Business History

ISSN: 0007-6791 (Print) 1743-7938 (Online) Journal homepage: https://www.tandfonline.com/loi/fbsh20

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To cite this article: Juha-Antti Lamberg, Sandra Lubinaitė, Jari Ojala & Henrikki Tikkanen (2019): The curse of agility: The Nokia Corporation and the loss of market dominance in mobile phones, 2003–2013, Business History, DOI: 10.1080/00076791.2019.1593964

To link to this article: https://doi.org/10.1080/00076791.2019.1593964

Published online: 06 Jun 2019.

BUSINESS HISTORY
https://doi.org/10.1080/00076791.2019.1593964

Routledge
Taylor & Francis Group

The curse of agility: The Nokia Corporation and the loss of market dominance in mobile phones, 2003–2013

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ABSTRACT

We investigate how and why the Nokia Corporation failed to develop a successful strategic response to the threats of Apple and Google in the smartphone business and instead worsened its situation through several badly timed decisions. We identify key choices in technology and organisational design that jointly constituted sufficient cause for the abandonment of the mobile phone business. By focusing on choices instead of attributes (e.g. fear or hubris), we make progress in strategic failure research and simultaneously emphasise the strength of oral history methods and the philosophy of history as fruitful starting points for such an inquiry.

KEYWORDS

Strategy; technology management; decision-making; business history; oral history; Nokia

In business history, we can think of very few other cases in which new competitors so quickly and forcefully dethroned an overwhelmingly dominant market leader (cf. Langlois, 1992; Finkelstein, 2006, Van Rooij, 2015) as the case of the Nokia Corporation between 2007 and 2013. Nokia was by no means a passive follower of the novel competitive landscape dominated by the emergence of the smartphone. Nevertheless, its major strategic decisions towards the end of the period of analysis made the situation worse and aggravated the company's plight. In this article, we provide an historical analysis of the strategic decision-making process at the Nokia Corporation. Considering its technology and organisational design choices, we examine how and why Nokia failed to safeguard its strong market leadership in the global mobile phone market between 2007 and 2013. Earlier research on Nokia's misfortunes has found both simple answers (Vuori & Huy, 2016) and very complex ones (Cord, 2014; Doz & Wilson, 2017; Risku, 2010) to this question. Following Van Rooij's (2015) lead, we aim to find a solution that is both theoretically sound and respects historical reality from Nokia's strong technological dominance in the early 2000s – being global market leader with almost 40 per cent share from mobile phone markets in 2008 (see Appendix 3) – to the divestment of its entire mobile phone business unit to Microsoft in 2013.

Our empirical focus is thus on technology choices and decisions concerning organisational design. By technology choices, we refer broadly to stop-go decisions concerning specific technologies and research and development processes and by organisational design we refer to choices concerning organisational structure and incentives. With respect to

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technology choices, we ask the following question: Why did Nokia invest so heavily in its own more or less outdated Symbian software platform even after major competing smartphone platforms – iOS and Android – emerged in 2005–2007 and quickly proved themselves hugely successful? Subsequent question – if and when Symbian development was so difficult and expensive – is the reason why Nokia at the same time also invested in other platform options (at least MeeGo, Maemo, Android, and Meltemi platforms)? Further, all this happened during the critical years after iPhone's emergence and would have required building extensive technological capabilities to implement any of these alternatives accordingly.

Regarding organisational design choices, we focus on Nokia's dominant management philosophy of the era, called 'strategic agility' – and its antecedents and consequences. Doz and Kosonen (2010) define this concept largely based on their experience at Nokia through the organisational capability to quickly change strategic direction using strategic sensitivity, resource fluidity, and top management leadership unity. The paradox we address is that mentally, Nokia's top management was fully prepared to meet new competitors with an 'agile' mentality and willingness to keep the organisation in a constant state of 'structured chaos' (Brown & Eisenhardt, 1997). However, the organisation actually regressed to sluggish decision-making at the top and fierce internal competition between alternative technological platforms at the lower levels of the organisation. Nevertheless, we want to emphasise that Nokia's failure in the mobile phone market is not a story of defunct leadership at the top of the corporation *per se*. On the contrary, we see Nokia as a prime example of the performative aspects of contemporary management thinking in its search for an agile organisational form and its use of top-tier professors and prominent management consultants as catalysts in the process. However, sometimes an organisation is ill prepared for this type of novel thinking, and the resultant new ways of working may severely distort the functioning of some of the core processes of the organisation, in this case technology management (including more traditional research and development activity). This tension makes the history of the corporation very interesting as a natural experiment of the performative effects of strategic management ideas and fashions (Abrahamson & Fairchild, 1999).

Our research makes two contributions. First, it joins earlier critiques of causal inferences in case studies by showing the complex nature of strategic failure processes and the consequences of that complexity. Essentially, without access to company archives, all research on Nokia (or any other corporation) remains tentative. This is not a problem if we realise the limits of our research, but most of the similar case studies published even in top management journals ignore these limitations when seeking theoretical explanations, contributions and 'being interesting' (Barley, 2016; Davis, 1971). Second, we identify key choices in technology and organisational design that jointly constitute sufficient cause for the abandonment of the mobile phone business. By focusing on choices instead of attributes (e.g. fear or hubris), we make progress in explaining strategic failure research and simultaneously emphasise the strength of oral history methods and more broadly the philosophy of history as fruitful starting points for such an inquiry.

Literature review

One key question in both business history and strategic management is to understand why firms differ in their investment choices and subsequent performance (Kornberger, 2013). Consequently, firms' failure to make choices that result in long-term positive economic

performance is a central research topic. Ever since some seminal contributions (Ghemawat, 1991, Mokyr, 1990; Henderson & Clark, 1990), researchers have turned their attention to different industries and analysed cases of failure, for example, in manufacturing (Lorenz, 1991; Magee, 1997), service industries (e.g. Bakker, 2005), and high-tech industries (Cusumano, Mylonadis, & Rosenbloom, 1992; Langlois, 1992). The research on failed technology adaptation and erroneous technology choices typically frames incumbent firms as particularly slow in making radical changes to their products (Ansari, Garud, & Kumaraswamy, 2016; Christensen, 1993). The Beta vs VHS video standard is a classic case in which customer needs (e.g. video rentals and recording time) and ecosystem building were the major determinants in VHS's victory over its competitor (Cusumano et al., 1992).

Beginning by explaining performance problems through hindsight is problematic in terms of causal explanations. For example, the well-known case study on the demise of Polaroid (Tripsas & Gavetti, 2000) highlights the role of top management cognition as a crucial impediment to strategic renewal. Similarly, Danneels (2011) frames the failure of the typewriter manufacturer Smith Corona to adapt to computer-based word processing as a cognitive problem – managers of Smith Corona could not adapt their mindsets to the new technological era. Both case histories have been important in developing our theoretical understanding of strategic failures; however, they are problematic as causal explanations (see Cornelissen and Durand (2012) for a thorough discussion; Denrell, 2003; Rosenzweig, 2008). First, by stating that biased or narrow ways of thinking by the top management team (i.e. in managerial and organisational cognition) resulted in organisational collapse is not the same as inferring a bullet or a shooter pulling the trigger caused a person to die in a shooting incident. In the shooting case, A causes B, but in both the Smith Corona and the Polaroid cases, we know that A (top management team cognition) and B (organisational collapse) may *co-occur*, but this has little to do with a causal explanation and probably not even with a causal inference (see Mahoney, 2000; Pearl, 2000).

In general, causal reasoning is especially challenging in disciplines such as business history or strategic management. The challenge originates from the philosophical difficulty of making theoretical generalisations from empirical findings (Ketokivi & Mantere, 2010). In principle, all inductive reasoning is speculative, as researchers cannot control all alternative explanations (Mahoney, 2003) or run a counterfactual analysis (Morgan & Winship, 2015), which is the strongest test of causality. In single case studies in which the motivation for the study is to explain backwards from the outcome, causal inference becomes very difficult, if not impossible. Thus, studying Nokia's unfortunate years in 2007–2013 with the CEO and Chairman of the Board, Jorma Ollila, or some other absent factor would pose a great analytical challenge, excluding simulations (compare Harvey, 2012). However, this type of approach would be the only way to arrive at the causal conclusion that Nokia was managed deficiently.

As Ketokivi and Mantere (2010) describe, scholars have taken different positions as a consequence of the dilemma of causal inference in inductive studies. One group of scholars has adopted an explanatory viewpoint, emphasising the value of theoretical explanations in science. For example, a study may be valuable because it is interesting and provokes new ideas (Davis, 1971), even though its empirical grounding is not solid. In contrast, a Spartan view starts from a premise that truth (Seale, 1999) or the search for truth-like explanations (Danermark, Ekström, & Jacobsen, 2005) is the only acceptable virtue in science. This approach motivates the critical realists in business history (Kipping & Lamberg, 2016) and social sciences in general (Mahoney, 2000) and is something that our research aims to achieve.

