

Path Creation, Path Dependence and Breaking Away from the Path: Re-Examining the Case of Nokia

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Abstract

The explanation of how and why firms succeed or fail is a recurrent research challenge. This is particularly important in the context of technological innovations. We focus on the role of historical events and decisions in explaining such success and failure. Using a case study of Nokia, we develop and extend a multi-layer path dependence framework. We identify four layers of path dependence: technical, strategic and leadership, organizational, and external collaboration. We show how path dependence at these four interdependent layers can blindfold the organization from seeing and understanding the importance of intermediate outcomes, which in the case of Nokia was the importance of software ecosystems and adaptable mobile devices. Furthermore, we show how the layers of path dependence mutually reinforce each other and become stronger.

Keywords: Path creation, Path dependence, Mobile industry, Nokia, Evolutionary theories

1 Introduction

Researchers and business managers have tried and are trying to understand why some firms succeed and some fail. One answer is the firm's ability to cope with environmental changes, caused for instance by technological innovations. This is particularly important in technology-intensive industries, such as software and mobile services. Apple, Microsoft, SAP, Google, IBM, Kodak, and Nokia are examples of firms that have been, at different times, both successful and not so successful in managing technological innovations (see, e.g., [27]).

Technological innovations are opportunities or threats to which firms need to respond [26], [38], [42]. *Hyper-competition* is a term used to describe a business context in which rapid technological changes take place and firms proactively and reactively appropriate technological innovations to gain competitive advantage [11]. Technological innovation creates disequilibrium and change in the market [10] to which firms have to respond. Those that are successful have the ability to adapt or renew themselves through technological innovations and explore new business opportunities. Those that fail have made wrong choices or have been unable to make the necessary changes to their business model [19].

One stream of strategic management theory that addresses these questions in particular is an extension of the resource-based view of the firm [6], [49], namely dynamic capabilities [28], [51]. The core idea of dynamic capabilities is the firm's ability to adapt or renew itself in a changing environment [45]. A firm can do this by leveraging, creating, accessing, and releasing its resources [15]. The framework of dynamic capabilities has shown promise, but has also been criticized for being "abstract and even esoteric" [12]. Another line of criticism is its focus on current internal capabilities, thereby neglecting the role of history in shaping current and future decisions [39]. Therefore, we stress the role of history in exploring a firm's ability to appropriate technological innovations.

This is not a new issue. It has been explored over the past 80 years [3], [36], [41]. Rather than applying dynamic capabilities, we adopt the perspective of path dependence [4], [34]. Historical decisions, events, actions, and successes are useful in explaining why firms are unable to adapt and renew themselves when faced with technological innovations. We argue that history can make decision makers blind, and we show in a case study how and why historical decisions limit the decision makers' ability to see and understand the role of emerging technologies. We develop a multi-layer path dependence framework. The framework consists of three phases: preformation, formation, and lock-in- at four layers: technology, strategy, leadership and organization, and external collaboration. The framework is sensitized in the context of Nokia, a firm that has been successful in the past, but has been out-competed over the recent few years. Our theoretical lens and empirical setting will enable us to contribute to the theoretical understanding of why firms may become unsuccessful.

The reminder of the paper is as follows: Section 2 covers a review of extant path dependence literature, leading to our multi-layered path dependence framework in section 3. The following section outlines our case study approach with its data collection strategy, after which we present our empirical findings in section 5. We then discuss the findings and conclude with some thoughts on future research.

2 Theoretical Background

We can find partial answers to why and how firms succeed or fail in strategic (e.g., gaining market position, building strategic networks, developing dynamic capabilities, or creating alliances and partnerships), and organizational (e.g., organizational arrangements, innovation and diffusion, decentralization/centralization of decision making, or empowering the workforce) literature [7], [8], [37], [43], [48]. However, the earlier literature largely neglects the so-called intermediate outcome, which has been found to form the basis of consumers' purchase decisions [31]. For example, a technology feature (Internet of Things, mobile technology, or touch screens), service bundle (mobile phone subscriptions with free access to some services), or flexible device design (app-enabled devices) might increase the perceived quality of the offering, which is between technological innovation and the performance of the firm [19]. One explanation for why firms do not see or understand the intermediate outcome is path dependence.

2.1 Path Creation and Path Dependence

How and why an organization evolves and reacts towards technological innovations is not purely rational [17], [40], [44], [47]. One stream of research that tries to explain the lack of rational response to organizational change, and in particular the role of technological innovations in such processes is the concept of path dependence [4], [17], [34], [47]. The core assumption is that previous actions, decisions, or events, for instance a choice of technology, standard, product portfolio, top management team, or ownership structure, can gradually create organizational lock-in [40]. These events might be very small at first, but over time they become irreversible. In other words, history matters and all organizational processes are imprinted [3], [4], [17]. This means that one decision might be self-reinforcing, influencing future options and creating a lock-in [13], [24]. The self-reinforcing actions might span decades, thereby creating a path [17]. Path creation includes three phases: preformation, formation, and lock-in [44].

