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Nokia Phones: From a Total Success to a Total Fiasco

A Study on Why Nokia Eventually Failed to Connect People, and an Analysis of What the New Home of Nokia Phones Must Do to Succeed

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Abstract—This research intensively reviews and analyzes the strategic management of technology at Nokia Corporation. Using traditional narrative literature review and secondary sources, we reviewed and analyzed the historical transformation of Nokia's core business, leadership strategies, business architecture, R&D policy, innovation strategy, product launch, and smartphones recognition and demonstration. We identified various strategic gaps that the previous analytical studies seemingly have missed to identify and generalize. Therefore, we add to the literature a bundle of the lessons learned that chronologically explain how Nokia failed to create and sustain competitive advantages, particularly in the smartphone market. We concluded that the problem at Nokia was not the lack of innovation, but rather, it was the lack of a precise technology forecasting, and misunderstanding that the needs in smartphone market were not just about demonstrating a mobile phone that makes calls, texts and connects to the web, but also the platform that operates all these functions together. Since Nokia's brand name is recently back in the market through a newly licensed firm (HMD Global), we further discuss how likely the new Nokia's smartphones will possibly compete and plausibly succeed in a very well-established market.

I. INTRODUCTION

Peter Drucker urges that the mission statement of any business is what defines the starting point of its strategies and plans [1]. The mission statement of Nokia was simple and straightforward; "Connecting People" [2, p. 10]. Nokia was focused on building its brand worldwide and achieving the credibility and market leading, which it once had. In 1994, the company successfully made the shift from a Finnish company to a global payer and became during the 1990s and early 2000s one of the world largest mobile phone firms in terms of volume, sales, market share and profit [3]. The introduction of its first smartphone N95 and the Symbian OS in Spring 2007 has fostered the company leading position proved by the jump of its overall market share from 36% in 2006 to 38% in 2007 [4]. In fact, Nokia made another dominance, particularly in smartphones industry with a market share of 70% in 2007 [3], leaving its competitor far behind. However, Nokia's story of success started to fade away shortly after the introduction of the Apple iPhone in the third quarter of 2007 [4] and the breakthrough Human-Computer Interaction HCI, which set the standards for the user experience [3]. Although the overall market share reached 39% in 2008 [4] yet, all the financial figures of Nokia started to decline. For instance, net sales dropped by (-1%), operating profit by (-38%), and profit attributable to equity holders by (-45%) [5]. As a result, senior

management made various strategic changes to take the company back into its leading position, or at least into a position that compensates or reduces the losses incurred since then. These strategic changes included the replacement of the CEO in 2010 to deploy new strategies. Nonetheless, Nokia's deterioration was consistent, year after year [3, 4, 6, 7]. According to [3], Nokia's market capitalization dropped from 110 to 15 billion euros in 2012, which led the company to close various factories and R&D facilities, in addition to laying off many of its employees. Further, in September 2013, Microsoft officially announced the purchase of Nokia's business unit of devices and services for 3.79 billion euros [3, 4] and patent license for 1.65 billion euros [8]. However, Microsoft as well couldn't make any success in the space of smartphone market, and later in May 2016, the feature phone assets were sold to FIH Mobile Ltd., a subsidiary of Taiwanese firm Foxconn Technology and a newly-established firm HMD Global for \$350 million [9, 10]. To this end, this research aims to answer the following questions;

1. *What are the strategic gaps at Nokia Corporation that led to its collapse, particularly in the smartphone market, despite it was one of the world's great corporate success stories?*
2. *How likely is the new home of Nokia phones, namely (HMD Global) would succeed in the smartphone market?*

In this research, we intend to present that the story of a significantly successful business may end up in a total fiasco, particularly when the strategies and plans deviate from the business mission and objectives. The business eventually fails regardless of how high its market share or how superior its leading position when the leadership fails to forecast the right time of the technology to market, and underestimates and/or misunderstand the total capabilities of the rivals, the market size and demand, the customer wants and needs, and the industry eco-system. Although the failure of a company such as Nokia was too painful and extremely expensive yet, it can be the perfect lessons learned to rethink the strategies for creating, achieving and sustain competitive advantages.