Literature on Nokia's drift towards the divestment of its mobile phone business in 2013 is a miniature of the problems related to retrospective causal inference in general. At the end of 2018, ex-managers, journalists, business scholars, and other writers published at least ten (see Appendix 2) articles, reports, teaching cases, and books offering specific explanations for Nokia's failure to maintain its competitive position in mobile phones. The explanations fall into two broad categories. On the one hand, some publications (e.g. Van Rooij, 2015; Ali-Yyrkkö et al., 2013) see the process as a relatively deterministic evolutionary struggle during which Nokia tried but failed to adapt to the new competitive situation catalysed by players such as Apple and Google. On the other hand, the remaining basket of books and articles (e.g. Cord, 2014; Salminen & Nykänen, 2014; Doz and Wilson, 2017) focus on Nokia's internal leadership problems as causing the failure. From this category of studies, Vuori and Huy's article in *Administrative Science Quarterly* (Vuori & Huy, 2016) was the first to blame Jorma Ollila, the CEO (1992–2006) and Chairman of the Board (1999–2012). Ollila's aggressive temper and confrontative managerial style was presented as the root cause of many internal misfunctions and Nokia's ultimate failure to renew itself. Siilasmaa's (2018) (member of the Nokia board of directors since 2008 and chairman of the board since 2013) recent book echoes Vuori and Huy's (2016) results and frames Ollila's ultra-formal way of managing the board as an important factor in Nokia's failure. Likewise, Ollila's memoirs (Ollila & Saukkomaa, 2013) blame his successor, Olli-Pekka Kallasvuo (as CEO in 2006–2010), for failing to manage the process of strategic renewal. Overall, the publications focusing on Nokia's internal struggles mainly belong to the explanatory view of inductive reasoning. The main aim of these studies is to offer a dominant theoretical explanation such as fear, faulty management, or challenging organisational design (Doz & Wilson, 2017), not to study Nokia's history to discover more robust causal relations between doings and undertakings on the one hand and key organisational outcomes on the other.[1]

Historical research is relatively distinct from theory-motivated case studies in the management field (Decker, Kipping, & Wadhwani, 2015), especially in terms of causal reasoning. As Mahoney, Kimball, and Koivu (2009, p. 124) characterise, 'Historical explanations […] explain the specific past occurrences; the question of whether and how the resulting explanation might then be generalised is a secondary concern. Accordingly, if generalisability is not the primary driver of research, it needs to be the primary driver of how causal inferences are made. Most historical reasoning works with INUS conditions,[2] referring to how '[…] multiple causal factors combine together to produce particular outcomes. The individual causal factors are neither necessary nor sufficient; rather, they are part of an overall combination that is sufficient for the outcome (Mahoney et al., 2009, p. 129)'. Accordingly, the research motivation is to find combinations of factors that are sufficient but not necessary to explain the outcome (e.g. inability to build a better phone in our case). For example, it is possible that there may be some other explanation (such as CEO Elop truly being a Microsoft mole who engaged in a disguised plot to cause trouble for Nokia), of which we do have evidence and cannot predict. We essentially follow these principles and Van Rooij's (2015) lead in looking for a more balanced and causally believable explanation for strategic failure based on an understanding that there is no necessity for one or even few explanations:

> Success may be due to chance and luck in this perspective—and failure outside a firm's control. Consequently, we are left with irony: a good-humoured fatalism that puts success and failure in business down to a bit of luck and perhaps some hard work—but as something outside management's control. (Van Rooij, 2015, p. 203)

Our mission is to move towards a more analytical and causally plausible understanding of Nokia's loss of market dominance in mobile phones. We ask why the corporation was unable to make a transformation from feature phones (with a tactile keyboard and static software) to smartphones (with a touchscreen and dynamic software, including numerous new functionalities for the use of a phone). Compared to the above-identified problems in earlier research, ours aims to be less subjective and certainly less emotional, and it aims to follow the principles of causal inference in judging the strengths of the identified causal mechanisms. These principles are all features of good historical research, and in this sense, we offer nothing more or less than an analysis of Nokia's evolution based on evidence, an understanding of *ex ante* causal factors, and the strengths and limits of causal inference. Likewise, before the Nokia archives open to researchers, the best we can do is to follow the advice of Collingwood (1951) to first study choices (i.e. the outer realm) before rushing to understand the behavioural and motivational factors driving these choices (i.e. the inner realm). Accordingly, we hope that our study will serve as a model for business history scholars who will have the archival access currently lacking or who identify similar turning points in other contexts. We start our inquiry with a short reading of Nokia's recent history.

A short history of Nokia[3]

At the turn of the 1980s and the 1990s, Nokia Corporation faced a severe crisis and was forced to make a corporate turnaround. In the process, the company quickly concentrated on mobile phones and telecom networks and by the mid-1990s, had divested itself of dozens of other lines of businesses. By the late 1990s, mobile phones clearly produced the majority of both the net sales and the operating profit of the company (Appendix 3). In 1982, Nokia introduced the world's first car phone for the Nordic Mobile Telephone (NMT) analogical standard. In 1991, the GSM standard for digital cellular networks was adopted as the pan-European digital standard – again, Nokia played a key role in the related technology development and standardisation process (Manninen, 2002). While mobile communications evolved rapidly throughout the 1990s and the early 2000s, Nokia was able to establish itself as the clear global market leader in mobile handsets, with sales peaking in 2007 and remaining in that position until the second quarter of 2008 (Appendix 3).

The success of Nokia in the early 2000s and its technology development was linked to the Symbian operating system. In June 1998, Nokia, Ericsson, Motorola, and Psion established Symbian Ltd., which became the developer of the operating system Symbian OS.[4] The company's main strategic focus during the early 2000s was to expand to both the mobile voice market and the multimedia business. As we will see below, these targets were sometimes conflicting rather than complementary in terms of technological and organisational choices and strategies. For example, in 2004 alone, Nokia introduced 36 mobile device models[5] in all price ranges and with a wide variety of functional features. Market penetration was impressive – Nokia sold its billionth phone in 2005,[6] and its peak global market share reached 39% in early 2008 (Appendix 3).

After the introduction of Apple's iPhone in 2007, Google's announcement that it had formed an Open Handset Alliance to develop standards for mobile devices and, most importantly, Android OS, the situation in the mobile phone device market quickly began to agitate. For the first time in its recent history, in the latter half of 2008, Nokia's global market share

in mobile devices declined. In only two years, Nokia's operating profits shrank; by 2011, the corporation as a whole was unprofitable.

In 2008, Nokia's top management made a decision to acquire the full ownership of Symbian Ltd., which was still the world's leading smartphone software platform.[7] In 2010, Nokia launched an 'iPhone killer' – the flagship N8, which was the first product to run on the improved Symbian^3 OS, but with no success in challenging iPhone. Moreover, in February 2010, Nokia and Intel officially announced joint plans to build a new software platform, MeeGo, which would support multiple hardware architectures.[8] In the fall of 2010, the former head of the Microsoft Business Division, Stephen Elop, was appointed as the new CEO of Nokia. The strategic intent of Elop's new top management team was to regain product leadership in the smartphone market and to retain the market leader position in low-end mobile phones. To do so, Elop and Nokia announced a collaboration between Microsoft and Nokia 'to form a broad strategic partnership that would use their complementary strengths and expertise to create a new global mobile ecosystem'.[9]

Contrary to its earlier strategy, Nokia decided to adopt the Windows Phone operating system (OS) as the primary smartphone platform for Nokia devices for (at least) three years. This decision also meant the end of the development of Symbian OS, MeeGo, and other OS projects an area in which literally thousands of software developers and engineers were still working at full steam. In September 2013, after two years of close cooperation between Nokia and Microsoft, the companies announced that Microsoft would purchase Nokia's Devices and Services business.[10] In hindsight, the Microsoft acquisition was only a cosmetic change to the market battlefield, as the Android camp and to a lesser extent, iOS/Apple had seized the dominant position (Figure 1).

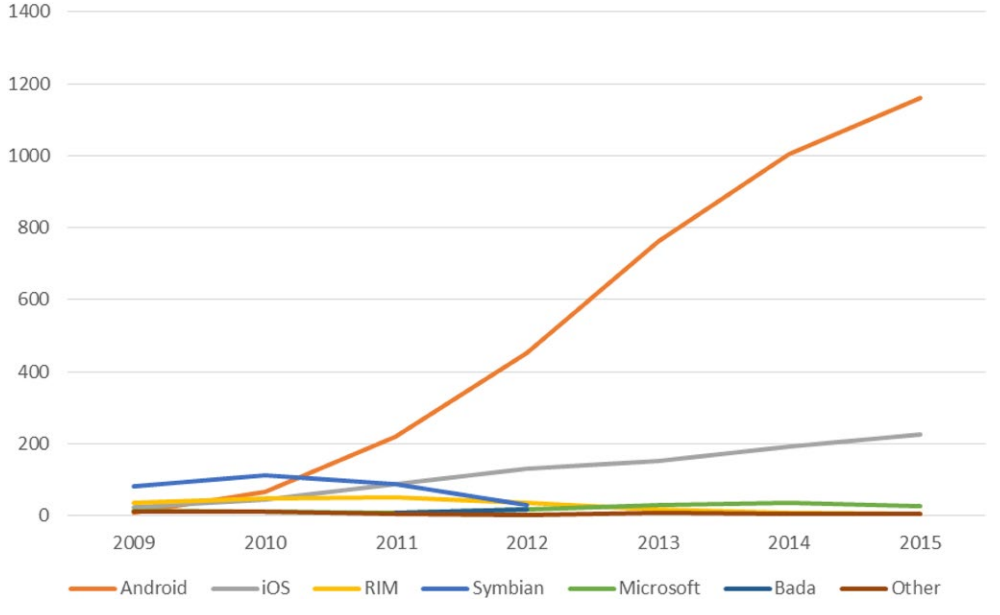

Figure 1. Smartphones sold globally according to their operating systems, 2009–2015, million units. Source: https://www.statista.com/ (retrieved 15 September 2016).

Method

Our study is a part of a larger oral history programme called 'Memory of Nokia' (for similar programmes see, e.g. Alexander, 2015; Giertz-Martenson, 2012; Kroeze & Keulen, 2013). We started a research and oral history collection after several (technology) managers who had worked at the Nokia Corporation contacted us as researchers and urged us to start collecting the memories of Nokia's former employees. We started data collection in 2010 first by arranging manager and expert interviews and continuing with an analysis of the rapidly accumulating accounts on social media, where former Nokia employees often share their memories. For the purposes of this study, we primarily use the first set of interviews conducted in 2010–2014.

We followed best practices of oral history research tradition, emphasising that oral history is both a (subjective) research methodology (conducting interviews) and a result of the research process (see especially Abrams, 2010; Portelli, 1998). According to the Oral History Association's guidelines,[11] we started our inquiry by collecting academic publications on Nokia's history (see also Friedlander, 1998; Heehs, 2000). We used this collection to create a timeline of the main historical events in Nokia's evolution and to obtain an understanding of how other researchers have approached Nokia's technology management and key organisational choices. At the same time, we systematically collected hundreds of newspaper articles, business magazine reports, and other public material that we triangulated with the academic research reports. After this initial phase of data collection, we assembled all available public material produced by Nokia. This material included the full series of annual reports, CEO letters, and internal company magazines. All of these data have been deposited in a specific research repository available to other scholars.