In the preformation phase, the organization has many possible choices regarding technology, management, and markets [44]. Organizations can take any action, but the long-term consequences of one action cannot fully be foreseen or evaluated. All actions are embedded with other actions. Thus, actions cannot be seen as isolated. Actions are or become mutually interdependent. Any action at any time is imprinted by its past and may set off self-reinforcing processes. When an action becomes self-reinforcing, it is labeled a “critical juncture” [9].

The formation phase is dependent on previous actions [4], which will affect the number of alternatives available as they are reduced and become increasingly irreversible. For instance, the choice of Google’s Android platform limits the choices mobile manufacturers can make in the future. The starting point of this phase is the preceding critical juncture. It must be remembered that not all actions create path dependence. The self-reinforcing process provides increasing returns and supports positive feedback processes. These in turn further reinforce previous actions [44].

In the lock-in phase, there are very few options for the organization. Previous actions have created a path that the organization cannot break from, or can do so only with great difficulty. One particular choice or action has determined future actions and flexibility is lost. The path might be so strong that not even new entrants can change future actions [44].

The literature on path dependence has focused predominantly on technology-related events and actions, for instance the choice of operating system (OS) (e.g., Windows 95) and keyboard design (e.g., QWERTY) [23]. However, self-reinforcing events do not have to be technology related [20]. Path dependence can occur at different layers. We next outline four layers relevant to path creation and path dependence, namely technology, strategy and leadership, organization, and external collaboration.

3 Multi-Layered Framework of Path Creation and Path Dependence

Researchers have recently begun to explore layers of organizational path creation. In the context of digital innovations, three layers of path creation have been suggested [20], including a material layer, a cognitive layer, and an organizational layer. We adapt these layers to be in line with salient issues in path creation and path dependence, identifying a technological layer, a strategic and leadership layer, and an organizational layer. Furthermore, we add the fourth layer of external collaboration, which is of particular importance in hypercompetitive industries, such as software and telecommunications [21].

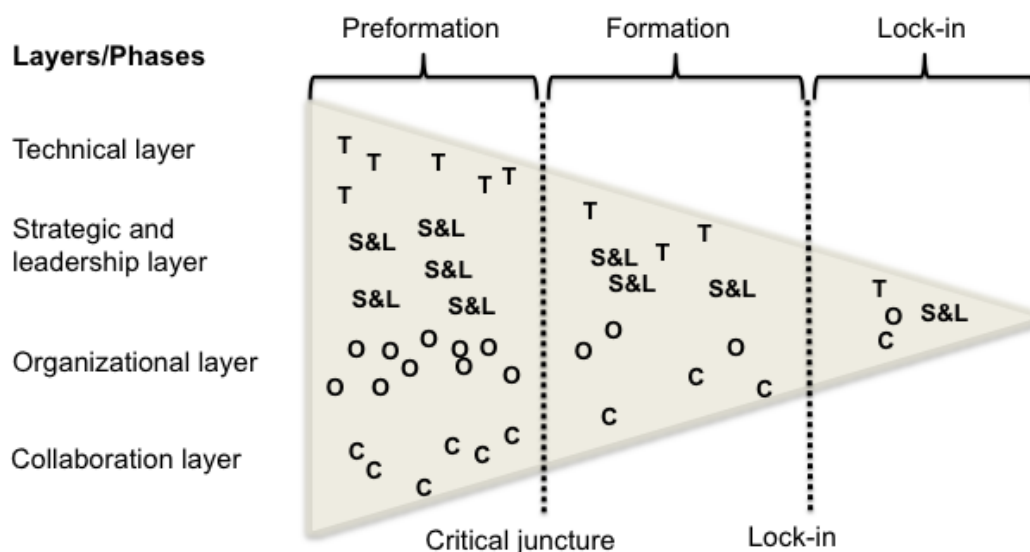


Figure 1: Multi-layered framework of path creation and path dependence (adapted from [20], [44])

The technology layer includes technological choices, such as choice of OS, technical formats and standards, and platform design. The strategic and leadership layer addresses matters at a strategic level, including corporate values, partnerships, issues such as the composition of product portfolio and where to locate production, as well as leadership decisions, including the appointment of board members and the chief executive officer (CEO), and the creation of the ownership structure. The *organizational layer* addresses choices related to how to structure business activities, organize learning, and views of knowledge. The *collaboration layer* deals with external partners and collaborators significant to the organization and its success.

Our multi-layered framework (see Figure 1) is an integration of path creation and layers of path dependence. On the horizontal axis, we depict the three path creation phases of preformation, formation, and lock-in. On the vertical axis,

we show the interrelated layers of path dependence: technical (T), strategic and leadership (S&L), organizational (O), and collaborative (C). T, S&L, O, and C are the possible choices, decisions, actions, or events. The decreasing numbers illustrate that these becoming increasingly few over time, leading to an organizational lock-in related to choices made in the past.

4 Research Methodology

In this study, we have chosen a retrospective case study approach [14], [52]. Such an approach is suitable when writing a high-level story that outlines major events, change processes, and their outcomes that span decades [16]. This allows us to identify indicative events and patterns [22], and to develop a more generalizable conceptual framework.

We have chosen Nokia as it is a well-known mobile sector firm that was highly successful in mobile phone markets over a number of years, then less successful, until it finally sold the whole mobile phone unit to Microsoft in 2014. Furthermore, the case has been used extensively over the years as a case company [2], [5], [25], [32], [33], [35].

