimedia, who were more focusing on the consumers and not so much business users. (Ex-Nokian)

Though the overall aim of the company was fulfilled - new products delivered - the fact that business units went after the same segments sent signals that they did not have a clear focus of their business strategy. It only refueled the internal competition which was due to the fact that separate business units had no clearly differentiating strategies:

Having 3 business units made no change. They all made the same stuff and that just increased internal competition <...> And the other thing was that the technical skill was so low that the top management couldn't specify any technical criteria how the Enterprise product or the Multimedia product would be different.

There were no technical guidelines to the Research and Development people due to the laziness of the top management and not understanding even products themselves. (Ex-Nokian)

The period until 2007 marked fascinating success of Nokia corporation – company managed to penetrate basically all of the market segments leaving all its competitors behind. Nokia was leading the innovations and dictating the incremental development of mobile devices. Optimization and cost advantage was achieved through restructuring, transferring production facilities overseas, designs made and consumer preferences analyzed in R&D centers all over the world, operators were accepting and prioritizing Nokia's devices as well as the consumers.

### **5.3.2 2006-2010 Olli-Pekka Kallasvuo and the market turbulence**

Taking over a company that is already flourishing is never an easy job. Jorma Ollila publicly admitted that becoming a CEO of a company that was balancing on the edge of failure in 1992 was much less pressuring, compared with taking over a company that is at its ultimate peak. Olli-Pekka Kallasvuo was sat in the invidious position with the competition stirring up and the whole world waiting for Nokia's next move.

It is important to note that Jorma Ollila left the company at its peak – in terms of sales, and market share, even the global competition looked calm and steady with Nokia being miles ahead of its closest rival. In this kind of situation, when stability and continuity was needed more than a radical change and revolution, Olli-Pekka Kallasvuo was a suitable candidate – a business and finance expert, who spent most of his professional career in various managerial positions at Nokia Corporation.

The decision to appoint Kallasvuo as a CEO of Nokia is still debated and many different viewpoints prevail. However, the decision was very much based on what the internal and external stakeholders required. Nokia was a listed company and from an investor point of view radical decisions were not preferred, instead a sustained market share and stable returns were appreciated:

All the different things put together: the inner culture, the demand for continuity and stability internally and externally, all those were playing the cards in a way that you were looking for a candidate that would fit into that profile. (Ex-Nokian)

Olli-Pekka Kallasvuo was a very experienced business manager, who worked in various top positions at Nokia. He was a CFO since 1992, led the Mobile Phones business unit in 2004-2005, later appointed as COO of the company, thus the management and process optimization was his area of expertise. He was seen as a business professional with strong background in finance, and was able to ensure continuity of a well functioning business and

therefore seemed as a suitable choice to lead Nokia Corporation at the time. However, the matrix structure implemented in 2003 had its flaws which became apparent only when the competitive landscape changed dramatically and new strategic decisions had to be made fast.

First of all, the interdependencies between units and programs slowed down the delivering process. It became obvious when Apple brought their brand new iPhone experience in 2007 and took over Nokia's dominant market share already in 2009, whilst Nokia was unable to deliver anything close to set against the iPhone. Even adding some small tweaks to a new software release required involvement of several project teams and were linked to various different organizations, that getting a *yes* decision took too much time as opposed to a classical chain of command.

Because of the structure, all the product projects developing some device they were always dependant on some other program or platform. They were not able to develop anything by themselves. (Ex-Nokian)

Interlinked structure was not the only malign matrix attribute. Another flaw that became obvious in times of crisis was the low decision making power. In the 90s, when Nokia still had the classical hierarchical organizational structure, the major decisions about the devices and technology development were made by the top management and the Board of the company, whereas after 2003 the decision making was delegated very low in the organization. Business units and product managers were in charge of the development process; and the lower the decision making power is, the lower is the risk taking:

They know what is successful, they improve a little, but they never develop something totally new. Because it's a risk; and lower in the organization, their job is not to take risks - their job is to make a successful product programs or new products. (Ex-Nokian)

It was extremely difficult to bring in any innovations or new business opportunities that did not align with the mainstream Nokia strategy - unless it was pushed down from the top management. The top line - Symbian devices - were showing outstanding sales figures and any activities that might have threatened the existence of the top-selling line were considered cautiously.

After 2007 the new major players emerged in the mobile device market, such as Apple, Samsung, HTC etc, and Nokia felt serious pressure because of the increased competition. In such times of near-crisis it is top-management's power in induce the change, and that is what the newly appointed CEO Olli-Pekka Kallasvujo started to implement in 2007.

The organizational change to bring the Devices and Services businesses under one business line was a response to a fast convergence that was

happening in the industry, where the mobile device was no longer just hardware, but instead an instrument for different services and content, an instrument to access a wide ecosystem. The new strategy emphasized the importance of consumer Internet services, and therefore the development of both the software and services was brought to closer collaboration.

As industry showed clear signs of convergence, Nokia's management tried to increase efficient ways of working across the company by closer integration of functional and divisional groups. However, the strategic target setting remained the same as previously - mostly focusing on the number of newly delivered products, time-to-market and total cost of a product. However, software development still did not receive enough resources and was not made a strategic priority:

There was no finance, no budget to keep the software platform good, and it was not analyzed as an important business component. <...> I can explain that the core target setting was how many new products a year - I mean hardware products, new model numbers. (Ex-Nokian)

Thus, the new strategy and new management received heavy criticism for being too focused on optimizing the business processes and underestimating the converging devices and Internet-based services. At the time Nokia set the priority to process optimization - reduction of costs, negotiation with suppliers etc.:

<...> at the same time as the CEO changed, a lot of technical skills disappeared from the top management and it became more and more business - people with the business background and with no technical skills. <...> there was not enough understanding in the top-management or the layer underneath what is realistic and where the real problems are. They were living in the bubble and very focused on the new strategy on doing the services, and totally ignored the devices. Because it was "we are no. 1 in the world and we don't need to care about it". (Ex-Nokian)

As the penetration of new markets has slowed down, the only way to sustain the profit margin was to optimize the production and resources. R&D and other costs were optimized, however in the changing market environment it was felt that the expenditure of research and innovations should have been kept a priority. As the situation worsened, employees of Nokia gradually started to lose trust in Kallasvuo's capability to steer the company away from the crisis situation, thus the corporate atmosphere started to deteriorate as well:

<...> he [Olli-Pekka Kallasvuo] didn't have the vision. I think the best times for Nokia were those times when Ollila was the CEO and

Pekka Ala-Pietilä was supporting him. Pekka had the brains and Jorma had the muscles to put it into the practice. (Ex-Nokian)

Nokia traditionally was a hardware oriented company and most of the R&D focus went towards the new devices. A lack of software expertise is very often attributed as a root cause of Nokia's failure; especially lack of software understanding in the top management layer:

<...> why Nokia failed to see the trends is that there were not powerful enough software person in the management that could have had influence on management decisions. <...> Nokia was a product company where all the targets are set to product making and when these software development kits and third-party ecosystem and apps, they are a second priority. We were pretending that they are the first priority, but in the actual action and the actual target setting for people and the actual compensation systems, they were not the primary target - they were the secondary target. And that was pretty much due to the target setting of Mr. Ollila, which was completely inadequate to attack the iPhone. (Ex-Nokian)

Nokia had its biggest asset - Symbian platform on which their competitive advantage was built. Nokia was meant to become a strong leader in software and software services. It was emphasized strongly that Nokia needed to build up software expertise fast, however with Symbian operating system as a main smartphone platform it was very difficult if not impossible to win back the smartphone market. By 2007 Symbian already showed clear signs of being morally outdated and was clearly obsolete compared with new emerging mobile platforms, therefore it was very difficult to implement the new strategy based on Symbian platform.

Nokia was in need of new winning software solutions, and there were some notable initiatives, such as Maemo and MeeGo development, Meltemi operating system for low-cost devices or OVI services, including the music and app stores, for example. However, none of these initiatives received top management commitment and were canceled sooner or later.

Although the new strategic priorities were set, there was an actual lack of implementation tools, which in this case means software expertise and new winning technology which would allow building up on it and expanding the strategy. The reason for that might be the loosened links between the technology development and the top-management - as discussed above, top level executives were business experts and critical decision factors were based on numbers and reported figures, top management was somewhat separated from the actual technology processes.

The fact that Future Technologies team, which analyzed the future technology trends and possibilities to integrate them into existing technologies,



was cancelled by the time Kallasvuo became a CEO, shows that the optimization was done also on the account of R&D and future technologies research which might have led to faulty decisions and missing out some of the important trends. Moreover, the Chief Technology Officer position disappeared from the Executive Board around the year 2007, when Pertti Korhonen left the executive team together with the long-term CEO Jorma Ollila. The executive team got reorganized and the CTO position was reestablished in 2010 under the supervision of the new CEO Stephen Elop.

The competition in the industry continued to evolve rapidly, and by 2009 Nokia was already the underdog in the smartphone market, outgunned by Apple and Android devices. Consumer preferences were clear, developer community switched to simpler and more financially attractive platforms, the morale of employees was low and Nokia was left behind in a baffled situation. It took only few years for a situation to change dramatically and it is fair to say that no-one, not even Nokia expected such sudden and dramatic turn of events.

### **5.3.3 2010 Stephen Elop and the new strategic alliance**

Year 2010 was probably the most dramatic and challenging throughout the history of Nokia. As discussed above, Nokia hit the rock bottom in terms of sales or new product releases. Company was in a desperate need for new strategic direction and fast actions, therefore it was decided that changes in the top management have to be made.

Much speculation took place on who might be appointed or would agree to take over the management of Nokia. Obviously, the change was needed and fast; however whether the most rational choice was made is still debatable to this day. There was both resistance and appreciation for the new CEO – a former Microsoft executive Stephen Elop. However, one fact is clear that Nokia continued to struggle in smartphone market, and it became obvious from early on that Nokia and Microsoft alliance is going to tighten, which in fact resulted in selling off the whole Mobile Phones business unit in 2013 to Microsoft.

Former CEOs of Nokia have been mostly selected from the Nokia insiders. Although there were several good candidates from within the company, the decision was made to appoint an expert from the outside. As it usually happens in any organization, person from outside can have a more thorough and objective view on processes and strategy. As Nokia was losing the war primarily in the Northern American markets, a person with an excellent expertise working in Microsoft seemed as a logical choice. Nokia was exceptionally an engineer driven company, also rooted in Finland and represented Finnish and European corporate culture and values. Although the internationalization of workforce and diversity of staff in terms of countries, educational background, age or sex was highly encouraged, Finnish ways of conducting business still prevailed.