After creating a solid collection of publicly available material, we entered into the second phase of our data collection. We interviewed 28 former Nokia executives and experts from the telecommunications industry. Our informants included six former members of the top management team and/or board of directors, 11 executives from corporate headquarters, five middle-level managers who had worked in important positions during the Symbian era and seven experts who had consulted for or worked with Nokia in software and application development. The selection criteria for whom we wanted to talk with were as follows. First, following the guidelines of the oral history research process (Friedlander, 1998), we looked for technology experts with a long tenure either at Nokia or in its proximity (at supplier companies, consulting companies, etc.). All of our informants (one board member excluded) had considerable Nokia experience and knowledge since the early 1990s and even earlier from the Mobira era in the 1980s (for the history of Mobira see Aspara, Lamberg, Laukia, & Tikkanen, 2011). Long tenure was crucial, as we were interested in the 'life-stories' of each individual (László, 2008; Portelli, 2010). Second, we focused on people with a strong technological background. Executives have already had many opportunities to tell their versions of the process (starting with CEO Jorma Ollila's memoirs and widespread media attention since 2013); we primarily wanted to talk with middle managers and technology experts who understood (a) the strategic challenges of the corporation and (b) the limits of Nokia's internal technological competencies to build better smartphones. This allowed us to avoid the 'narrative imperialism' (Maclean, Harvey, & Stringfellow, 2017) and intersubjectivity problems prevalent in earlier research on Nokia and in the oral history tradition more generally (Summerfield, 2000). Finally, we had no personal links with the informants. This is important

since many compatible longitudinal studies are based on 'casual ethnography' (Westney & Van Maanen, 2011) – that is, they are conducted by scholars who are familiar with the context and are even friends with the key actor-informants (see, e.g. Burgelman, 1994; Doz & Wilson, 2017).

In the interview process, we again followed the guidelines of oral history research. We started with questions concerning personal background and attributes (e.g. the length of tenure at Nokia, education, and other similar information). However, we primarily provided an opportunity for informants to freely tell their life histories concerning the Nokia Corporation and the mobile phone business in general. Interview sessions lasted from two to three hours and were recorded and transcribed. Our analytical strategy built on the strength of the oral history method (compared to, for example, in-depth interviews). As Hesse-Biber and Leavy (2005) describe, this allows the study of processes instead of attributes and understanding processes in a holistic way:

> What is really underlying the strength of the method is that you can study process. If you are studying a woman's life from childhood through college in order to understand her body image issues at the present time, what you will learn about is not only what she is currently experiencing and her perspective on that, but the process that lead her there. Likewise, historical processes and circumstances will underscore her narrative in ways that help us understand individual agency within the context of social and material environments. So, while oral history focuses on the individual and her narrative, it can be used to link micro- and macrophenomena and personal life experiences to broader historical circumstances. Accordingly, oral history is a critical method for understanding life experiences in a more holistic way as compared with other methods of interviews. (Hesse-Biber & Leavy, 2005, p. 153)

In this spirit, we aimed to document Nokia's final 10 years in the mobile phone business as it was told to us while simultaneously being conscious of the problems of subjectivity and intersubjectivity. Accordingly, we weighted all information against other sources and the narratives we had accrued, attempting to avoid 'ready-made' narratives given, for example, in earlier research and popular media texts. We started our analysis phase by synthesising Nokia's history with the larger societal and market evolution. At the same time, we built a chronological database of Nokia's historical evolution, focusing on key strategic decisions, changes in the top management team, and changes in the corporate structure. In the second phase of our analysis, we mapped the evolution of Nokia's technology management. During this process, we held a workshop in which all members of the research team analysed the same data by reading the material, taking photographs and making photocopies of individual documents, and finally drawing figures and system descriptions that resulted in an explicit understanding of the key characteristics of technology evolution over time and across organisational sub-units. Consequently, we focused on the rhetorical and textual representations of strategic technology-related decisions by analysing key documents and interview transcripts that included explicit statements related to our research framework focusing on technology choices and organisational design (see Vaara & Lamberg, 2016). We report our findings in the following pages. The interview excerpts are intended to demonstrate the personal memories and narratives of our informants rather than to be interpreted as 'evidence'. Our reasoning is based on our extensive historical work based on source triangulation and represented, for example, in numerous timetables, figures, and depictions of key decision-making points along the evolutionary processes analysed in our study.

Analysis

Technology choices concerning new business challenges

In the following, we focus on two causal factors that we argue combined with organisational design decisions as a sufficient cause of Nokia not producing a better smartphone between 2007 and 2013. The two factors are (1) continuing with Symbian and (2) deciding to abandon Maemo and build an alliance with Intel to develop MeeGo, among other software experiments. Together these two factors – making one decision slowly and others too fast – are sufficient cause – we argue – for why Microsoft OS in 2010 was the only available option after Symbian became outdated and MeeGo and Meltemi were not ready for commercial use. These technological choices were part of the company's internal decisions – and, to a certain extent, internal political struggles – regarding its future technological focus areas. Figure 2 presents the causal structure of this argument in graphical format and Table 1 lists the OS projects in which Nokia invested between 2007 and 2013.

Earlier literature lists the development of the Symbian software platform as the most crucial technological issue in the rise and fall of Nokia's mobile phone domination.[12] Nokia was locked into a strong path dependence,[13] '[…] outcome in any period depends on history and can depend on their order' (Page, 2006, p. 97), with the Symbian software platform and hardware development simultaneously being a captive of the company's major telecom operator customers. However, the evolution and importance of the Symbian OS cannot be understood without considering the interdependence between software and hardware development – and the targets of technology development from the perspective of strategic marketing. Our informants suggest that throughout the early millennium (approximately

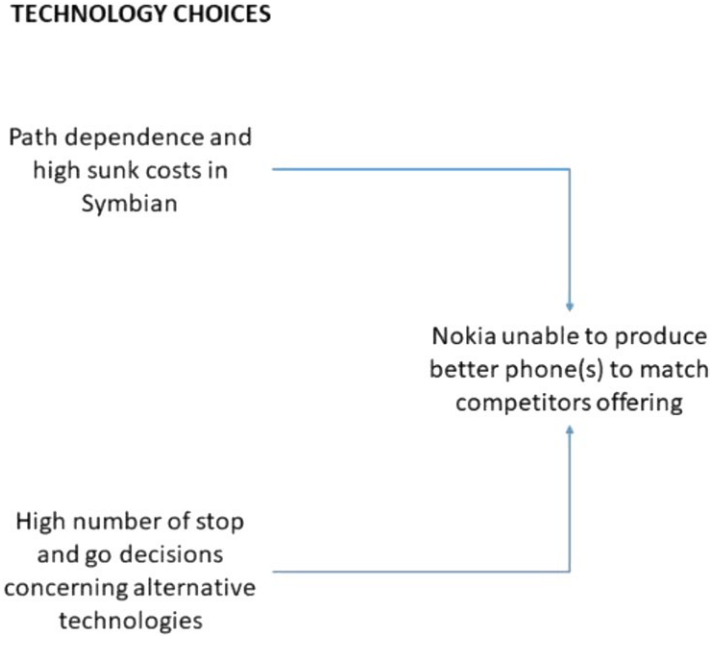

Figure 2. Causal structure of technology choices.

Table 1. Nokia's (known) operating system projects after iPhone launch in 2007.

Operating system	Description	Life cycle	Application compatibility	Heritage
Symbian	After the acquisition of Symbian Foundation in 2008, Nokia launched three Symbian generations, ^1, ^2, and ^3. Rumours of Symbian ^4. Used in high-end mobile phones.	2001–2012	Practically no compatibility across Nokia OS environments and limited compatibility between Symbian generations and modifications.	Symbian development effectively stopped with Stephen Elop's burning platform speech and subsequent outsourcing of Symbian development to Accenture in 2011.
Maemo	Linux-based open source project which resulted in few commercial products (especially N900 in 2008). Targeted to high-end smartphones.	2005–2010	In the beginning, no compatibility with any Symbian OS varieties. Potential compatibility with Android, MeeGo, and Meltemi (due to shared Linux-kernel) and at least through cross-platform software (QT).	Maemo project was stopped and the resources transferred to the MeeGo project.
MeeGo	Linux-based OS development project in alliance with Intel Corporation. Resulted in one commercial product (N9) and one product only targeted for developers (N950). Targeted to high-end smartphones.	2010–2011	Potential compatibility with Android and Maemo and designed compatibility with Meltemi (from Meltemi to MeeGo).	Nokia withdrew from the MeeGo project when it decided to solely use Windows OS in its smartphones. Jolla and its Sailfish OS were successors of MeeGo OS. Members of the MeeGo development team switched to Meltemi as did large parts of the code.
Meltemi	Linux-based OS running on top of modified Android kernel and targeted to low-end phones (less than $100). Never officially released yet pictures of prototypes exist. Targeted to low-end mobile phones.	2010–2012	Designed compatibility with MeeGo and potential compatibility with Symbian through cross-platform software (QT).	Nokia's top management planned Meltemi to be a competitive complement to Windows OS in the low-end feature phones yet the project never resulted in any commercial products.
ASHA	OS that built on low-end S40 (Symbian) OS and received features from Meltemi and MeeGo.	2012–2014	No compatibility with other OS versions.	Asha was the successor of S40 and to some extent Meltemi and produced few commercial products.
Windows	OS built originally by Microsoft Corporation and later designed in Nokia for the Lumia series. Targeted to high-end smartphones.	2011–2016 (last three years in Microsoft)	No compatibility with other OS.	Windows became the sole smartphone OS in 2011 and was used in a variety of commercial products until Microsoft divested the business line entirely.
Android	Nokia built prototypes of Android phones both for high-end Lumia hardware and low-end Asha hardware of which the latter project resulted in the Nokia X family.	2010–2014 (the exact start of the development project is unclear but probably started before the Windows decision was made)	Compatibility with Android apps.	High-end Android phones did not enter into the commercial market. The low-end X family resulted in few products while soon stopped by the new owner, Microsoft.