In our study, we choose only to collect data that represents Nokia's official version from two sources, namely its annual reports and F20 forms (*Form 20-F* is a filing submitted to the U.S. Securities and Exchange Commission, according to sections 13 or 15(D) of The Securities Exchange Act of 1934.) over a 10-year period (2003-2012). These official documents provide us with an organic and consistent source of data throughout the years. This kind of consistency cannot be provided by interviewees *after-the-fact*, as their memories and individual interpretations would necessarily be influenced by events known now but not at the time, as well as their personal history with the company (the problem also known as the "Hawthorne effect" [1]).

In writing Nokia's narrative, we began by reading through all the annual reports and F20 forms, and identifying the key events throughout the history of the company. These key events included, for instance, open standards, phone models, partners, organizational structure, changes in competition, creating an ecosystem, changes in CEOs and new OS. The events identified were both internal and external, and were selected based on our retrospective evaluations of their relevance to the outcomes at different levels of our framework. In the narrative, the Nokia story unfolds and enables the analysis of events using theory. Subsequently, we undertook a qualitative analysis of the data, using the data to challenge the initial framework [30]. Even though the four layers of our framework are highly interdependent, we have separated them to highlight the crucial role of each layer in the path formation, and subsequently in the path dependence, and finally in the attempt to break free from the path.

5 Nokia's Evolution

We next present our analyses of Nokia's evolution, identifying the different phases of path creation, the critical junctures leading to path dependence, and finally Nokia's attempt to break from lock-in to the path that was successful for many years, but eventually lead to grievous troubles and the sale of its mobile phone division to Microsoft.

5.1 Phase I: Preformation of the Path

Nokia's history dates back to 1865 and the wood pulp mill industry in Finland. It entered the telecommunications market in the 1960s, when it established an electronics department and began to produce radio transmission equipment. In 1979, Nokia created a radiotelephone company, Mobira Oy, together with a Finnish television producer, Salora.

Technology. Nokia played a major role in establishing mobile infrastructure in Europe, first by defining the Nordic Mobile Telephony (NMT) system in 1981. NMT was the first international cellular network that allowed roaming and the system soon became a standard in Europe. The following year, Nokia launched the first car mobile phone. Later the same year, the DX200 digital telephone switch went into operation, forming the foundation for the Global System for Mobile communications (GSM). In 1984, the *Mobira Talkman* was launched, one of the first transportable phones in the world. In 1991, Nokia won contracts to supply the technology for GSM networks in nine countries in Europe. The same year it launched the *Nokia 1011*, the first hand-held GSM mobile phone. During the 1990s, mobile phones became widely available.

The first *Nokia Communicator*, which also included e-mail functionality, was introduced in 1996. This was the beginning of a series of business-optimized smartphones with Internet connectivity. In 1999, Nokia introduced the *Nokia 7110*, a feature phone with simple internet-based functions, also including email. The series of sturdy, affordable and critically acclaimed phone models, such as *Nokia 3210* and *Nokia 3310*, made Nokia into a global brand. These contained pre-installed games, the *Snake* game being the biggest hit. In the following years, camera and video functionalities were included in many Nokia mobile phone models, such as the *Nokia 7650* with a built-in camera and the *Nokia 3650* with a video-capturing feature. In 2002, Nokia launched the first 3G phone model.

Strategy and leadership. In terms of path creation, the first critical juncture for Nokia was its accentuated focus on mobile phones in the 1990s. Its focus on telecommunications was a strategic decision taken in the 1990s by the CEO at that time, Mr. Jorma Ollila. Most of its traditional business areas, such as forestry, power, and rubber were sold off.

Organization. By the late 1990s, Nokia had evolved around two business divisions: mobile phones and networks. Nokia led the market when the new millennium arrived, and from 1996 to 2001 the firm's turnover increased fivefold to €31 billion. Nokia focused on growth through engineering design, supply chain management, high quality manufacturing, and sales.

Collaboration. The most significant form of external collaboration in which Nokia engaged during this period was the forming of Symbian Ltd in 1998 as a partnership with its competitors, Ericsson, Motorola, and Psion. Symbian Ltd was a software development and licensing company that developed the Symbian OS for smartphones. Nokia also launched the *Open Mobile Architecture Initiative* together with other industry leaders in 2001. The aim of this initiative was to accelerate the growth of the mobile services industry by agreeing to develop open mobile architecture.

5.2 Phase II: Formation of the Path - Nokia Connecting People

Technology. In 2002, Nokia adopted the Symbian OS on its feature phones and smartphones. Symbian Ltd developed the OS. The Symbian-Nokia collaboration helped Symbian attain a significant position in the platform hierarchy. Nokia reached a market share of 38% and sold a record volume of 152 million units during 2002. Nokia was, as its slogan said, truly *connecting people*. Nokia continued its product differentiation strategy, for instance, introducing 56 new mobile phone models in 2005 with a *wide variety of designs and technologies for all segments and at all price points* (Nokia, 2006). It was also customizing phones for operators.