There were internal good people that would have fulfilled that job. <...> when you bring an outsider to the company it's necessary for

the fact that none of the internal persons can do the corporate culture change. <...> It was regarded like he [Elop] would as an external person observe the situation, and be able to go through those changes that an internal candidate would not be able to do. It made perfect sense. (Ex-Nokian)

Together with the new CEO many reforms rippled through the company, starting from thorough revision of ongoing projects, organizational reforms and so on, which resulted in somewhat more crystallized strategy and narrower focus. It was important to revive the corporate culture as well – Nokia needed to regain the winner mentality it once possessed, therefore the transformation was necessary on all levels. Although change in the management had brought high expectations and hope to regain the lost market share, drastic changes also meant lay-offs and closing down of many projects and initiatives, among which probably shutting down of MeeGo and Symbian development were the biggest disappointments. This in turn meant that existing partners and subcontractors were no longer seen as beneficial counterparts and thousands of jobs related with Symbian and MeeGo were at stake:

Stephen was of course was the integral part of killing the business from Finland. So in that sense he started just negotiating with the big boys – the Accenture and Microsoft and not really, I would say he wasn't really interested in the smaller players. (Subcontractor)

New CEO started acting decisively, and his first task was to replace obsolete Symbian operating system with a new winning platform. He intended to turn the company around and emphasized the need for a new strategy and new winning solutions. Soon after joining the company, in February 2011, Stephen Elop released the famous Burning Platform memo, which was later on leaked to the press<sup>16</sup>. The memo itself and the metaphor used, comparing Nokia company with the burning oil platform, was seen as a controversial choice of words and allowed many interpretations. Elop admitted that Nokia has fallen behind as opposed to the main competitors in the smartphone market – *“The first iPhone shipped in 2007, and we still don’t have a product that is close to their experience. Android came on the scene just over 2 years ago, and this week they took our leadership position in smartphone volumes. Unbelievable”*.

However, as awakening as it was, the memo did a lot more damage than it was supposed to. It was intended to be a wake-up call for a technology company to re-think its strategy and current assets. Nokia’s capabilities lied exclusively in hardware technology; however the software patent portfolio did not counterbalanced the hardware, as opposed to Nokia’s competitors. Re-thinking the strategy also meant executing organizational and management changes. Sadly, the burning platform metaphor was understood as an obituary

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<sup>16</sup> <http://blogs.wsj.com/tech-europe/2011/02/09/full-text-nokia-ceo-stephen-elops-burning-platform-memo/> [retrieved 4.3.2014]

to Symbian OS, whether the message was indented or not. The effect was immediate – Symbian smartphone sales have slumped down as did the consumer, developer and subcontractor trust. The company openly stated the discontinuity of its all time best-seller operating system devices and had no other alternative to offer at that time.

There is one rule what the top executive cannot do – complain about his own product. <...> The biggest problem in the software transformation is that you have to make a decision in-house: "I will change the software platform". But at the meantime to pay the salaries to the people you still have you keep telling *good* about your current product. <...> I mean that single-handedly by himself to ruin the top line. What's the sense in that? (Ex-Nokian)

It is fair to mention that the decision to abandon Symbian was made way before Stephen Elop became a CEO of the company. The Burning Platform memo was a resonant case example of controversial corporate communication and it is believed to have made damage to Symbian sales, Nokia corporate image and share value, which sometimes is even referred to as an *Elop Effect*<sup>17</sup>.

He [Elop] made speeches for Nokia people on the Burning platform. And that was highly confusing because it was degrading the achievements that the company has been doing so far. And many people felt that their contributions were not valued properly. There was an ambition of being able to still sell hundreds of millions of Symbian phones but then when you come out with an announcement that this is something that Nokia is not going to continue, so the whole market died over one week. (Ex-Nokian)

Employees felt baffled and insecure – there were thousands of people working with Symbian OS and Symbian was the greatest achievement and treasure of Nokia that had brought the company to outstanding success. But the industry has changed dramatically since then and old capabilities, no matter now advantageous they were in the past, became obsolete almost overnight. Without a doubt, switching to other platform was necessary; however timing of the change was probably not thoroughly considered and created a lot of frustration within the company.

Looking in retrospect, the most damaging effect of the Burning platform message was the vacuum that prevailed after that – the senior management did not realize that the alternative platforms (e.g. MeeGo or Meltemi) were still far away from being finished. The “iPhone killer” Nokia N9 was ready for the mass market only seven months after in September 2011, and by that time Nokia had already lost the market share dramatically, as well as its developer community

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<sup>17</sup> <http://communities-dominate.blogspot.com/brands/2011/12/calculating-the-elop-effect-hes-already-destroyed-a-company-the-size-of-oracle-and-profits-the-size-.html> [retrieved 4.3.2014]

and partners. As good as the MeeGo and N9 device initiative looked; it was already doomed by the top management's decision to discontinue MeeGo development already in February 2011. All development plans beyond the N9 were cancelled although the device and the platform have received fairly positive feedback from both experts and the consumers.

Nokia Lumia phones that were the last hope for Nokia to reclaim its lost position in the mobile business started shipping only in the fall of 2011 – models Lumia 800 and Lumia 710. The US variant – Lumia 900 – was launched only in 2012 (Nokia Annual Report, 2011). With all the hype built around iPhone and Android devices, delay by even a few months meant losing a critical amount of consumers who now were choosing and becoming tied up with their favorable ecosystems.

In February 2011 Nokia's management announced many major changes for the company. First of all, it was officially announced that Nokia is *“entering a broad strategic partnership with Microsoft to build a new global mobile ecosystem and Windows Phone would serve as Nokia's primary smartphone platform”* (Nokia press release, February 11, 2011).

This was followed by organizational reform to separate Devices & Services business to Smart Devices and Mobile Phones business units. Smart Devices now had a focus on high-end smartphones and the strategic partnership with Microsoft to build a new winning Windows Phone platform and new device portfolio was made a top priority. Symbian and MeeGo initiatives were downsized, however still kept on – MeeGo until the development of N9 device would be finalized and Symbian for maintaining the existing ecosystem and supporting the existing customers.