Sources: Press releases, SEC filings 2007–2013; oral history database; technology oriented web-collections such as http://mynokiablog.com/2014/11/25/mythbusting-nokias-meltemi-part-1-n9-elop-android-safest-best/ [retrieved 25 July 2018].

from 2001 to 2010), hosts of high-level executives engaged in intra-firm competition to direct the corporation's technology strategy. This competition regressed in three alternative directions: (1) whether the company should maximise profits by lowering costs (the 'low-cost' strategy); (2) whether the aim should have been to develop software and hardware to enable high-end features (the 'smartphone' strategy); and (3) whether the company should emphasise security and target emerging business markets (the 'enterprise solution' strategy). Over time, these three competing strategies led Nokia to establish separate units with conflicting interests within the company:

> There were no gaps in know-how or competence—it was all about choosing between three options: optimizing costs and volume, maximizing performance, or maximizing security. And we moved toward optimizing costs. The hardware decisions based on cost optimizing made it impossible to achieve performance in software. (Ex-Nokia executive)

After the appearance of iPhone and Android phones, the rivalry culminated between low-cost and high-end phones. At the time, the key rival technologies were Series 60 and Series 90 (and their variants) – and, again, in practice, the two technology views of the company: whether to focus on Series 60 (which required less expensive hardware) or on high-end smartphones (which would have been better enabled by Series 90 than by S60). The low-cost strategy won in 2010 and was driven by Nokia's top management for economic and organisational reasons: low-cost mobile phones brought in the bulk of Nokia's revenues, and the corporation's centralised software development wanted to concentrate on one main platform instead of two with their different variants.

The very beginning of the tripod strategy among low cost, smartphones, and enterprise solutions occurred when three major mobile phone producers (Nokia, Ericsson, and Motorola) and Psion founded Symbian in 1998. Symbian's governance structure was peculiar, considering its role as the leading mobile operating system before 2007. Each company had the same number of shares in Symbian, but at the same time, each had its own strategic agenda. Our material emphasises that the ownership structure made it impossible to strategically develop Symbian during its first years, as the owners had different views on the basis for this development. These differences of opinion resulted in three different types of Symbian operating systems and their varieties. In practice, this rivalry continued for ten years, until Nokia bought Symbian in 2008. As one of our informants concluded, 'Symbian was handicapped from the beginning due to this fracturing [between owners]'.

The major problem for Nokia was to simultaneously pursue three objectives with the same platform. Over time, these divergent development processes resulted in a situation in which the software was complex and difficult to manage while the hardware was kept as inexpensive and simple as possible. This was satisfactory for ordinary phones, but impossible for high-end products that required maximal performance. For Apple and Android, development was performance- and feature-driven from the beginning in terms of both hardware and software. The computational power of CPU is not the only story involving what makes some phones better than others. However, the comparison below (Figure 3) illustrates the result of Nokia's decision to focus on cost instead of excellence: Nokia lagged behind in computational power, which had concrete effects on the features and functionality that the company could offer to the high-end market segment.

It is wrong to demonise Symbian in hindsight. In its heyday in the early 2000s, Symbian was the most advanced, efficient, and power-saving mobile OS, and it quickly became the

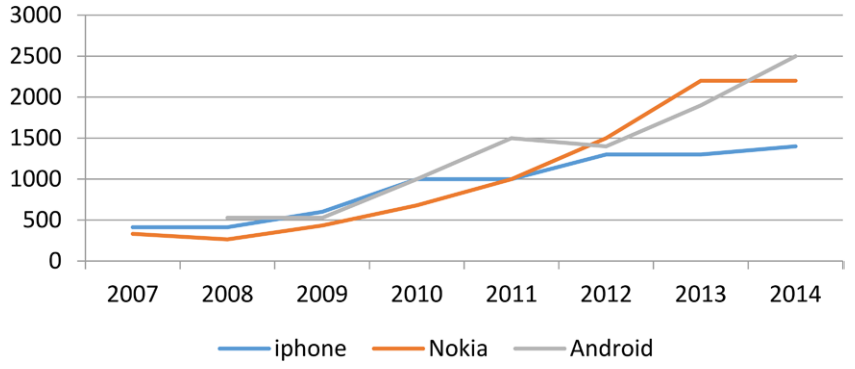

Figure 3. CPU speed of high-end smartphones (Nokia, iPhone, Samsung/HTC).[23] Source: http://www.gsmarena.com/ (information retrieved 12 October 2016).

core element of Nokia's R&D processes. This dependence became stronger in 2008, when Nokia acquired full ownership of Symbian Limited and initiated plans to create an independent entity that would lead the development of the platform.[14] In other words, one of Nokia's reactions to the changing market situation was to accelerate the development of Symbian:

> 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 basically calm. But, yes, it was a blessing and a curse because it was already an old operating system. (Industry expert)

> The good thing about the Symbian was that it used much less memory and resources than the other operating systems. And, because we selected Symbian, we were able to bring the smartphone to the marketplace […] But I think that if we had not selected Symbian, we would have not have gotten that far; we would have had much less knowledge of applications and the software development kit that Symbian people were familiar with. They understood the market in the same way as corresponding American companies. (Industry expert)

Although the Symbian OS was recourse-efficient, reliable, and worked well with the early smartphone devices and later with devices for developing markets, there were serious impediments to Symbian's success in the new competitive situation: limitations in creating apps and the absence of an Apple-type app store, the fragmented ecosystem, and poor user friendliness. Under Nokia's ownership, the Symbian ecosystem aimed to overcome these obstacles. However, changes took too long and efforts were not always as expected. The key challenges with Symbian were, first, its complicated structure, which made development difficult, and, second, the fact that there were numerous versions of Symbian.

In the telecommunications industry, the *modularity* of the software platform became crucial after smartphones with hundreds of applications emerged. Modularity enabled rivals – especially firms making Android phones – to enter markets quickly, undermining Nokia's production efficiency, distribution, and logistics. The central architectural problem with the Symbian software was that it was not modular. Therefore, devices were tightly coupled with the release of each software version and the performance enabled by the hardware. At the same time, dozens of different Symbian software versions were available, but they were not entirely compatible with one another. Thus, there was de facto no common platform. The main difference between Symbian and today's most popular operating systems, such as

Android or iOS, was that device development drove platform development – the product-specific software was only compatible with that device in many cases. A built-in software upgrade function was not available (the first Symbian *Anna* update of Symbian^3 was only available in 2011), and different parts of the software could not be developed and sold. This method of organising software development was similarly reflected in Nokia's organisational structure, which made decision-making about key technological choices complicated, slow, and resource-intensive.

The question of software design was interlinked with decisions about CPU features and prices. Around 2007, Nokia's top management needed to choose between two competing hardware (microprocessor architecture) solutions: Nomadik and Rapuyama. Nomadik was the choice of managers willing to focus on high-end products, whereas Rapuyama was optimal for the low-cost strategy. Top management (Olli-Pekka Kallasvuo and his inner circle) opted for Rapuyama. As a result, only Nokia N96 used Nomadik microprocessors in 2008,[15] whereas the bulk of Nokia phones were based on Rapuyama architecture. The decision resulted in a situation in which Nokia attempted to offer the same features (cameras, etc.) as its rivals with less powerful CPUs and inferior software.

At the same time, when Nokia's top management clashed when choosing the optimal OS/CPU combination, the development of the new Maemo OS had already started, although according to our informants, resources were still mainly allocated to Symbian:

> The best people applied for the Maemo developing team [around 2007/8], as they saw it as a future. This further messed up the Symbian development. (Ex-Nokia executive)

Coupling software and device development may have led to perfectly tailored software for a certain device; however, by 2010, it proved inefficient and overly resource-intensive. The tightly wired and coupled development and matrix organisational structure, which was changed constantly, led to a situation in which no one in the organisation was able to speed up the development process independently:

> […] 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, it was not at all sure that when you developed an application, it worked across the whole Symbian product portfolio. (Software developer)

> [By 2003,] as a group of organisational development people, we realized that the Symbian development was too heavy. It was inflexible; it was not doing what the software would be doing. (Consultant)

According to our informants, developing applications on the Symbian OS was substantially more difficult than on iOS or Android. Nokia's developer community grew steadily until 2008 and involved some 8,500 developers, approximately 2,500 of whom were independent subcontractors or developers.[16] However, after 2008, the situation changed, and as more attractive open-source systems became available, Nokia was unable to maintain its developer community: device-specific releases, uncertainty, and constant delays destroyed the confidence of Symbian OS developers.