Strategy and leadership. As early as 2003, Nokia realized that the mobile communications, information technology, and media industries were converging into what it called the *mobility industry*, and that this would alter the competitive landscape: *We expect this convergence to lead to the creation of new mobile devices, new services and new ways in which mobile devices are used* (Nokia, 2003). Nokia concluded that if it failed to respond successfully to this development, it might have a *material adverse impact* on its business and its ability to attain the firm's goals. In 2003, it began promoting its products heavily worldwide with the *Nokia Connecting People* campaign.

The 2004 strategy had three main anchor points: First, it aimed to expand mobile use in markets with low mobile subscription rates, in geographic areas where wireless infrastructure was better than fixed-line networks, in heavily populated areas with poor housing infrastructure, and in markets where the need for network capacity was growing as fixed networks were replaced with wireless; second, it aimed to drive consumer mobile multimedia by entering new product and service niches that would emerge as technologies from diverse industries began to converge in the near term focusing on imaging and games; third, to bring extended mobility to enterprises by offering products and services to companies and individuals, such as a diverse handset range, security, and connectivity solutions tailored to business needs (Nokia, 2003). This strategy continued on the proven path of success- based on the assumption that the introduction of new product standards and the development of product features had to be tailored to the specific needs and lifestyles of various different user groups. Nokia's mobile phone portfolio was designed to consist of several categories, including affordable low-end devices, mid-range priced phones, balancing price, functionality, and style, and high-end phones targeted at image-conscious consumers who select their products on the basis of design or a more specialized range of features.

CEO Jorma Ollila's strategy continued successfully to rely upon Symbian as Nokia's primary OS. However, the competitive landscape and the basic mechanisms of the industry were changing. Nokia's success with many devices, its success in both consumer and business markets, the introduction of the Symbian OS, and the forecast of a world of converging technologies formed the second critical juncture for Nokia, triggering a regime of positive self-reinforcing feedback and persistent patterns. Nokia had become a highly valued, dominant, and prosperous hardware firm with a focus on a number of different consumer segments. This self-reinforcing mechanism was supported by positive network externalities created by the strong brand favored by a growing body of users worldwide, their increased switching costs and lock-in to the Symbian OS, increasing returns from increasing sales, and highly efficient logistics. In 2006, the second-in-command, Olli-Pekka Kallasvuo, replaced Jorma Ollila as CEO of the firm and the making of a new strategy began. Kallasvuo was about to face a monumental change in the market.

In early 2005, Nokia sold mobile phone number 1,000,000,000, but at the same time its market share dropped dramatically to 30%. Motorola represented the major challenge, introducing the super thin RAZR V5 in 2004. Nokia's stock dropped 14%, and Nokia's response to the threat was again to introduce 21 new models, together with an aggressive price reduction program.

Nokia was fully aware of the increasingly intense competitive landscape with new competition, in addition to other mobile device companies and mobile network operators offering mobile phones under their own brand: *We face new competition, particularly in our Multimedia and Enterprise Solutions business groups, where we compete with Internet based products and services, consumer electronics manufacturers and business device and solution*

providers. [...] The industry is increasingly complex and challenging, and vendors need to master many elements in order to succeed (Nokia, 2006).

At the time, the sales of Symbian phones were thriving. In 2007, Nokia was still increasing the net sales of its mobile phones, and its market share reached just about 40% of the global mobile phone market. Nokia seemed invincible. RIM's BlackBerry email device was a popular choice among the North American business community, but it was not a serious competitor for Nokia. The real threat came from an unexpected direction.

Apple was creating a new digital ecosystem around its products with the introduction of the iMac (1998), iBook (1999), iTunes (2001), iPod (2001), and finally the iPhone in 2007. Apple revolutionized the music business with its extremely well-received and well-designed mp3 player, iPod, and iTunes, the service for purchasing and downloading music. Leveraging the success of iPod and iTunes, together with clever design and a user experience that was unmatched by anything else on the market, helped make the iPhone a new smartphone favorite of users around the world – despite the premium pricing of the device. The number of applications available for the iPhone grew rapidly, quickly making the Apple AppStore the largest mobile service platform.

Organization. Until the end of 2003, Nokia's organizational structure consisted of two main business groups, Nokia Mobile Phones and Nokia Networks, a venturing arm, Nokia Ventures Organization, and the common group functions. This changed at the beginning of 2004, when Nokia divided the organization into four business groups. The Mobile Phones business group aimed to develop mobile phones for all major standards and customer segments in more than 130 countries, including the Vertu subsidiary manufacturing, and selling high-end and hand-made phones for the business segment. The Multimedia business group combined a range of digital services (Imaging, Entertainment and Media, Mobile Enhancement and Mobile Services business units from the former Nokia Mobile Phones, as well as Nokia Home Communications). Manufacturing, logistics, and sourcing were located in the horizontal group, Customer and Market Operations, together with sales and marketing for Mobile Phones, Multimedia, and Enterprise Solutions. Technology Platforms was responsible for technology management, and development. The new organization was clearly tailored to optimal performance in the new *mobility industry*.