Mobile Phones business unit, on the other hand, further sustained the "web for the next billion" strategy and focused on emerging markets. Emerging markets were still a gold mine for Nokia with millions of first-time buyers that valued the features and quality of Symbian smartphones or S40 feature phones. In 2011 Nokia sold 22% less Symbian devices in Europe and 65% less in the USA market than the year before. Although slumped in the high-end sector, were still steady in the middle and low-end sectors, especially in the developing markets – sales in Africa increased by 13% and Latin America by 5%. However, drastically cutting all the development in Nokia's proprietary operating systems meant also getting rid of the only cash cow that still prevailed – sales in the emerging markets.

The end of the Symbian era meant massive lay-offs and termination of dozens of ongoing projects. Development of any operating system is usually extremely costly; therefore in 2011 Nokia outsourced the development of Symbian to management consulting company Accenture. Also, by transferring all the development to Accenture Nokia to some extent avoided unpleasant procedures of reduction of its extensive workforce. Accenture company is now responsible for maintaining Symbian OS and supporting the last Symbian users until 2016.

The rationale behind the decision to switch to Windows Phone operating system and the other alternatives that existed in the market at the time were

discussed in the chapters above. It is fair to say that Nokia entered a strategic partnership with its long-time arch enemy and competitor and both companies were found it similar situation – stunned by a sudden success of Apple and Android and unable to match the competition on their own. Microsoft has shown interest in the mobile business many times and alliance with Nokia was probably its last attempt to penetrate the mobile market.

Microsoft was interested in going into alliance in the mobile world with Nokia [from very early on]. And obviously the terms were different at that time and Nokia was much more in an equal status with Microsoft than it was in 2011. So there was a discussion about technology partnerships and all that, and it made perfect sense. (Ex-Nokian)

Microsoft has brought corporate clientele base as well as strong software expertise and widely known brand name. Nokia, on the other hand, strengthened the alliance with superb logistics and hardware potential, also widely recognized brand and quality standards. The idea behind switching to the Windows Phone for the next 3 years was to differentiate in the existing market, to provide new ecosystem as an alternative to Apple and Android. However, Microsoft was never an appealing consumer market player and going after the same consumer segments turned out to be a slip in the strategy.

The cooperation between the two companies culminated in September 2013 when companies announced that Microsoft will purchase Nokia's Devices & Services business unit, which meant that the development of smart devices as well as mobile phones would be acquired by Microsoft. Nokia was left with its Mapping business (with a signed 10-years licensing agreement to Microsoft), Solutions and Networks business unit and large amount of patents which were licensed to Microsoft as well (Microsoft press release, September 3, 2013).

Microsoft saw the potential in Lumia brand and Windows Phone ecosystem, as well as Nokia's low-end series and believed it had the potential of fastening the development of the devices. For Nokia it was definitely a hard decision to give away something that once brought the company to global success. However, the sell-off of the handset business was in the best interest of Nokia's shareholders and provided company with financial stability and further investment opportunities to the businesses that prevailed after the acquisition.

The purchase was finalized on April 25, 2014 with the transaction price of 5.44 billion Euros. Approximately 25 000 employees were transferred to Microsoft together with the Nokia's leadership team – Stephen Elop, Jo Harlow, Juha Putkiranta, Timo Toikkanen, and Chris Weber (Nokia press release, April 25, 2014).

## 6 DISCUSSION

The aim of this thesis was to provide a comprehensive overview and analysis of the technological, organizational and industrial processes which have affected Nokia's strategic technology management between 2003 and 2013. As the findings show, strong focus on the core technology is essential, and even more importantly, the transfer to the new core technology in a deliberate and timely manner. The summary of the findings is provided in Figure 7.

With regards to the research question proposed in the beginning, the analysis suggests that the technological, organizational and industrial factors are interconnected and causally linked. The explicit and implicit causal links are portrayed in a figure below. It is merely impossible to separate the processes and analyze e.g. Nokia's technology portfolio or organizational structure separately because of the unique causalities, interdependencies of power relations and industry perceptions.

Symbian OS was the biggest asset of Nokia in the early 2000s and contributed heavily for establishing the dominant position in the market. Coupled with the superb hardware, supported by optimized production, logistics and trusted brand name, Nokia was able to gain a competitive edge that ensured its market leader position until 2008.

Symbian was Nokia's proprietary operating system and the most advanced platform for embedded devices in the market during the early 2000s. However, Nokia's broad diversification strategy predetermined fragmentation of the Symbian platform, which caused severe problems to the whole platform development in the future. In the late 2000s fragmented architecture was not the only flaw of the outdated Symbian - binary-break, closed source code, product-specific software and coupled devices were among many flaws of the Symbian platform. Multiple incompatible variants of certain technology can determine failure of the technology (Kretschmer, 2008), thus the fragmentation of the