The developer problem partially explains another major reason why Symbian did not prevail – Nokia failed to provide and nurture a functioning Symbian *ecosystem*. In the telecommunications industry, the number of users determines the possibilities for building a credible ecosystem and, thus, the possibility for achieving network effects (Griva & Vettas,

2011). Nokia's early ecosystem-building attempts included close cooperation with network operators. However, with the rise of Internet-based services and ecosystems, it became apparent that operators were unable to provide that kind of service. Nokia and the operators were constantly bickering over whose prerogative it was to create online stores, applications, and downloadable content:

> The only difference in what Steve Jobs understood is that neither Nokia nor operators understood software. Nokia was pretending; all the operators were pretending. All the operators' CEOs were telling Ollila or Kallasvuo that 'Nokia does not do a product that has an application store' […] Typical telecommunication ecosystem behavior in which operator is the king. And the operator pretends to be the king of things it does not understand either. (Ex-Nokia executive)

As the industry's dynamics changed after the iPhone revolution, the power of network operators plummeted. 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 attracted more than 13 million downloads per day,[17] but the iOS app store and Google Play store offered millions of applications and attracted billions of downloads per day. Nokia lost the app game, as it was not able to build an attractive business ecosystem. Nokia was and remained a telecom company, unlike its rising rivals Apple and Google – with origins in computing and the Internet – and thus presented a different view of the industry. This difference was also continually noted by the informants in this study:

> I think it (Internet services) was disruptive, but the smartphone itself – I don't think that was the actual thing. It was the mobile Internet that came before the smartphones. And probably the second disruptive things were the applications that came on top of that. (Supplier)

Again, the issue was not one of the capability to understand trends: Nokia's management realised the value of downloadable content early on: by the turn of the 21st century, Club Nokia services were available and offered products such as ringtones and background pictures – but they were not applications in the sense that was common to smartphones a decade later. The main obstacle to generating more user content was that Symbian OS was not an open-source system; external developers had to wade through numerous legal procedures to bring their apps to the market. Even after Nokia made the Symbian OS fully open source, the platform was unappealing to the developer community:

> The Symbian ecosystem was driven by the manufacturers and the operators, while the other ecosystems that emerged then were dominated by the applications and the service developers. That was the fundamental difference. (Ex-Nokia executive)

The end of the Symbian era came on 11 February 2011, when Nokia announced that it was joining forces with Microsoft and making Windows Phone its primary smartphone platform.

It is important to note that Nokia's top management and technology specialists recognised rather clearly and realistically the challenges of the Symbian OS and the new ecosystem-based competition logic. Management discussed multiple options for a new technology strategy in terms of both software and hardware. One option that was widely discussed in the media was whether Nokia should have used the open-source Android operating system and dismissed the ongoing development with Symbian – and, in the end,

not allied itself with Microsoft at all. If Android had been selected, Nokia could have become the quality leader, better than Samsung, HTC, or any other manufacturers using the same software. However, top management attempted to avoid becoming a software-agnostic hardware vendor at all costs and thus wanted to avoid the open-source option. In 2010, one of Nokia's top managers, Anssi Vanjoki, made it clear that choosing Android OS would have solved only short-term problems and would have not provided any solution for the company's long-term strategic problems.[18] Even with Android, Nokia would not have had a dominant operating system under its control. Accordingly, although the decision to adopt the Microsoft platform was controversial, many of our informants agreed that it was the logical choice.

> […] the only alternative was the old archenemy Microsoft, which 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 make. (Industry expert)

Although Microsoft did not possess an outstanding market share in the mobile phone market, it did – in theory – possess the software muscle to push development forward. Additionally, Microsoft had a strong presence in the enterprise sector in which Nokia attempted to win back lost corporate customers. MeeGo, Maemo, Meltemi, and newly coded versions of Symbian were options before the Elop regime, but they never obtained enough support and network effect to break in commercially.

In summary, the picture of Nokia's technology strategy from 2003 to 2013 is confusing. In the beginning, Symbian became an endogenous element in practically all high-end phone development, and when its inferiority in the new competitive setting was later recognised, Nokia launched a series of development processes (new versions of Symbian, Maemo, MeeGo, Meltemi, Nokia X, other prototypes with Android, Microsoft, etc.), each requiring attention and other resources and even resulting in fierce internal competition 'between factions', as one of our informants described the last years of mobile phone production at Nokia.

As the above narrative and Table 1 demonstrate, Nokia executives made many peculiar decisions concerning the technology strategy of the corporation. For example, Nokia had already launched a number of commercial products using Linux-based Maemo OS (e.g. the Nokia N900). For unknown reasons, the development of Maemo was stopped and switched to the MeeGo project in 2010 and simultaneously to the Meltemi project. MeeGo was a joint operation between Nokia and Intel and proceeded slowly. It is possible that Maemo had such technological challenges that it came to a dead end. However, the decision to enter into the mentioned alliance in a situation in which urgency was very high is unusual because of the well-known risks of inter-firm alliances. It is possible that the competitive threat was not seen as a true strategic challenge, as Nokia had already succeeded in besting its competitors' innovative new products with its superior production capacity and logistics – or simply by copying products (such as the Motorola Razr and the RIM Blackberry earlier). Thus, management clearly thought that copying the iPhone would also be possible, for example, by using the emerging MeeGo platform, but it was not ready yet to compete without having developers and applications for MeeGo devices:

> I think it was a classical type of thing that Symbian was hoping that MeeGo would come earlier and MeeGo was hoping that Symbian would last longer, and kind of neither happened. And there was a clear mismatch of what was needed in the market and what was available from Nokia. (Ex-Nokia engineer)

> [The dismissal of MeeGo] …was basically because it was felt at that time that there was not a proper ecosystem supporting MeeGo—to make MeeGo successful in a global marketplace, you would have needed these 4.5 million application developers. And there was not a single one at that point when it was introduced to the markets. And the overall development was slowed down in the latter part of 2000. (Ex-Nokia executive)

Overall, Nokia's technology development stretched to many directions and lacked a clear strategic vision: the corporation was not in paralysis but just tried to do too much in a short period of time. We are left with two open questions important for our understanding of how and why Nokia was left behind in the OS competition: (1) Why did specialists and decision-makers in Nokia believe and invest in Symbian for such an extended period of time; and (2) why and how did key decision-makers engage in making a series of stop-go decisions concerning alternative technologies in a situation that would have required focused action?

Organisational design both unfrozen and disunited

In the previous section, we identified two causal conditions (Symbian and the number of alternative technologies) as having a direct causal relationship with the effect that Nokia was unable to produce a competitive smartphone after iPhone and before the business was divested. Next, we demonstrate the inconsistency in Nokia's organisational design that logically affected the two conditions related to technology management. Because we do not have data, for example, on individual-level movement from one business unit or R&D project to another, we do not know the exact causal mechanism, but we assume that the causal conditions are not separate. Instead, they jointly configure a set of conditions that explains the 'no iPhone killer' effect. Our material also highlights the role of political conflicts. However, this condition remains a latent condition, as it is neither necessary nor sufficient to directly explain any of the other conditions and effects. Figure 4 illustrates this causal reasoning in graphical format:

Our inquiry into changes in Nokia's organisational design starts from the observation that Nokia attempted to be a modern, flexible (aka agile) company. Since the early 2000s, Nokia's

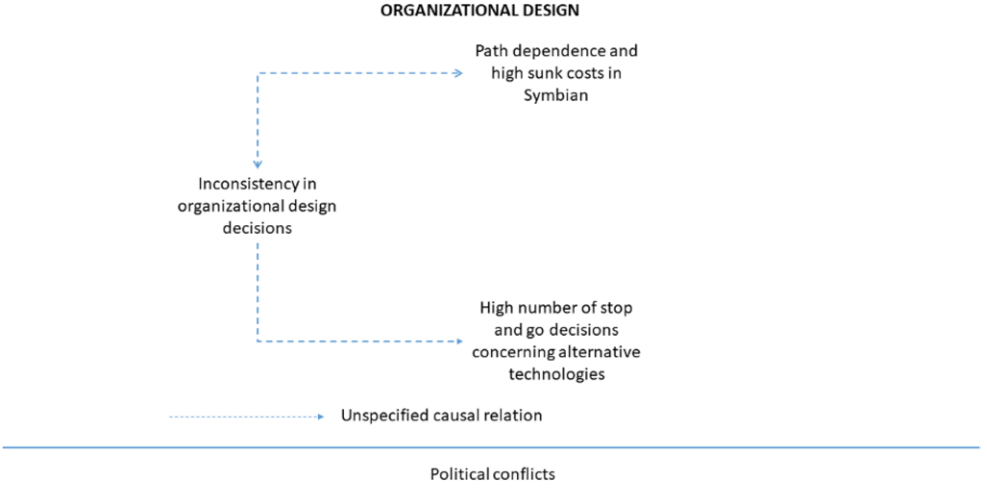

Figure 4. Causal relationship between organisational design and technology choices.

managerial culture specifically emphasised flexibility and internal competition as the key antecedents of its competitiveness. This agility principle was duly communicated in the literature associated with Nokia's interests (Doz & Kosonen, 2010; Steinbock, 2003, 2010) and in public speeches given by the firm's top management:

> Being fast is significantly more important than foreseeing what happens in the market. This is our key competitive advantage. (CEO Olli-Pekka Kallasvuo in Suomen Kuvalehti, 10/2006)

> So, on all three key dimensions of strategic agility – strategic sensitivity, collective commitments, and resource fluidity – Ericsson was outmanoeuvred by Nokia when it came to mobile communication opportunities. (Doz & Kosonen, 2010, p. 4)

When examining the period of 2006–2010, the dominant picture is that these ideas materialised in a near-hysterical corporate climate. As the preceding sections have demonstrated, during the first intense encounter with a new type of competitor, Nokia was inconsistent in its reactions, launching numerous projects and strategies to counterattack its emerging rivals. We now turn to two key organisational aspects that correlate with the erratic top-level strategising at the Nokia Corporation: top management team dynamics and decisions on strategy and corporate structure.

In a flattering report in *Fortune* magazine in 2000, Nokia's success was centrally linked to its experienced and close-knit executive team (CEO Jorma Ollila's 'dream team'), which had a shared history at the corporation going back to the early 1990s. By 2010, most of these dream-team executives were long gone, and Nokia's strong self-confidence in the early years of the 21st century had turned into near panic at the top of the corporation, which was registering heavy quarterly losses. One interpretation regards Nokia's evolution as a series of unrelenting management interventions regarding both strategy and structure. The competitive challenge posed by Apple and Google was not the only, or perhaps even not the foremost, worry at Nokia's corporate headquarters during the formative smartphone years of 2006–2008.