Collaboration. The Open Mobile Alliance (OMA) comprising close to 200 companies, including mobile operators, device and network suppliers, information technology companies and content providers followed the Open Mobile Architecture Initiative in 2002. The aim of the OMA was to act as the *Leading Industry Forum for Developing Market Driven – Interoperable Mobile Service Enablers*. However, during this period, Nokia started to face resistance from telecom operators and companies within the Symbian cooperation, now creating negative network externalities and limiting the possibilities of adjusting Symbian to the new world of converging technologies. A mixture of positive, self-reinforcing feedback, negative internalities, and negative externalities brought Nokia closer to path lock-in.

5.3 Phase III: Lock-in to the Path - Battle of the OSs

Although Nokia had been aware of the emerging world of mobile ecosystems earlier, it had always been convinced of its own superior technical expertise as the foundation for innovation. Only now, with the new pressures created by Apple, did Nokia begin to view consumers and their needs and preferences as providing a direction for development. Furthermore, in its 2008 strategy, Nokia seemed to recognize the advantages of open collaboration with external partners.

Technology. Nokia assessed the situation and once again decided to focus on a broad offering of mobile devices. This was Nokia's response to increasing digital convergence afforded by mobile devices, allowing users to *take and send pictures, listen to music, record video, watch TV, play games, surf the Internet, check email, navigate, manage their schedules, browse and create documents, and more. [...] We believe that in order to meet our customers' needs, we need to have a broad and balanced offering of commercially appealing mobile devices with attractive aesthetics, design and combination of value adding functionalities and services for all major consumer segments and price points designed, as appropriate, for the local requirements of different markets (Nokia, 2007).*

By the end of 2007, Nokia had started to offer initial services and software in the areas of advertising, business, entertainment, navigation, and social communities. At the same time, Nokia introduced its mobile service platform Ovi. Ovi enabled customers to access their existing social networks, communities, and content, and to gain access to the services of Nokia and other providers through a single access point.

Symbian was still the primary software platform for Nokia smartphones as well as being the market leading software platform. However, as Nokia struggled increasingly with falling net sales (a 21% drop from €35,099 m in 2008 to €27,853 m in 2009), it chose to address the challenges by complementing the existing range of four software platforms with yet another software platform: *To support the continued enrichment and development of Nokia consumers' user experience, we have invested significantly in research and development across our four software platforms: Series 30, Series 40, Symbian and Maemo. Nokia is merging Maemo with Intel's Moblin software platform to create a new software platform called MeeGo. These software assets are designed to balance usability, features and cost in a flexible manner across our wide range of market segments, price points and user groups (Nokia, 2009).*

Strategy and leadership. In 2007, CEO Kallasvuo announced Nokia's new strategy with four main objectives: 1) lead and win in mobile devices; 2) grow consumer Internet services; 3) accelerate adoption of business solutions; 4) leverage scale and transform to solutions in infrastructure. The strategic capabilities defined that were to be shared among the business areas were consumer understanding, the strong brand, superior technology and architecture, and efficient channels and supply chain.

In 2008, Nokia began cooperation with Microsoft to use *Mail for Exchange* (software compatible with Microsoft Exchange Server protocols allowing push email and the synchronization of contact lists, calendars, and tasks) in all S60 series devices. At the same time, new competition in the form of the Android OS was entering the smartphone market. The Android OS was originally developed by Android Inc., which was acquired by Google in 2005. The Open Handset Alliance, a coalition of 80 companies, was established in 2007 to develop and improve the Android open standards for mobile devices. Also, the Blackberry OS, developed by Research in Motion (RIM) had grown into a major player, particularly in the North-American market. The battle of mobile Oss-Symbian, Apple's iOS, Android, and Blackberry- had begun, and the competition in the smartphone market grew fierce. Some competitors chose to accept significantly lower profit margins than Nokia, while some chose to focus on building products and services based on commercially available components and content, in some cases available at very low or no cost. In particular, the new entrants used aggressive pricing and marketing strategies, as well as alternative design approaches and technologies.

In 2008, Nokia and its industry partners also took the first steps in developing the Symbian OS into an open and unified mobile software platform, thus moving towards an open source development model. In December 2008, Nokia acquired full ownership of Symbian Ltd. Another major acquisition was Navigation Technologies Corporation (NAVTEQ), the leading provider of comprehensive digital map information and related location-based content and services for automotive navigation systems, mobile navigation devices, and Internet-based mapping applications.

By 2010, the total worldwide sales of mobile phones and smartphones reached 1.6 billion units, an increase of 31.8% in a year. Smartphone sales increased by 72.1% and smartphones sales now represented 19% of the total communication device sales. For the first time in its recent history, Nokia's market share had dropped to less than 30%. Net sales and operating profits in Devices & Services were descending or unstable, and R&D expenses went down, as did the number of R&D employees. Apple, on the other hand, experienced an astonishing 87.2% growth from 2009 to 2010. In the fourth quarter of 2010, iPhone had gained a 16% share in the smartphone market. At the same time, the Android OS had overtaken Nokia's Symbian unit sales. Yet more challenges were created when Microsoft launched its Windows Mobile OS.

Organization. Although the strategic period was hardly completed, CEO Kallasvuo carried out new organizational and strategic changes in April 2007 and more were to come at the turn of 2008. In 2007, the Networks division was combined with the networks and carrier services divisions of Siemens (a German multinational engineering and electronics firm) to form the Nokia Siemens Network, jointly owned by both but consolidated by Nokia. In January 2008, Nokia's mobile device business groups-Mobile Phones, Multimedia and Enterprise Solutions- and the supporting horizontal groups were replaced by an integrated business segment: Devices & Services. The new structure left Nokia with only two reportable segments for financial reporting: Devices & Services and Nokia Siemens Networks. Also the new acquisition, NAVTEQ Corporation, was to be a separate reportable segment.