II. RESEARCH METHODOLOGY

Our interest is to acquire a wider and deeper understanding of why and how successful high-tech firms fail to create and sustain competitive advantages. We choose Nokia as a renowned story of success and a market leader for more than a

decade, but eventually suffered a persistent declination until it has completely failed to compete in the smartphone market. Therefore, we follow a historical posture in solving issues and interpreting ambiguities by collecting evidences that produce a comprehension of the processes, mechanisms, and outcomes. Our goal is to conduct a rigorous examination of the relevant data (desk-research or secondary sources) using traditional narrative literature review to summarize the available body of literature and draws conclusions regarding the issue in question. This type of literature review is used to provide a comprehensive background for understanding the current knowledge of the problem and highlighting the implications of new research. We started gathering data from multiple sources by looking for information regarding the social, economic and industrial history of Nokia between the late of the 1970s and the present. The information was gathered focusing on Nokia's history, including published academic research, magazine and journal articles, conferences preceding, as well as the firm's official history and annual reports. Moreover, we considered the use of the available statistical data and logical reasoning to cope with the potential subjectivity of the qualitative analysis of the previous studies. The review comprises Nokia's successive leaderships and strategic changes, business architecture, R&D policy, innovation strategy, products' launch, and smartphones' recognition. In the final analysis, we employed multiple data sources to understand; (a) how Nokia has transformed its business model and greatly succeeded during the 1990s and early 2000s, and (b) how its story of success continued until it started to decline in 2008. Moreover, our review and analysis extend to further our understanding of how likely the new Nokia's smartphones by the newly licensed firm (HMD Global) possibly compete and plausibly succeed in a very well-established market.

III. COMPANY OVERVIEW

Nokia is Finnish multinational communications and IT corporation, which was founded in 1865 by Fredrik Idestam under the name of Nokia Katabolic [3, 13]. The company went through various changes over its history [6]. Its business model has been transformed from different industries; rubber, paper, and cable company to mobile handsets and mobile telecommunication infrastructure [7, 13]. The most prominent change happened between 1990 and 1996 when a fruitful transformation of the business model has been made to save the company from near bankruptcy and settled it on the path of becoming one of the world's great corporate success stories for more than a decade and a half [6]. According to [14], the success of Nokia during that time was achieved based on various factors, namely; economic, cognitive, organizational, and institutional. Furthermore, Nokia's dominance viewed as it was behavioral rather than structural [15]. In other words, it was based on factors such as culture and diversity, which articulated in corporate accountability, and development of shared values, management of human resources besides, the strength and unique characteristics of its senior management. In addition, the R&D within Nokia was a crucial factor that explains the development of new products and businesses [14].

However, Nokia's success did not last longer than 2007, as the company went through a journey of a persistent declination of its financial performance as illustrated in figure 1 below [4].

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

Figure 1 - Key data of Nokia mobile phones business unit – Source [4]

According to [16], Nokia's collapse from the top of the smartphone pyramid is due to three factors; (1) less technical capabilities compared with the rivals' (e.g. Apple), (2) high level of complacency, and (3) failure of the leadership to see the upcoming disruption, particularly Apple's iPhone. Another perspective views the factors to failure were; (1) the inability of the executives to grasp the market accurately, (2) deviation in the business tactics, and (3) lack of teamwork [8]. However, to identify and define the gaps in Nokia's previous strategies that led to its disappearance from the mobile phone industry, multiple aspects will be discussed in the following sections.