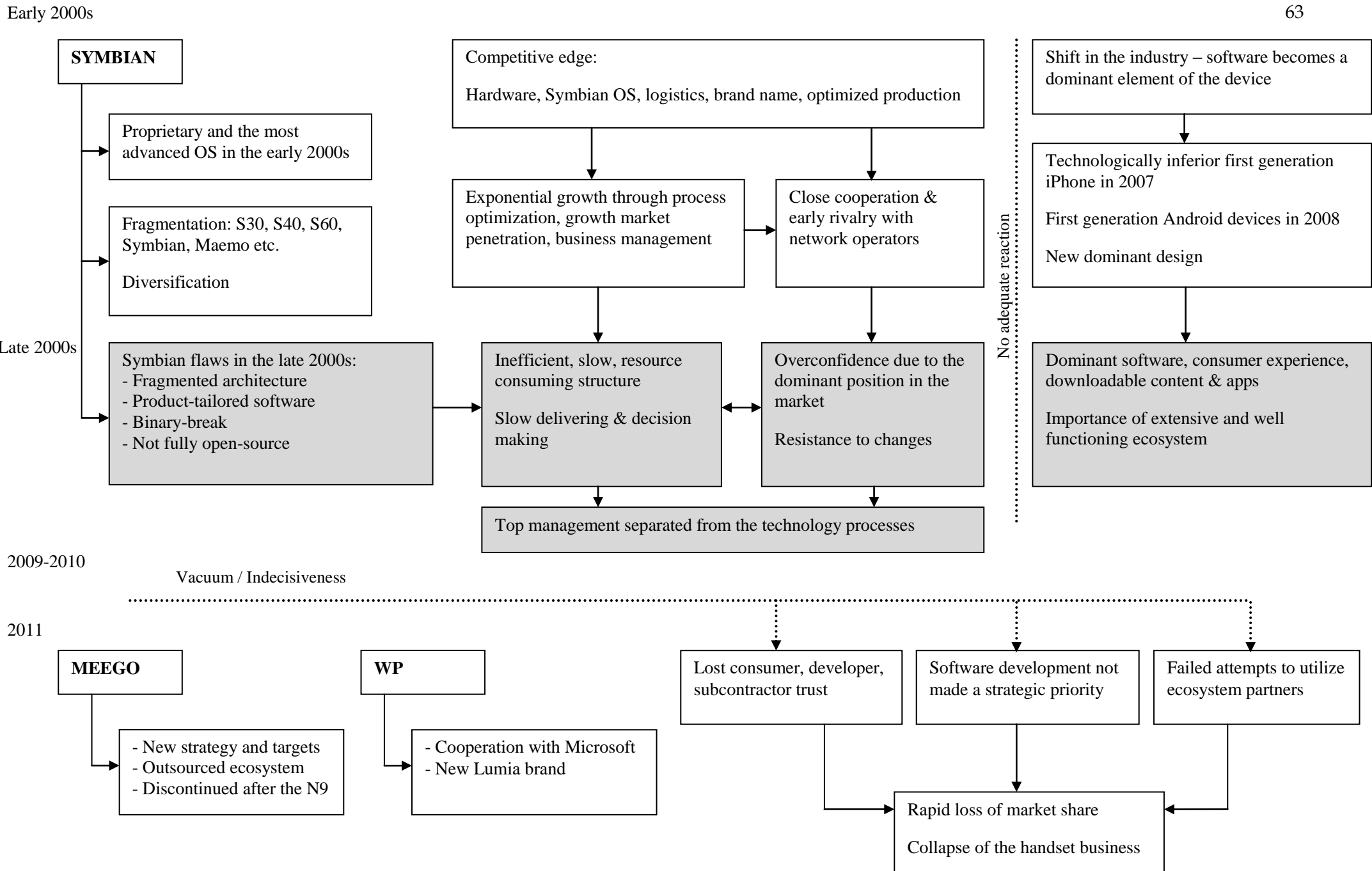


FIGURE 7 A summary of interdependent technological, organizational and industrial processes of Nokia during 2003-2013

technology platform causes users as well as developers to question the compatibility and prospects of the technology.

In early 2000s the situation in the mobile communications industry was calm with Nokia being a market dictator; however the shift in the industry occurred when software became a dominant element of a mobile device. The release of the first generation iPhone in 2007 and the first Android device HTC Dream in 2008 were the initial milestones of the market disruption. The main attributes of a disrupted mobile communications market were the dominance of software, advanced consumer experience, downloadable content and applications. In order to achieve superiority in afore mentioned elements, the extensive and well functioning ecosystem and broad cooperation with the ecosystem partners became the crucial success factor.

Unfortunately, Nokia did not show any adequate reaction to the radical market changes. In the end of the 2000s mobile devices market started showing the signs of maturity, therefore Nokia was more and more focusing on process optimization and cost management. Towards 2007 Nokia was still enjoying exponential growth through process optimization, growth market penetration and careful business management.

Moreover, the company cooperated closely with the network operators, who at the time served not only as major ecosystem partners but also as marketing and distribution channels, with an exception of North America. Nokia failed to penetrate the US markets mostly due to the rivalry and disagreement over various network standards with the local network operators.

Around 2008 Nokia was showing signs of overconfidence due to the dominant position in the market and close collaboration with the network operators. However, after the iPhone revolution, the operator power has diminished significantly and consumer experience became the dominant element, and Nokia did not have a strong competence on the latter. Nokia traditionally was a product- and engineering- driven company therefore its reinforced focus towards the hardware designs and telecom standards prevailed throughout the entire analysis period, leaving the software development as a second priority. The competitive advantage that was in the past built on the superb technology proved to be insufficient to ensure the timely transition to the newly emerged dominant design, which was based on software and new user experience.

Symbian development required significant recourses due to the outdated architectural features discussed above. Complicated and inefficient operating system development was reflected in a complex and stiff organizational structure. The structure originated from 2003 organizational reform when *Matrix* structure was implemented under the supervision of a long-term CEO Jorma Ollila. When company's growth slowed down, obscure decision making schemes, scattered responsibilities and lack of centralized technology development prevented company from performing a fast response to increased competition and contributed to inner tensions.



Slow decision making and delivering, inefficient and resource consuming structure and resistance to changes – all are the attributes of big corporations faced with a need for a radical transformation. In Nokia's case it is apparent that business management and maintenance of the existing business lines remained a strategic priority; and lack of technological expertise in the top management layer created difficulties for new technology and competence acquisition. Nokia never suffered from lack of innovations – in fact, prototypes of today's smartphones, tablets, app stores etc were designed way ahead of their time. However, every innovation was selected and implemented carefully to comply with the mainstream strategy.

The indecisiveness created a very dangerous vacuum in 2009-2010 which meant ages in rapidly evolving mobile communications industry: during that time Apple introduced 4<sup>th</sup> generation iPhone 4 and Samsung released its Android powered flagship Samsung Galaxy S. Nokia had no clear strategy on how to win back the smartphone market and no product to match the competition. This dangerous situation resulted in lost consumer interest, as well as diminished developer and subcontractor trust.