Collaboration. With the introduction of the Ovi platform, mobile operators were invited to join the development of new services on the platform: *In line with our belief in the coexistence of Nokia and operator services in our devices, we are partnering with mobile operators in Ovi services [...] in order to partner on value added services such as location based services, maps, mobile advertising and gaming* (Nokia, 2007).

In 2009, Nokia formed a global alliance with Microsoft to design and market a suite of productivity applications for Nokia's smartphones, starting with Nokia's business-optimized E-series range of devices. At the same time, a range of new services were launched: Ovi Mail (email service), Ovi Store (mobile apps store), Ovi Maps (navigation), Ovi Lifecasting (location and status on Facebook), Nokia Money (mobile payments service), and Ovi SDK (software developer kits for application developers and content providers). This collaborative relationship with Microsoft was the third critical juncture tying Nokia firmly on its path.

5.4 Struggling to Break from the Path - The Burning Platform

Technology. In 2011, the market was changing more rapidly than ever, and Nokia was pursuing its lost leadership role with a new, non-internally developed OS: the first Nokia smartphones powered by Microsoft's Windows Phone OS were introduced in October 2011 under the new *Lumia* brand. In 2011, Nokia also launched the *Nokia N9*, which turned out to be the only MeeGo smartphone ever, and the *Nokia 808 PureView*, the last Symbian smartphone ever.

The change from Symbian to the Microsoft OS was to be the foundation of Nokia's efforts to regain the lead in the smartphone market: *The key element of our smartphone strategy is our planned strategic partnership with Microsoft, announced on February 11, 2011, to build a new global mobile ecosystem. The Windows Phone ecosystem, targets to deliver more competitive, differentiated and innovative mobile products with an unrivalled scale, product breadth, geographical reach and brand identity. [...] The Microsoft partnership would provide us, however, with opportunities*

to innovate and customize on the Windows Phone platform with a view to differentiating Nokia smartphones from those of our competitors who also use the Windows Phone platform (Nokia, 2010).

As before, Nokia was determined to meet the market with a broad product portfolio, even though the product launches did not reach the high numbers of the past.

Strategy and leadership. Dramatic changes called for dramatic responses and in September 2010 Nokia announced that Kallasvuo was to be replaced by Stephen Elop as CEO. This was the fourth and final critical juncture cementing Nokia's lock-in on its path. Elop was not only the first non-Finnish CEO for Nokia, but also the former head of Microsoft's Business Division. He spent the first year analyzing the firm's situation and in February 2011 he was ready to present his answer to Nokia's many challenges.

In an internal memo written to all Nokia employees and leaked to the press, Elop described Nokia as a *firm standing on a burning platform*. Elop changed the management group and altered the organizational structure, as well as the way of thinking, making decisions, and working. Most significantly, the leading role of Symbian and the MeeGo OS was to be brought to an end, and the decision was made for Nokia's future smartphone products to be built solely on the Microsoft Mobile OS.

Elop's new strategy was built on regaining leadership in the smartphone market, reinforcing Nokia's leadership position in mobile phones, and investing in future market disruptions. The net sales and profitability of Devices & Services were expected to be driven primarily by continued convergence of the mobility, computing, consumer electronics, and service industries. Furthermore, the increasing importance of competing on an ecosystem-to-ecosystem basis with new monetization models was now better comprehended. Achieving sustained differentiation and impact on overall industry gross margin trends was perceived as the main challenge. Although Elop came from outside Nokia, even he was partly locked into the old *Nokia way* and wanted to maintain many of Nokia's traditional virtues, including the idea of providing customers with unique experiences (e.g., bringing together best-in-class photographic and imaging capabilities with location-based geo-positioning assets), distinctive design, combining local and global approaches, and excellence in hardware engineering, branding, supply chain management, and intellectual property, in an attempt to achieve the much needed differentiation.

The sales of Symbian OS phones dropped drastically when Elop's *burning platform* memo-quite understandably-created uncertainty about the future of the OS. In 2012, Android and iOS were clearly ahead of both Symbian and Windows Phone OS sales, and the same remained true the following year. From 2011 to 2012, the net sales of Nokia's smartphones dropped almost 50%. Also, in mobile phones, the drop in net sales was 13% in 2010 and a further 21% in 2011.

Sales were plummeting in Europe, North America, and Greater China. In the Asian-Pacific, Latin American, and Middle Eastern & African regions sales were also dropping. Nokia was cutting expenses, but at the same time net sales and operating profit kept sliding downwards. By 2012, operating profit had turned into operating loss of €1,100 m. The turnover from Symbian to Microsoft OS had effectively failed, and in 2012 Nokia had to admit that the change had created too much uncertainty in the market, affecting not only sales but also the willingness to develop an ecosystem around the new OS: *The significant momentum and market share gains of the global ecosystems around the Android platform, where Samsung is the dominant participant, and Apple's iOS platform have increased the competitive barriers to additional entrants looking to build a competing global smartphone ecosystem. [...] The dominance of the Android and Apple ecosystems makes the growth of other ecosystems, such as the Windows Phone ecosystem, increasingly more difficult (Nokia, 2012).*

Organization. The changes not only had consequences for the leadership team, but also for the organization as a whole: a new organizational structure and massive layoffs of employees were ahead. Nokia was again re-organized, now around three business divisions: Devices & Services, HERE, and the Nokia Siemens Network.