IV. LEADERSHIP AND STRATEGIC CHANGES

For around eleven years (1977-1988), Kari Kairamo was the CEO of Nokia. During his leadership, the company was transforming from a conglomerate to an internationally large multi-industry firm with an emphasis on telecommunication devices [3], mainly network equipment and digital switches for the telephone exchange [13]. This period has been considered as the era of growth, represented by the remarkable joint venture with Salora to develop the radio telephone company Mobira Oy in 1979, followed by the acquisition of ten large electronic and telecommunication companies [17]. As a result, Nokia became the largest electronics company in Scandinavia, particularly after the introduction of the Mobira Senator in 1982, which was the first true mobile phone in box form with a network standard of 1G [13]. Later in 1984, Nokia introduced the Mobira Talkman, a portable car phone, which was featured to be recharged from the car's cigarette lighter socket, followed by the introduction of Nokia Mobira Cityman brick-form mobile phones in 1987 [17]. Kairamo has always been cited as the driving force behind Nokia's rise. This process of shifting and transforming the company to this type of industry was considered very successful, yet it did not complete due to his sudden death in 1988 [3]. However, Simo Vuoriletho succeeded him and led the company as a CEO till 1992. Vuoriletho changed Nokia's strategy from an aggressive buyer to a seller of the basic industrial units [18]. This was considered not strategic since all Nokia's businesses were divested [19].

This strategy left the company with internal and external conflicts, particularly with the two main shareholders at that time, the Union Bank and Kansallis Osake Pankki [3]. The company then failed to turn around among the unrestrained changes in the world between 1988 to 1991 [18].

In 1992, Jorma Ollila has appointed as the CEO and since then, the era of modern Nokia has begun [3]. Ollila led the era of the digital GSM expansion and refocused Nokia by the strategic choice for mobile technology and wireless business [7, 19]. Despite the process of restructuring at Nokia started at the time when Vuorilehto was the CEO however, Ollila has continued this phase [18], particularly during 1994-1995, where the company witnessed a cultural change, namely the value-based leadership and management [3, 17]. Trust, loyalty, and commitment were the key values within Nokia under Ollila’s leadership, while employees enjoyed a freedom and took responsibility [3, 20]. Ollila in fact geared Nokia’s strategy towards; “internal product development based on concentration of intangible assets in know-how, skilled people and filling of critical patents, while operations were based on coherent and efficient process architecture, and strong customer orientation offering that was integrated with technical consumer-focused solutions” [3, p. 5]. Moreover, in 1994, Nokia 2110 DCT/GSM handset was brought to the market with (618,000) units sold [20], making the shift from a Finnish company to a global payer [3]. Figure 2 illustrates the number of mobile phones produced and sold per year for Nokia and its rivals during 1990-2012, which reflects the upward streaming by Nokia starting in 1994. Ollila’s leadership led Nokia to be the number one mobile phone manufacturer in the world by 1998 [17] and continued in the lead until he left in 2006 [4].

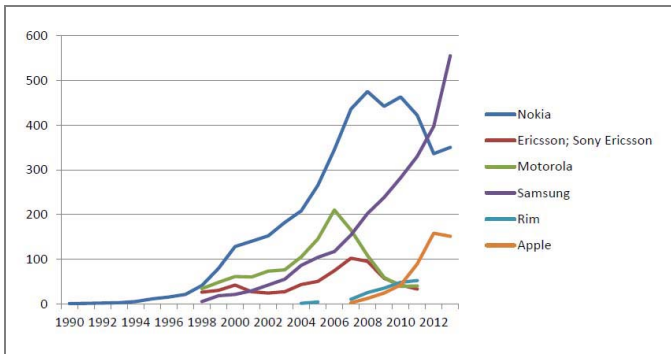


Figure 2 - Mobile phones produced per year – Source [3]

Olli-Pekka Kallasvuo who was Nokia’s CFO has succeeded Ollila in 2006. He implemented another cultural change by focusing on control due to the logistic crises and shifting the ownership from traditional Finnish investors to international investors, and to American mutual funds with short-term profit expectations as well as aggressive and active policies [3]. This strategic change was Kallasvuo’s vision since he was the CFO as he once said; “there is no way on earth this country [Finland] could own Nokia. Even if every penny of every investor in Finland was put into Nokia stock, the Finnish could hold perhaps 25 percent of the company. So, we had to go to the biggest capital market in the world and really become a