As Figure 5 illustrates, even without considering external competitive threats, Nokia seems to have experienced high internal turbulence. There was a high rate of turnover in its top management team, post-merger integration challenges related to the amalgamation of Nokia and Siemens' telecom networks businesses in 2006 were obvious and far-reaching (to create a unified Nokia-Siemens network), and the corporation consequently undertook a series of major strategic and structural changes. Accordingly, the new CEO, Olli-Pekka Kallasvuo, took over from Jorma Ollila in a highly demanding situation, given that the attention of the top management team is a key resource for any company (Joseph & Ocasio, 2012). Changes at corporate headquarters, business-related challenges other than mobile phone competition, and Kallasvuo's conservative leadership mentality produced three outcomes: inadequate technological understanding among the top management team, a corporate strategy heavily based on investor expectations (including, e.g. considerable stock buybacks), and cost-focused conservatism in the launch and implementation of competitive counter-moves against emerging competition from smartphone players such as Apple and Google.

Symbolically, one of the first decisions in the Kallasvuo era was to dissolve the Future Technologies team, which had focused on analysing future technological trends and related business opportunities and threats. At the same time, the position of the Chief Technology Officer (CTO) disappeared from the top management team around 2007, when

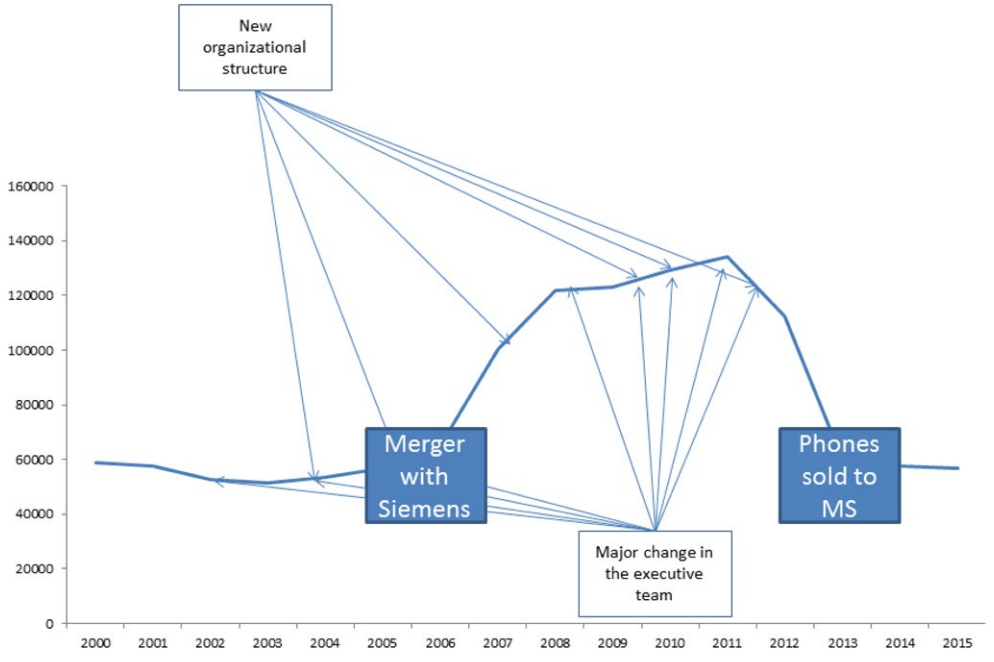

Figure 5. The number of employees from 2000 to 2015 and the timing of major changes in the organisational structure and executive team.

Pertti Korhonen[19] left the executive team with long-term CEO Jorma Ollila (although Ollila chose to remain chairman of the board until 2012). The top management team was consequently revamped, and the CTO position was re-established in 2010 under new CEO Stephen Elop; however, some of the earlier literature (Cord, 2014; Salminen & Nykänen, 2014; Risku, 2010) and our informants are almost unanimous regarding the impossibility of running a technology company without strong tech-specific leadership at the top of the corporation:

> […] at the same time the CEO changed, a lot of technical skills disappeared from the top management, and it became more and more businesspeople with business backgrounds and no technical skills. […] there was not enough understanding in the top management or the layer underneath about what is realistic and where the real problems are. They were living in the bubble and were very focused on the new strategy of 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-Nokia technology manager)

> It is an exaggeration to say that there was no technical know-how in the top management team, even during the turbulent years; that simply is not true. However, Kallasvuo was not knowledgeable in technology. (Ex-Nokia executive)

> There is no need for the CEO to be an expert in software development or technology. Instead, she or he must be passionate about learning the basic technological logics and willing and capable to find the right people for the right positions. Nokia was unable to find managers who would have built it as a software company. Nokia was phlegmatic and powerless with Symbian […] when Pertti Korhonen left Nokia in 2006, the software-specific understanding of business in the top management team decreased dramatically. (Ollila & Saukkomaa, 2013, p. 458)

The interpretation here is not that the Nokia of the era lacked technological capabilities *per se* – rather, Kallasvuo and his closest strategy officers had quite different strategic objectives. They wanted a streamlined corporation that would look good to investors and other financial market actors. This was necessary since the gross revenues of the corporation had been flat due to the saturation of the (non-smartphone) handset markets for a couple of years. They were convinced that Nokia would outcompete its rivals with its operational excellence in the future. Earlier, Jorma Ollila had not been particularly interested in technological detail either,[20] but he had a top management team that had hands-on experience both in research and development and in technology strategy.

The diminishing emphasis on technological capabilities in Kallasvuo's regime is understandable from a strategy process perspective. Salminen and Nykänen (2014) and Cord (2014) reveal that Nokia employed a colossal strategic planning team in its Espoo headquarters that involved hundreds of people in various roles. However, this team was not empowered either to challenge the corporate strategy or to help the top management team renew its strategic focus. In contrast, the team was part of Nokia's unrelenting efforts to match investor expectations – 'to produce marketing materials for the stock market', as one of our informants described the role of the strategy staff. This logic permeated the organisation and its culture:

> Nokia was a product company, where all the targets were set to product making and these software development kits and third-party ecosystem and apps were a second priority. We were pretending that they were 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. It was completely inadequate to combat the iPhone. (Ex-Nokia executive)

> 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 why many new products appeared each year—I mean hardware products, new model numbers. (Ex-Nokia executive)

The emphasis on keeping investors happy created a chasm between corporate headquarters and the technology development teams lower in the organisational hierarchy. Most importantly, emerging substantive conflicts particularly affected software. An engineer in the Symbian development later described a total communication breakdown between organisational layers:

> […] the Nokia leadership responsible for the Devices unit's execution of Symbian Open Source products and initiatives was told directly that the ecosystem (consisting of manufacturers and suppliers) and our efforts would falter if we didn't have commitments to 1) relocate and improve developer tools under our open model, 2) to have an effective app store strategy, e.g. not one homegrown by Nokia alone, and 3) to secure our operating budget. We asked for their direct support on all three…The Foundation and our ecosystem initiatives didn't get any support for those initiatives, despite sitting down with the leadership at the key moment. Quite the opposite, the rug was pulled out from under us at almost every turn. (Interview with Lee Williams, *Forbes*, 3 September 2013)

Why was Kallasvuo unable or unwilling to change Nokia's technology strategy to more aggressively counter the ascension of Apple and Google? The stream of strategic decisions from 2006 to 2010 illustrates an essentially conservative strategy that emphasised stock

market reactions and neglected crucial technological issues, which would have been essential for the generation of powerful feature phones in the emerging smartphone market. Key reasons for this conservatism were that Kallasvuo and his team had invested a considerable amount of their time and energy to launch and implement major structural changes. A key outcome was the neglect of a comprehensive but focused technology strategy. The tantamount strategic objectives were financial performance and market share:

> Kallasvuo was absolutely the best possible CFO, but he was unfortunately the CEO at a time when technological decisions were more important (Ex-Nokia executive)

> Nokia said a 'substantial' portion of savings [from the merger with Siemens network] was expected to materialize in the first two years. [Kallasvuo:] 'These changes are expected to result in a headcount adjustment over the next four years in the range of ten to fifteen per cent from the initial combined base of about 60,000'. (Financial Times, 19 June 2006)

> 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. (Ex-Nokia executive)

An elemental part of 'Nokia agility' involved reacting to changes in the market by changing the company's organisational structure. The threat by Apple and Google from 2007–2013 was not the first competitive challenge Nokia had repelled during the 2000s. In 2003, the company faced increased competition, such as Motorola's slim and appealing Razr phone using cheap component producers in Asia, resulting in its market share dropping from 35% in 2002 to 31% in 2004 (Appendix 3; see also McCray, Gonzalez, & Darling, 2011). In response, Nokia's top management, led by Jorma Ollila, restructured the company and further optimised its production and logistical processes, which significantly reduced costs and time-to-market while increasing the range of devices produced.[21] Moreover, new models and the introduction of the first Symbian 60 series phone with a camera returned Nokia rather quickly to its previous market leader position in most target markets globally. The new decentralised matrix structure brought about positive changes and helped boost Nokia's sales. In 2004, Nokia's Chairman and CEO Jorma Ollila stated, *'We are energized by our reorganization into four business groups, which better reflect our strategy to expand mobile voice, drive consumer mobile multimedia and mobilize enterprise solutions'*.[22] However, even in 2003 and 2004, ideas about the matrix organisation were questionable; one of our informants claimed that the organisational changes in 2003 and resulting insufficient investments in marketing were the main reason for this market share decline, not the appearance of competitors such as Razr (compare Doz & Wilson, 2017).

The idea of the value of constant structural changes, however, was deeply rooted in Nokia's management culture. Accordingly, combined with the requirements of the Siemens merger and the Navteq acquisition, Kallasvuo's response to engage in incessant rounds of major organisational changes and restructuring was logical. However, this time, the changes damaged Nokia's competitiveness and resulted in increased slowness in Nokia's competitive actions against the new competitive threats in the smartphone market. The most apparent problem with Nokia's habitual use of organisational restructuring to change or implement a novel strategy was the high frequency of such changes. Between 2000 and 2013, Nokia launched three larger changes in its organisational structure, and practically every year

included some major adjustments. As a consequence, the importance of the informal organisation grew exponentially as organisational process development ground to a halt and was constantly manipulated by top management. In some sense, the more hierarchical organisation structure from the 1990s continued during these organisational changes, but without centralised power:

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

> I would say that [the organisational structure] wouldn't have been a problem if there had been enough coordination between the different business units. But there was no sufficiently strong technological leadership in a context where the different business units were driving in different directions. (Ex-Nokia executive)

The manner in which Nokia's top management redesigned the organisational structure presented another problem: the matrix organisation consisted of a constantly changing quantity of business units (Mobile Phones, Multimedia, Networks, and Enterprise Solutions in the 2004 corporate architecture, for instance) on the one hand and numerous horizontal units that linked and served functional units on the other hand. While the core rationale for this decision may have been sound and in line with Nokia's agile image, the result was the gradual emergence of serious functional problems: cannibalistic internal competition between business units and even individual development projects, fierce rivalry between competing technologies (especially between Symbian and Maemo/MeeGo), and a highly complex decision-making environment that was sensitive to politicking.