CEO Elop formed globally accountable business units, revised the services mission, empowered employees locally, simplified decision making, fostered a performance-based culture, and introduced new leadership principles. Furthermore, he implemented a new structure for Devices & Services: Smart Devices and Mobile Phones (mass-market mobile phones). Each of these two units would have profit and loss responsibility and end-to-end accountability for the full consumer experience, including product development, product management, and product marketing.

During 2011, Nokia also made significant changes to its R&D operations for smartphones. These changes included both personnel reductions and personnel transfers: 2,300 employees were transferred to a management consulting, technology services, and outsourcing firm Accenture, which agreed to maintain the development of Symbian software and the provision of support activities to Nokia through 2016.

Nokia was now increasingly looking into new business models, particularly those that could help in strengthening its ecosystem. Exploration of new monetization models became a key element in the partnership with Microsoft: *We believe that the traditional industry monetization model-capturing the value of the overall experience through the sale of a mobile device- will continue to dominate in the near to medium term. However, we are also seeing the*

emergence of new indirect monetization models where the value is captured through indirect sources of revenue such as advertising revenue through applications rather than the actual sale of a device. [...] Obtaining and analyzing a complex array of customer feedback, information on consumer usage patterns and other personal and consumer data over the largest possible user-base is essential in gaining greater consumer understanding (Nokia, 2011).

In 2012, Nokia continued to streamline, and reduced and divested certain operations in Device & Services, leading to further reductions in headcount. From February 2011 to December 2012, the Nokia Group faced a reduction of 34,600 people, 75% of whom came from Devices & Services and Corporate Common, and further reductions were ahead: *We continue to target to reduce our Devices & Services operating expenses to an annualized run rate of approximately EUR 3.0 billion. [...] The measures included the closure of our manufacturing facility in Salo, Finland as well as the closure of our research and development facilities in Ulm, Germany and Burnaby, Canada. We also focused our sales and marketing activities and streamlined its information technology corporate and support functions to align with the sharpened strategy (Nokia, 2012).*

The closure of manufacturing facilities in Finland and the sale of the luxury brand Vertu and the headquarters building in Finland marked the end of an era for Nokia.

Collaboration. In line with the ecosystem thinking now being embraced, Nokia was working *closely with third party companies, application developers and content providers in other areas that we believe could positively differentiate our smartphones from those of our competitors (Nokia, 2010).*

Collaboration with Microsoft intensified further and in 2011 Nokia announced its partnership with Microsoft *to bring together our respective complementary assets and expertise to build a new global mobile ecosystem for smartphones. The partnership, under which we are adopting and licensing Windows Phone from Microsoft as our primary smartphone platform, was formalized in April 2011 (Nokia, 2011).* In addition to a *shared development roadmap to align on the future evolution of mobile products*, the collaboration was extended to joint marketing initiatives.

5.5 The Final Jolt: Sale of Nokia Mobile Phones to Microsoft

In 2013, the situation was critical for Nokia: Net sales had dropped year after year and both 2011 and 2012 resulted in significant operating losses. Nokia share prices were still falling. On September 4, 2013, the breaking news was announced: Microsoft had bought Nokia's mobile phone production and 10 years use of the most important phone patents (8,500 design patents) for €5,440 m. Nokia's market capitalization was approximately €10,450 m, whereas it had been closer to €200,000 m at its best.

Of the workforce, 32,000 employees and CEO Stephen Elop were part of the deal and were transferred to Microsoft in April of 2014, when the sale was finalized. A Finnish industrial adventure and a national treasure had come to an end after 150 years of history. Today, in late 2014, Nokia consists of Nokia Networks (mobile broadband), HERE location services, and Nokia Technologies (over 30,000 technology patents) and is led by Rajeev Sure as President and CEO.

6 Discussion

We next reflect on the key events in Nokia's history through our proposed multi-layered path creation and path dependence framework (see Figure 1). Drawing on Glaser [18], we also evaluate its validity in terms of its relative explanatory power and its theoretical relevance.

Looking over the last 10 years, it seems as if Nokia did all the right things. It was setting the standards in mobile infrastructure (first NMT and then GSM). It was the market leader and a trendsetter for a number of years, and it reflected very early on the emergence of an ecosystem structure for the industry. It analyzed customer needs very carefully, streamlined the organization and R&D efforts to the conditions on the market, and cooperated with external partners and subcontractors. Its production, logistics and sales were streamlined, and it acquired companies with important competences (and sold them if they were no longer needed). It invested heavily in R&D and marketing, and divested businesses that were not critical components for the company's vision of the mobile world. Nokia acquired companies with interesting new technologies and competencies, and developed cooperation with other mobile phone manufacturers and mobile operators, as well as with application and service developers. It also cooperated with universities and other external research institutes. Based on this picture, it is very difficult to appreciate why Nokia could not respond properly to the challenges of the changing market conditions.