U.S. company in that respect” [21, p. 12]. With his vision and background, Kallasvuo was considered the right CEO to deal with the financial markets and production optimization, but he was not a fit in managing the market changes and the innovation disruption [22]. This gap has reflected on his vision towards the smartphones disruption, which obviously caused the downward spiral in the overall Nokia’s market share. In fact, Nokia’s market share fell from 39% in 2009 to 28% by the end of 2010 [2] (see figures 1&2). Apparently, this was the reason that led to replacing Kallasvuo with Stephen Elop in 2010, who was the first CEO from outside Nokia and was expected due to his capabilities as the former head of Microsoft business division to be the best fit to turn around Nokia [3]. Elop reformed the team of the executive board management and the company structure, splitting devices and services business units into separate smart devices and mobile phones units [4]. However, the famous “Burning Platform” memo and the metaphor he used to compare the company with the burning oil platform considered a controversial choice of the statement [4]. Elop by that expressed his lack of trust in the company’s core products, particularly the Symbian, and MeeGo platforms, and therefore, he developed a strategic partnership with Microsoft to adopt Windows Mobile OS instead [2, 3]. Elop’s strategic intent was to gain a quick lead in the smartphone market and retain Nokia’s leading position in the low-end mobile phones. Obviously, Elop as well has failed to understand the users’ wants and needs in term of the platform that operates the products. Microsoft mobile OS was not the right fit to compete with Apple’s iOS and Google Android. In fact, this strategy led the stock price of Nokia to be dropped by 62%, the mobile phone market share dropped by 50%, the smartphone market share dropped from 33% to 3%, and the cumulative loss reached 4.9 billion euros [24]. The reflection of Elop’s strategies can be clearly seen in the downward performance as depicted in figure 3 below.

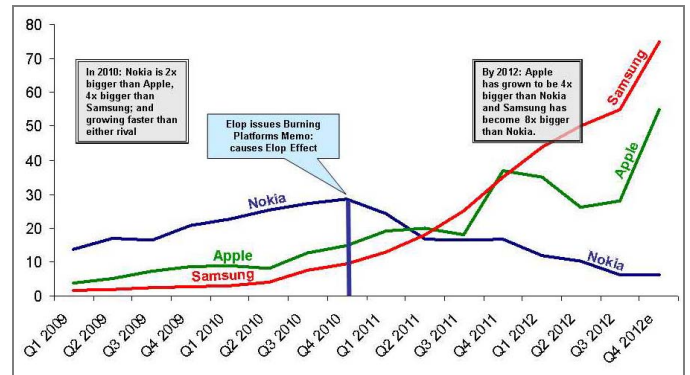


Figure 3 - Elop’s strategy – Source [23]

V. LOGISTIC AND BUSINESS ARCHITECTURE

To control the logistics and cope with the increasing demand on mobile phones, Nokia developed a strategy of market segmentation based on the distinction among the technologies, high-end and low-end markets, and entertainment and mobile services [3]. This strategy, in fact, has augmented the layers of the management (over 300 VPs and Senior VPs

globally) and built a complicated organizational structure that has caused considerable delays in the decision-making processes [25]. With this excessive organizational complexity and bureaucracy, decisions regarding each product were taking months if not years to be made. Therefore, the responsiveness to the rapid-changing mobile market has been significantly affected [26]. According to [27], the greatest barriers to growth are often caused by a dynamic called the “Growth Paradox”, which is the buildups of complexity and bureaucracy. This paradox caused for the case of Nokia; “the loss of the internal metabolism, speed, self-awareness, sense of urgency, and general bloat of staff instead of any outside factors they may have missed” [27, p. 2].

VI. R&D STRATEGY

The major focus of the R&D within Nokia was on product development, while the only minor portion was on basic research [3]. During the 1990s, the R&D efforts were mostly focused on the basic development of both mobile phones and mobile data communications, however, the focus on product development was incremental rather than radical [21]. Nokia conducted most of the R&D in-house (i.e. Nokia Research Centre NRC), as well as in 44 international research centers located in 12 countries [3, 21]. The NRC was closely associated with schools in Finland as part of the open innovation policy, represented by partnerships with the Tampere University of Technology as the core partner besides, Aalto and Oulu Universities [3]. In addition to partnerships with top American schools such as MIT and Stanford as well as Chinese schools such as BUPT and Tsinghua [3]. Nokia spent a huge sum of its revenues and 10% of its sales on R&D [28, 29]. The majority of the NRC funding sourced from the business divisions and researchers were asked to explain what they were doing by getting buy-in from the technology users [21]. According to the Bernstein Research [30], Nokia spent around \$3.9 billion in 2010 on developing its mobile phones, which is almost three times the average of its rivals spending, while third of the total spending on R&D for the same year went to the development of Symbian OS. Figure 4 below explains Nokia’s spending on R&D from 1990-2012.