Internal competition was hard-wired into Nokia's organisational culture. Nokia typically nurtured dozens of competing product programmes and focused on product-specific software designs and the wide diversification of market segments. This policy created tensions between functional and development project managers, scattered authority, and blurred responsibilities. These negative outcomes appeared not only in strategic planning but also in execution, in which employees ended up with more than one functional supervisor and became frustrated with reporting and fulfilling heterogeneous requirements that did not serve their core responsibilities in the organisation.

The matrix organisation generated novel practices in the workplace such as the formation of virtual teams and increased telework, along with the creation of decision-making teams based on a concrete problem and project teams formed in a temporary, ad hoc fashion. However, the scattered and ambiguous chain of command required more meetings and internal bargaining, which resulted in considerably longer procedures for any minor decision. Most importantly, the matrix only aggravated the fragmentation of technology development, as different organisational units began to concentrate on certain defined characteristics of the operating systems, which meant that different product development programmes needed additional adjusted software, resulting in copious product-specific software releases linked with certain devices:

> Having three business units made no sense. 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 for how the Enterprise product or the

> Multimedia product would be different. There were no technical guidelines for the Research and Development people due to the laziness of the top management and their lack of understanding of even products themselves. (Ex-Nokia executive)

> Nokia's problem was that Nokia had three competing factions inside the company: the MeeGo faction, the Symbian faction, and the Series 40 faction. And all these other factions tried to harm the MeeGo faction. Because you don't want even your internal competitor to survive; your objective is to kill them. And it's also that these low-level managers or medium-level managers were left to do is that the management didn't understand anything about the software […] So, the MeeGo failure is completely in-house politics because they were not allowed to put the telephone in. They were not allowed to put the chip that had the telephone into the product. (Ex-Nokia executive)

Internal competition was intensified by the aggressive incentive scheme for middle and top managers (Palmu-Joronen, 2010) and constant formal changes in corporate structure. In addition, the complex organisational architecture resulted in an increasingly slow and arduous decision-making environment. The agility-based management ideology simply stopped working when serious competitive threats emerged. Although Nokia's top management was acutely aware of the major competitive threats that it faced, it is paradoxical that few opportunities were available to make major strategic interventions without risking even more organisational dysfunction (Jacobides, 2007). Furthermore, Nokia employees were already frustrated with the organisation and its dysfunctional horizontal decision-making. The reasons for this frustration lay in the dispersed and unclear chain of command when the organisation removed some levels of the hierarchy:

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

Some key employees felt that they had no influence whatsoever over important decisions or vice versa – they had too much influence on less significant matters, and negotiations on petty details required too much effort. Forming cross-functional project teams was a productive way of moving forward, but only as long as they were supervised by a strong chain of command. At Nokia, the lack of technological capabilities in the top management team, the complex and unclear organisational structure, and the culture of internal competition resulted in slow and inefficient decision-making and ultimately in an inability to catch up with competitors' novel offerings, which were often superior from the perspective of the consumer. The remaining questions for future research focus on the process resulting in these outcomes and decisions: Why and how did Nokia's executives make the decisions they made and what was the role of internal (e.g. a strategic planning task force) and external (e.g. consulting firms and investment bankers) advisers in this process; and what were the specific mechanisms that transferred inconsistency in organisational design to technology management issues and processes?

Discussion and conclusions

The key lesson of our study can be summarised as follows: there can be no short cuts in explaining complex causal processes. Nokia did not lose its market leader position because

of middle manager fear and anxiety, internal politics, or because of deteriorating top leader competence. Such simple explanations originate from the strong tendency to formulate compacted narratives and novel theoretical explanations in both academic management research and popular management literature (Barley, 2016).

The initial motivation for our study was to collaborate with Nokia engineers to collect oral histories focused on software development and the ill-fated Symbian platform. This article is a by-product of that project, with the goal of critically analysing the related evolutionary process as studied by business historians with a philosophical background in critical realism. While we do not argue that we found *the* truth concerning Nokia's history (or a piece thereof), our study should be seen as a step towards cumulative knowledge about Nokia's loss of market leadership and similar failure cases (cf. Finkelstein's 2006 study on Motorola).

Consequently, our key finding was the causal relationship between choices concerning technology and organisational design, as illustrated in Figure 6:

The above causal model illustrates that the agile management philosophy materialised in a constant flow of changes in organisational structure, allowing multiple incompatible technology platforms and development projects to compete for resources at the same time. The organisational outcome was a profound inability to use the still-abundant resources Nokia possessed effectively and efficiently to retain market leadership. We have to remember that during our period of analysis, Nokia used almost €19 billion for its own share buybacks instead of investing this enormous sum in the development of new technologies, products, processes or entirely new businesses (Hämäläinen, 2012).

There are many questions that our study could not answer: why was the development of the Maemo platform halted and the resources transferred to a risky joint project with Intel; why did top executives believe in the future prospects of the Symbian platform for so long; and how did Nokia use external advisers in making various platform decisions? Naturally, our

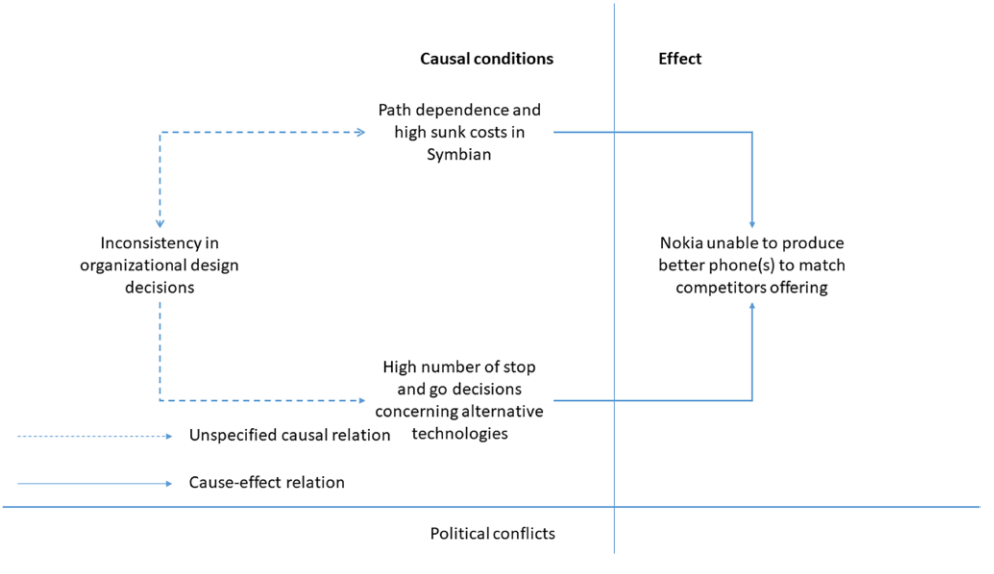

Figure 6. Causal model of the process ending in Nokia's inability to produce better smartphones.

main argument is not that agility would be a strategic management concept generally and univocally harmful for corporate performance in all possible contexts or that organic evolution and incremental learning would be beneficial for each and every firm. What we aimed to demonstrate through the Nokia case is that the corporation chose the worst possible time for the simultaneous implementation of both strategic agility and high evolutionary variation in its technologies. Speedy decision-making (Stieglitz, Knudsen, & Becker, 2016) accompanied by ruthless, effective and efficient architectural product innovation (Henderson & Clark, 1990) would have been required to win the smartphone game (if that could have been won at all, cf. Roiij, 2015). The logic underpinning this somewhat counterintuitive notion is the need for fast and ruthless response to the quickly emerging competitive threat that would have been best achieved by relying on established routinised technology management processes. Nokia's history clearly demonstrates the earlier superiority of its technology management and product rollout processes. However, during the critical opportunity window to beat the competition in 2007–2010, these processes were essentially broken.

Our historical study reported in this article gives rise to a few important avenues for future research. First, Nokia is among many failed telecom companies: Motorola, Ericsson, Sony and many of the pioneers of the 1980s also dropped out of the competitive struggle. An obvious topic for a comparative historical study would be to focus on the anatomy of these failures. Second, and relatedly, the regimes of the successive CEOs Ollila, Kallasvuo and Elop and their top management teams should be investigated more in depth from the viewpoint of exercising strategic leadership. More generally, the question of top management regimes as an explanation for organisational evolution would open important theoretical and empirical avenues of research. Third, we hope that our work could be used as a sample of how oral historical methods can be used in cases in which archives are either non-existent or non-accessible. This might be of utmost value in future when massive digital archives become available; namely, to be able to use those archives (i.e. 'ask the right questions'), one might first have to pursue oral historical methods to make sense of the organisation (i.e. to be able to 'ask the right questions'). This might turn the process of oral history upside down, as current methodological guides usually emphasise the need to familiarise oneself with the object before beginning interviews.