Our integrated framework illustrates path creation and path dependence at four layers and over three consecutive phases. The horizontal axis outlines the three interdependent path creation phases: preformation, formation, and lock-in. The vertical axis shows four layers, including technology, strategy and leadership, organization, and collaboration. Decisions within any layer will influence the choices a firm has in the future. Choices made in the past can lead to organizational lock-in. The framework provides a means of understanding and explaining how and why

firms are able to respond to changes in their environment and potentially become successful. Earlier research related to a firm's responses to technological innovations, for example, has examined how a firm leverages, creates, accesses, and releases its assets [15]. Those studies have focused on specific competitive initiatives, whereas our proposed framework demonstrates the interdependence between historical actions and the firm's future success. Our multi-layered framework integrates path dependence [3], [4], [17] with the path creation layer [20], [21]. Its explanatory power lies in its ability to portray the role of historical decisions and events. The framework also helps us to see a hardware-oriented firm, dominated by an engineering culture and an assumption that customer needs are to be met with the best possible technology in the form of differentiated devices. The historical engineering culture influenced the technological choices, which were reinforced by the management team, and in particular the CEO's engineering background. This view stresses that a firm's success cannot be studied in isolation, but has to be seen in light of how decisions influence each other.

In our case analysis, we find that the first critical juncture for Nokia was its accentuated focus on mobile phones in the 1990s, a strategic choice by the CEO. The second critical juncture – commitment to Symbian as Nokia's primary OS – was not only a choice concerning technology but also a strategic decision. This is in line with previous findings that a strategy for proprietary platforms can be based both on utilizing an open strategy and on retaining control and differentiation [50].

Furthermore, our framework also enables analysis of why some decisions are more successful than others. The explanation is that it is hard or even impossible to foresee the long-term consequences of decisions, such as Nokia's choice of Symbian as its primary OS. The regime of positive self-reinforcing feedback and persistent patterns, together with negative internalities caused by internal turmoil and negative externalities created by telecom operators and other partner companies, brought Nokia closer to path lock-in. A mixture of technological choices, especially commitment to the Symbian OS, followed by the third critical juncture of partnership with Microsoft, created the final lock-in. The lock-in was strengthened by strategic decisions, especially the continued decision to try to serve each and every identified customer segment with a customized offering, and an organizational structure optimized for streamlined production, logistics, and sales. The final critical juncture was the selection of Stephen Elop, formerly a Microsoft executive, as the CEO. Thus, success is not contingent on only one decision, but many different decisions that are isolated when they are made. The framework explains how Nokia failed to see and understand the intermediate outcome and benefits of ecosystems: it was late in reacting to the ecosystem thinking [29] that fundamentally changed the rules of the industry [29]. Now that what used to be Nokia Mobile Phones has been sold to Microsoft and is free of the old *Nokia way* path, it remains to be seen if Windows Phone can create a strong and viable ecosystem for its products and services [46].

The theoretical relevance of the framework lies in building on the literature on firm failure and success by theorizing how historical decisions influence success and failure. As more and more industries become digital and are based on a two-sided market, the relevance of this knowledge will grow. We believe that our framework can be used to understand other success and failure histories. One example of success would be the payment industry and its global infrastructure.

7 Conclusion

Our narrative of the rise and the fall of Nokia as a mobile phone manufacturer is, by and large, well-known in academia [29], [46], [50]. What our case analysis provides, however, is new understanding of the intertwined reasons and critical junctures at technical, organizational, strategic and leadership, and collaborative layers that first led to the creation of a path, and then through lock-in to a path that was successful for a period of time. Path dependence can lead-as it did in Nokia's case- to a disproportionate focus on long-term outcomes (such as sales and shareholder value) that inhibit the firm seeing the often crucial intermediate outcome: in the case of Nokia and the mobile phone industry, the importance of ecosystem thinking and external collaboration. Path dependence is not easy to break, particularly when the firm is a global market leader as Nokia was in its heyday.

In this paper, we have focused on how historical decisions concerning technology, strategy, organizational structure, and external collaboration and critical junctures influence current and future decisions. All the first three identified critical junctures for Nokia were closely related to the technical layer - which is not very surprising considering the industry in question. However, these were not solely choices regarding technology but were to a large extent also strategic decisions by the CEO and leadership. Furthermore, the second critical juncture, in part, and the third in particular were also decisions related to external collaboration. The fourth and final critical juncture of nominating Elop as CEO was, of course, a strategic and leadership layer issue, but also an organizational decision, and indirectly a technical and collaborative choice.

We build upon a long and extensive research tradition. The explicit contribution of our study is the development of the multi-layered path dependence framework. We show how the technical, strategic and leadership, organizational, and collaborative layers are tightly interrelated and influence each other in creating path dependence that is difficult to break free from. We develop the framework through a case study of Nokia. In doing so, we provide a deeper, complementary explanation of how and why organizations succeed or fail in adapting to changes in their external

environment. As our findings are based on one case narrative only, future research needs to develop and refine our multi-layered path dependence framework further with empirical evidence from other organizations.

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