Nokia failed to utilize the ecosystem partners initially trying to compete with the outdated Symbian platform. After 2008 new open-source platforms became available that usually offered better monetizing schemes and easier legal procedures, and Symbian development with device-specific releases, uncertainty, and constant delays was not as appealing. Nokia grossly underestimated the importance of the undergrowth companies and individual developers that provided Nokia with new ideas and technology. Nokia believed that network operators will remain the ultimate ecosystem partners which later on turned out to be a wrong assumption.

This is partly the reason why anticipated release of MeeGo operating system and the model N9 did not bring the expected results. Although the project had new strategic targets and approach to utilize outsourced ecosystem, by the time N9 was actually released the developer community was scattered. MeeGo was never made a strategic priority and was seen as a threat to the existing Symbian business line at the time. This also highlights the important issue of the internal competition: Nokia had three main fractions competing at the time – Symbian, MeeGo and S40 – and instead of differentiating and complementing Nokia's product portfolio they were going after similar market segments, therefore seen as internal threats to one another.

Nokia's comeback with MeeGo was never meant to succeed – the termination of MeeGo development was announced even before the N9 was released. Yet another corporate mistake is often attributed to the miscommunication of the *Burning platform* metaphor which is believed to have ruined the top-selling Symbian line. In 2011 Nokia was left with no competitive proprietary software platform, weak network of ecosystem partners, averted consumer interest and a compromised corporate image. Thus, the result was a rapid loss of market share and the eventual collapse of the handset business.

Strategic alliance with Microsoft and a comeback with Windows Phone powered smartphones are seen as a logical result of the consequential events. Bringing in Microsoft's software expertise was seen as a solution to the software and ecosystem problems Nokia was facing. However, Microsoft was never a consumer-appealing brand, and the penetration of the consumer smartphone market continued to struggle. The cooperation between the two companies culminated in September 2013 when Nokia agreed to sell its Smart Devices and Mobile Phones business units to Microsoft. Nokia had fiercely dismissed its main business lines in the past; and however painful the decision was, Nokia's withdrawal from the handset business might actually mean a new beginning for a notorious company.

To sum up, the faulty strategic choices and perceptions of Nokia can be summarized as follows: Nokia overly relied on its proprietary Symbian platform, which had fundamental architectural flaws and was unable to match the competition; The importance of software and advanced consumer experience was underestimated; Focus on business optimization instead of new technology and expertise acquisition and lack of overall software excellence in the top management; Indecisiveness of the top management to make MeeGo a strategic priority or to acquire a new external software platform created a dangerous vacuum and gap in the competence building; Failed attempts to utilize ecosystem partners primarily because of strong commitments to the network operators.

## 7 CONCLUSIONS

This study provides a semi-empirical framework for explaining the strategic technology management and strategic technology choices of a company operating in a volatile environment. With regards to the research question, this paper suggests that the strategic technology choices are affected by (1) a firm's capability stack and its past performance, (2) industry changes and (3) firm's organizational and decision-making environment.

This work also extends previous studies on Nokia Corporation, for example business model transformation analysis between 1987 and 1995 by Aspara et al (2011), strategy-making during the industry downturn between 1997 and 2003 by Carral & Kajanto (2008), strategy and development of Nokia mobile phones by Leinbach & Brunn (2002), strategic agility and dynamics by Doz & Kosonen (2008) etc. This study also builds on a discursive framings analysis of corporate success and failure of Nokia by Laamanen, Lamberg & Vaara (2015) by complementing the analysis with a valid empirical data and reasoning.

Nokia case is an example of path-dependence induced evolution when a company follows its historical set of practices and builds on its competitive advantage achieved in the past (Teece et al, 1997). The inheritance in hardware designs led Nokia to a great success in the past, however it also majorly contributed to the strategic rigidity when the markets were disrupted and software platforms became the dominant factor of smartphone development.

This study extends the path-dependency literature by providing an empirical example of a company whose crucial path-breaking technology choices were prevented because of established power-relations and path-dependency. This study provides an example of strategic rigidity that was due to the high level of optimization and dominating technology (e.g. hardware, Symbian OS) that characterized Nokia during a given period, and which were detrimental once the market was disrupted.

This research looks further to the industry dynamics and market disruption (Christensen, 1997; Adner, 2002; Anderson & Tushman, 1990), which in Nokia's case resulted with the establishment of the new dominant design as a result of convergence of mobile communications, Internet and digital services. By building on the McGahan's (2004) framework on four industry evolution trajectories, this study provides empirical evidence to the radical industry transformation when both core activities and core assets became obsolete.

Incumbent firms very often follow path-dependent set of practices and procedures which prevent them from bringing radical innovations to the market (Danneels, 2010). Therefore, disruptive technologies are usually delivered by the new entrants, such as Apple. Although a new technology is always inferior to an existing technology (Anderson & Tushman, 1990), as was the iPhone, its revolutionary effect was a completely new user experience and software-based supplier ecosystem (Kenney & Pon, 2011) that Nokia had underestimated.

Once the markets are disrupted, targeting new market segments is more successful with an architectural innovation rather than incremental one (Christensen et al, 1998). In Nokia's case trying to win a disrupted market with the old Symbian OS was a faulty decision, mostly due to Symbian's technical specifications but also due to changed market perceptions and consumer preferences. Delaying investments in a new technology for too long prevents the accumulation useful knowledge in new technology (Eggers, 2014), which was observed in Nokia's attempts to win back the smartphone market with MeeGo or Windows Phone devices.