Notes

1. For example, Huy, the senior member of the research team of Vuori and Huy (2016), had studied emotions and fear in organisations long before doing fieldwork at Nokia (see e.g. Huy, 1999, 2011) so the hammer existed before the nail.
2. INUS refers to '**I**nsufficient but **N**ecessary part of a condition which is itself **U**nnecessary but **S**ufficient for the result' as defined by Mackie (1965) (cited in Mahoney et al., 2009).
3. Nokia's history has been written many times. We essentially built on Häikiö's (2001) commissioned history, Lindén and Nykänen's (2016) analysis of Nokia's societal impact, Aspara et al.'s (2011, 2013) studies of the company's 1990s corporate turnaround, the meta-analysis by Lamberg, Laukia, and Ojala (2014) and Laamanen, Lamberg, and Vaara (2016), Van Rooij (2015), and Ollila's memoirs (Ollila & Saukkomaa, 2013). In terms of facts and figures, we mainly use Nokia's SEC filings and annual reports. On popular histories of Nokia during the 1990s and early 2000s, see especially Bruun and Wallén, (1999), Steinbock (2001), Häikiö (2002), and Skippari and Ojala, (2008). Appendix 1 summarizes the main developments of Nokia.
4. http://developer.nokia.com/community/wiki/Symbian_OS [Retrieved 2.2.2014]
5. Nokia Corporation Annual report 2004, p. 31.

6. 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]
7. Nokia Corporation press release, 2 December 2008.
8. Nokia press release, 15 February 2010.
9. Microsoft press release, 10 February 2011.
10. Microsoft press release, 3 September 2013.
11. See http://www.oralhistory.org/about/principles-and-practices/. Retrieved on 14 August 2018.
12. The central role of Symbian is described in almost all of the ten Nokia studies listed in Appendix 2.
13. The literature on path dependence is extensive. Our work is based on conceptual research in organisation studies and applied mathematics. See, for example, Sydow, Schreyögg, and Koch, (2009); Page (2006); Arthur (1994).
14. Nokia Corporation Annual Report 2008.
15. https://en.wikipedia.org/wiki/Nomadik.
16. Research Institute of the Finnish Economy 2014.
17. Nokia Annual Report 2011.
18. http://www.engadget.com/2010/09/21/ce-oh-no-he-didnt-anssi-vanjoki-says-using-android-is-like-pe/ [Retrieved 24.9.2014]
19. CTO Pertti Korhonen worked at Nokia in different positions from 1986 to 2006 and was a key actor in numerous essential technology development projects.
20. An excerpt from the *Fortune* magazine article illustrates Ollila's attitude toward technological details: 'Jorma Ollila is standing before a small group of analysts and investors at the Mark Hopkins Hotel in San Francisco, failing to answer some increasingly arcane questions about technological developments in the wireless industry. "You beat me with the technical details there," the CEO tells one interrogator. "I'm sorry, my mind was wandering," he says as he asks another to repeat his question. Then Mark McKechnie, a wireless industry analyst at Bank of America Securities, asks about something that actually matters to Ollila: Will Nokia extend its market-share lead this year?' (Fortune 1.5.2000).
21. Nokia's governance model was such that even major shareholders could not effectively intervene in the strategic management of the corporation. According to the official SEC filing description '…the control and management of Nokia is divided among the shareholders at a general meeting, the Board of Directors (or the "Board"), the President and the Group Executive Board chaired by the Chief Executive Officer'. For example, in 2008 Jorma Ollila was the Chairman of the Board (having previously also been both CEO and Chairman for many years) and CEO Kallasvuo was a member of the board. What is more, the board was a mix of internal and external members and in practice strengthened the power of both Ollila and Kallasvuo, the latter of whom also acted as the President of the Group of Directors. This situation changed only in 2010 when Risto Siilasmaa became the Chairman (i.e. being the first 'outsider' Chairman since 1999) with Stephen Elop as the CEO and President of the Group of Directors.
22. Nokia press release, 2004.
23. We counted N95, N96, N97, N8, n9, Lumia920, Lumia 1520, and Lumia 929 as Nokia's flagship phones. For Android, every new variant of the Galaxy series was included, except for 2008–2009, for which we used HTC's best models.

Acknowledgements

We gratefully acknowledge the comments received at the 2016 Industry Studies Conference and the feedback from Jukka Luoma. The project has been funded by the Academy of Finland project 'Learning from the past for the future', which focuses on the narrative explanation and causal inference of failures of large telecommunication firms and especially Nokia, Apple, Motorola, and Ericsson.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

Academy of Finland, Kulttuurin ja yhteiskunnan tutkimuksen toimikunta.

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Appendix 1: Timeline of the events at 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 reorganisation Nokia 7710 – first touchscreen smartphone	
2005	Internet tablet 770 (Maemo)	Google acquired Android Inc.
2006	Olli-Pekka Kallasvuo appointed as CEO CTO position discontinued 46 new device models in one year Nokia Content Discoverer Nokia Music Recommenders	
2007	Nokia N95 – Symbian OS (S60) Nokia-Siemens Networks (merger)	First generation iPhone Google announced the 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 (to share Symbian software products)	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	Symbian becomes open source MeeGo officially announced Symbian^3 Nokia N8 Stephen Elop appointed as CEO Anssi Vanjoki leaves Nokia	Apple iPad USA shift to LTE networks (4 G) Samsung Galaxy S Nexus smartphones and tablets (Google) iPhone 4
2011	Burning platform memo Windows Phone made primary platform Smart devices and mobile phones separated OVI services discontinued Symbian upgrades released (Symbian Anna, Nokia Belle) Nokia N9 – first and only MeeGo smartphone Symbian software and development outsourced to Accenture Lumia 800, Lumia 710 with MS OS Meltemi OS introduced	39% of all devices sold were powered by the Android OS Samsung Galaxy S II Samsung Galaxy Note 'phablet'
2012	Lumia 900 for the US market Meltemi development stopped by top management	iPhone 5 Samsung Galaxy S III
2013	Handset business sale to Microsoft announced	Samsung Galaxy S4

Appendix 2: Earlier literature focused on Nokia's fall

Publication	Type	Scope and depth	Material used	Key results
Alcacer, Khanna, and Snively (2014)	Teaching case	Relatively narrow	Public sources and interviews	Being a teaching case, nothing decisive.
Ali-Yrkkö et al. (2013)	Report	Relatively narrow	Public sources and accumulated company-specific knowledge of the authors (recognised industry specialists)	Nokia's collapse was a result of increasing competition and the rise of superior offerings by Apple and the Android producers.
Cord (2014)	Book	Complex and broad	Interviews and public sources	Being a book with a narrative structure, explanations are many from the emergence of new competition to the internal struggles of Nokia.
Doz and Wilson (2017)	Book	Broad but theoretically focused	Interviews, public sources, and first author's personal knowledge on the company's recent history	The explanation is built on the co-evolution of culture, cognition, and other factors from the theoretical framework, ending in an empathetic, but deterministic account of the complexity and difficulty of strategic renewal, especially with respect to social tensions on the top management team.
Ollila and Saukkomaa (2013)	Book	Broad	Memoirs of Jorma Ollila	Reasons for Nokia's problems originate in Ollila's book as mistakes and misunderstandings of the new management combined with the magnitude of the problems they faced after Apple's coming to the market.
Risku (2010)	Book	Broad	Autoethnography and memoirs by the author, who had worked at Nokia in different managerial positions.	Risku's book identified many of the problems resulting in Nokia's collapse before that collapse was publicly recognised. The problems listed in the book are many, starting with a lack of capabilities in consumer marketing and design and ending in structural and cultural factors preventing any attempts to obtain radical changes.
van Rooij (2015)	Peer-reviewed article	Relatively narrow	Public sources and especially use of the theoretical framework of the article.	Rooij's interpretations is that Nokia failed to respond to new competitive threats primarily because of its success in feature phones (i.e. the 'wrong segment' after 2007) and lack of strategic alternatives (i.e. new businesses other than phones and networks).
Salminen and Nykänen (2014)	Book	Complex and broad	Interviews and public sources	Salminen and Nykänen's book primarily focuses on Nokia's internal struggles during and after Kallasvuos's regime: complex decision-making chains, internal competition, and other factors directing Nokia's focus to the wrong elements instead of facing the competitive threat.
Siilasmaa (2018)	Book	Complex and broad	Memoirs of Risto Siilasmaa (Chair of Nokia board)	Siilasmaa's main thesis is that with Nokia's resources and knowledge, the only logical explanation must be bad management, especially how Jorma Ollila had organised the working of the corporate board to insulate board members from knowledge about Nokia's problems.
Vuori and Huy (2016)	Peer-reviewed article	Narrow and focused	Interviews and public sources	Vuori and Huy's article focuses on the negative effects of emotional dynamics in Nokia's middle and top management. In particular, they emphasise the poisonous effect of Jorma Ollila's aggressive temper and the subsequent control of information flows inside the corporation.

Appendix 3. Key financial information of Nokia and its mobile phone business unit

	Nokia Corporation				Mobile phones business unit (Devices & Services business unit since 2008) share (%)	
Year	Net sales	Operating profit	N of employees	Global mobile device market share	Net sales %	Operating profit %
1994	30,177	3,596	28,593	N/A	36	49
1995	36,810	5,012	33,784	N/A	44	35
1996	39,321	4,226	31,723	N/A	55	34
1997	56,612	8,453	36,647	19	49	45
1998	79,231	14,799	44,543	23	61	62
1999	19,772	3,908	55,260	27	67	79
2000	30,376	5,776	60,289	31	72	85
2001	31,191	3,362	53,849	35	74	135
2002	30,161	4,780	51,748	35	77	109
2003	29,533	4,960	51,359	35	71	28
2004	29,371	4,326	55,505	31	63	20
2005	34,191	4,639	58,874	33	61	17
2006	41,121	5,488	68,483	35	60	17
2007	51,058	7,985	112,262	38	50	22
2008	50,710	4,966	125,829	39	69	17
2009	40,984	1,197	123,553	36	67	12
2010	42,446	2,070	132,427	29	69	12
2011	38,659	–1,073	130,050	23	62	4
2012	30,176	2,303	112,256	19	51	–7
2013	12,709	519	59,333	14	–	–

Source: Nokia Annual Reports 1994–2014; for market share: Statista.com (accessed 29 September 2018).
Notes: Million Finnish Marks 1994–1998 and Million Euros 1999–2013; for year 2013 excluding those businesses which were sold to Microsoft.