The competitiveness in nowadays ICT markets lies in controlling a competitive platform (Cusumano, 2010). This study proves that competitive software platform became the dominant element in disrupted mobile communications market. Platform itself is seen as a standard basis for technological development; however it is not only described as a technology development tool but more as a product of interrelations and interactions between the ecosystem partners (Kenney & Pon, 2011).

Complementary assets, according to Teece et al. (1997) can help to achieve a smooth transition to new technology, however later on Eggers (2012) argued that complementary assets can only moderate but not overcome a process of new knowledge creation. Analysis shows that Nokia possessed sufficient amount of resources and innovations and even forecasted the market convergence way before it actually happened, but was not able to leverage it properly to achieve a successful new capability creation, which is attributed to the lack of software expertise in the top management layer and protection of the mainstream business line. The bottom line is that lack of centralized technological development and especially software excellence in the top management prevented the path-breaking change with new technology acquisition.

## Managerial implications

This empirical study analyses the case of Nokia's handset business which was affected by unique processes and interdependencies of market changes, organizational dynamics and Nokia's own assets. However, some insights and conclusions drawn are universal and can be applied to any businesses experiencing core technology transition, market turbulence etc. The main lessons learned can be listed as follows:

- Fundamental business model differences have to be acknowledged and evaluated before entering a new product market. As Nokia historically was product and hardware oriented company it did not possess the understanding and dynamics of a software company.
- Internal competition and fear of cannibalizing own products require strong leadership and clear strategy and targets for each fraction. Having several competing technologies might be beneficial for expanding product portfolio and diversification, however there is a risk that running several programs simultaneously might be destructive and resource consuming.
- Indecisiveness of the top management and "wait and see" attitude might be extremely harmful. Once the dominant design is established the company needs even more time to acquire knowledge and capabilities; even a few months of silence in a fast evolving and highly competitive markets means lost networks, partners and consumer interest.
- Centralized technology management must be executed by the top management by providing clear technical criteria and technical guidelines to the R&D teams. Core technology expertise in the top management layer is crucial for the successful technology strategy and technological transition.
- The success in today's software business is based on the extensive utilization of the ecosystem partners.

## Limitations and future research

This study provides a comprehensive analysis of one case and comparison with other similar cases from different industries could provide stronger empirical generalizability of these findings. This research has an extremely broad scope and examines only the major events that contributed to Nokia's overall strategic performance. Examining all nuances in detail might provide better insights and reasoning for certain aspects. Also, it is also important to note that the majority of respondents were of Finnish origin, therefore there might be some biased opinions towards the strategic decisions made, which could be minimized with higher number and broader functional variety of the informants.

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## APPENDIX 1: Timeline of the events in Nokia Corporation and the mobile communications industry

Year	Nokia Corporation	Industry
2000-2001	Nokia 9210 Communicator – best selling PDA	iTunes released
2002	Nokia 7650 – first smartphone with Symbian OS (S60)	First network operators in South Korea and the USA adopt 3G standard
2003	N-Gage gaming phone (S60)	Motorola Razr BlackBerry convergent smartphone
2004	Matrix reorganization Nokia 7710 – first touch-screen smartphone	
2005	Internet tablet 770 (Maemo)	Google acquired Android Inc.
2006	Olli-Pekka Kallasvuo appointed a CEO CTO position discontinued 46 new device models in a year Nokia Content Discoverer Nokia Music Recommenders	
2007	Nokia N95 – Symbian OS (S60) NSN	First generation iPhone Google announced Open Handset Alliance (initiated plans to develop Android OS)
2008	Nokia acquired Trolltech (Qt framework) N-Gage purchase/download store Symbian Foundation Symbian^1 Nokia acquired NAVTEQ (location-based services & maps) OVI store	iPhone 3G HTC Dream – first Android powered phone Android market launched (later Google Play Store)
2009		iPhone 3GS LTE standard (4G) deployed in Europe Samsung, LG, Sony Ericsson, HTC, Motorola, Huawei manufacturers deploy Android OS

2010	<p>Symbian becomes open-source</p> <p>MeeGo officially announced</p> <p>Symbian^3</p> <p>Nokia N8</p> <p>Stephen Elop appointed a CEO</p> <p>Anssi Vanjoki leaves Nokia</p>	<p>Apple iPad</p> <p>USA shift to LTE networks (4G)</p> <p>Samsung Galaxy S</p> <p>Nexus smartphones and tablets (Google)</p> <p>iPhone 4</p>
2011	<p>Burning platform memo</p> <p>Windows Phone made primary platform</p> <p>Smart Devices and Mobile Phones separated</p> <p>OVI services discontinued</p> <p>Symbian upgrades released (Symbian Anna, Nokia Belle)</p> <p>Nokia N9 – first and only MeeGo smartphone</p> <p>Symbian software and development outsourced to Accenture</p> <p>Lumia 800, Lumia 710</p>	<p>39% of all the devices sold were powered by the Android OS</p> <p>Samsung Galaxy S II</p> <p>Samsung Galaxy Note “phablet”</p>
2012	<p>Lumia 900 for the US market</p>	<p>iPhone 5</p> <p>Samsung Galaxy S III</p>
2013	<p>Handset business sale to Microsoft announced</p>	<p>Samsung Galaxy S4</p>

## APPENDIX 2: Example questionnaire of the interview questions (first round)

### Background information

1. Could you briefly introduce your educational and work background? Are you in any way connected with Nokia now or in your previous work?

### Nokia's resources/technology

2. What was Nokia's role in the creation of Symbian OS?
3. When and why did Nokia decide to have Symbian as a primary smartphone platform?
4. Do you know how many firms from Finland have been involved in Symbian development network?
5. How big was Symbian development network globally? What were the other major countries?
6. Why Nokia decided to buy Symbian Ltd in 2008?
7. Why Symbian was not an open-source system? Could you explain how the open-source systems work?
8. In 2008 the whole competition changed - so not separate devices started competing, but the ecosystems, e.g. Apple or Google. Could you compare the Nokia's attempts to build Symbian ecosystem?
9. In 2011 Nokia sold off the Symbian development part to company Accenture and then outsourced it. What is your opinion about this decision?
10. What do you think about the decision to develop the operating system in-house instead of outsourcing?
11. Nokia was heavily involved in development of 3G networks. Could you elaborate what was Nokia's role in standardization processes and how did it comply with Symbian development?
12. When the top management realized that Symbian is outdated operating system?
13. According to HS, Nokia launched touch-screen phone to the market already in 2004 (7710) but after the negative feedback dropped the idea and continued with the non-touch-screens. Could you comment on that?
14. In a broad sense what do you think were Nokia's key advantages in early 2000s and how did they develop?

### Industry development

15. What is your opinion was the emergence of smartphone market as an incremental improvement of mobile communications or was it disruptive technology which came from internet services rather than mobile communications?
16. Could you describe the competitive situation in early 2000s?

17. Where did management set the priority during 2004-2008: to sustain the market leadership and preserve the well functioning routines or to innovate and look for new areas to expand to?
18. How did Nokia react to the increased competition in 2008 and later?
19. Maybe you could identify, what specific actions were taken when Nokia realized that Apple is a new major competitor?
20. What do you think about the decision to do cooperation with Microsoft in 2011?
21. What do you think, what are the necessary capabilities for a firm to succeed in this fast developing and changing market?

#### Organizational/internal processes

22. Could you explain, how was the level of risk taking and risk management executed in Nokia?
23. Could you compare what were the core corporate values before and after 2006 (when CEOs have changed)?
24. Were the common goals and strategy clear for all the units? Did separate units worked to reach their own goals?
25. How did the employees react to the departure of the long-term CEO Jorma Ollila? How did the working style and working atmosphere change?
26. In 2006-7 Nokia announced to change its organizational structure to less hierarchical levels and more networking, flexible decision making. Did the reorganization bring the expected results?
27. After the reorganization in 2008, how did the decision making process change? (Could you describe the decision making process?)
28. Are you aware of the 70/20/10 learning and development model? Was this model implemented in Nokia? (What effect did it have on employees and work efficiency?)
29. Nokia communication strategy. How were the decisions delivered and announced to the employees and public?
30. What were the reasons for the radical organizational changes in 2011 (new leadership team with new CEO, new operational structure)? Did it bring the expected results?
31. In a broad sense, could you compare the management style of the 3 CEOs: Jorma Ollila, Olli-Pekka Kallasvuo and Stephen Elop?

**APPENDIX 3: Example questionnaire of the interview questions (second round)**

1. Why was Symbian chosen as Nokia's primary platform? What were the alternatives at the time?
2. Please describe Symbian development network in Finland and globally. How was Nokia's relationship with the developers?
3. Comments on purchasing Symbian Ltd in 2008/ establishment of Symbian Foundation 2009/ Outsourcing to Accenture 2011
4. What was the company's reaction to original iPhone in 2007? Your personal opinion?
5. In 2008 the nature of competition changed – it was not the device-based but the ecosystem-based. Could you compare the Symbian ecosystem with newly emerged ones (Apple, Google)?
6. When do you think the top management realized that Symbian is not competitive enough and is not able to compete with iOS or Android? Why do you think the decision to abandon Symbian was postponed?
7. What is your opinion, was the emergence of smartphone market as an incremental improvement of mobile communications or was it disruptive technology which came from internet services rather than mobile communications?
8. Please describe Nokia's global presence and especially the situation in the US.
9. How were Nokia's relations with the operators in the US and Europe?
10. How did Nokia react to the increased competition in 2008 and later?
11. Innovating and rejecting the technology (2004 touch-screen Nokia 7710, Tablet 770 in 2005, N9 in 2011)
12. Please describe the decision making environment and if (how) it changed?
13. Were the common goals and strategy clear for all the units? How did the corporate culture and values change?
14. How did the employees react to the departure of the long-term CEO Jorma Ollila? How did the working style and working atmosphere change?
15. What were the reasons for the radical organizational changes in 2011 (new leadership team with new CEO, new operational structure)? Did it bring the expected results?
16. What do you think about the decision to do cooperation with Microsoft in 2011

#### APPENDIX 4: List of the thesis informants and interview details

	Date	Place	Functional background	
1	10.3.2014	Jyväskylä, Finland	Developer/Technology expert	Symbian supplier network
2	20.3.2014	Helsinki, Finland	Industry expert	Telecommunications and technology expert
3	21.3.2014	Helsinki, Finland	Ex-Nokia	Corporate Strategy
4	7.4.2014	Helsinki, Finland	Ex-Nokia	Products (devices)/Internet
5	7.4.2014	Helsinki, Finland	Ex-Nokia	R&D/Manufacturing
6	10.4.2014	Helsinki, Finland	Ex-Nokia	NSN/Corporate
7	7.5.2014	Helsinki, Finland	Ex-Nokia	Nokia consultant/Senior technology manager
8	3.6.2014	Jyväskylä, Finland	Subcontractor/Developer	Subcontractor
9	5.6.2014	Helsinki, Finland	Ex-Nokia	Technology policy/Corporate
10	9.7.2014	Helsinki, Finland	Researcher/Developer	Researcher/Subcontractor
11	15.7.2014	Online (Skype)	Ex-Nokia	Software/Subcontractor
12	13.10.2014	Jyväskylä, Finland	Ex-Nokia	Technology Platforms/Software
13	5.12.2014	Tampere, Finland	Ex-Nokia	Mobile Phones/Corporate