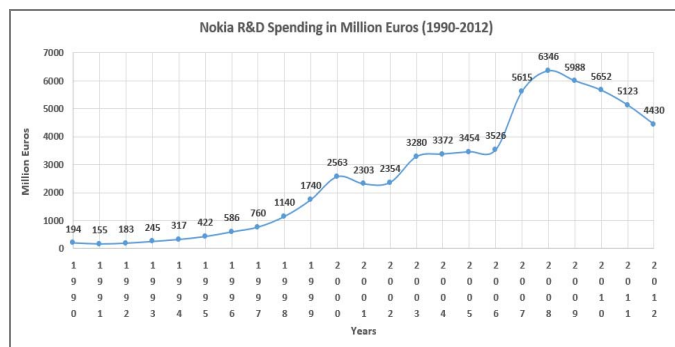


Figure 4 – Nokia’s R&D spending in euros – Adopted from [3]

Nokia’s spending on R&D has produced a remarkable list of innovations that consist of a variety of products ranging from network components to handset features, digital camera

and software solutions [3]. Figure 5 shows the upward streaming of Nokia’s number of patents filed during 1990-2013, making the highest number of patents in 2008. Importantly, prior to 2008, Nokia has been collaborating much more through joint R&D, outsourcing, and standardization consortia, but has at the same time managed to develop and maintain a strong brand name and corporate identity [31]. At the end of 2006, 31% of the employees worked in R&D, although largely in product development [24].

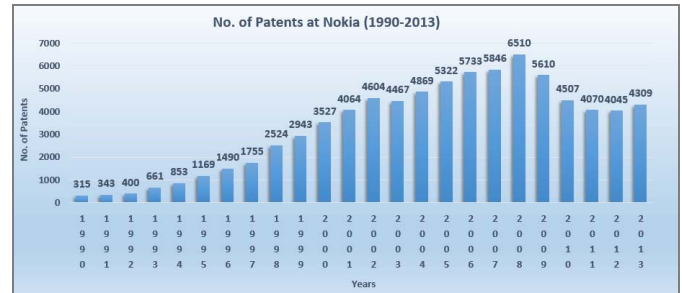


Figure 5 - Number of Patents at Nokia (1990-2013) – Adopted from [3]

VII. INNOVATION STRATEGY

Nokia is a technology-intensive firm therefore, it has massively invested to the R&D as discussed before. This huge investment led to release dozens of mobile devices every year to meet the dynamic and rapid changing in the consumers’ preferences and desires for additional and more features and settings, which required rigorous input and innovation [4]. Many people think that Nokia’s failure is rooted in the lack of innovation however, this company had a great portfolio of innovations and patents, explained in figure 5. For example, in 2002, Nokia demonstrated a prototype of 3D user interface, which means five years before its rivals brought it to the market [25], while in 2004, it has demonstrated a smartphone prototype with a large touch screen, or in other words, three years before the Apple iPhone was launched. Furthermore, the leadership at Nokia was mindful of having a well-defined advanced technology and competitive advantages based on high-tech products [3]. When the leadership team reflected on Nokia’s innovation record in the 1990s, it was clear that Nokia’s engineers had excelled at the technological innovations needed to improve the existing product categories [21, p. 15]. The concept of the open innovation has been early and effectively adopted [3, 31] as the company embedded its efforts in both local and international innovation networks [31]. During 1997-2002, (i.e. the beginning of the third generation (3G) of mobile telecommunications), or in other words, the advent of the Universal Mobile Telecommunications Service UMTS, Nokia was able to develop 48 agreements of strategic alliance, as 25 of which were joint development agreements, 16 co-production contracts, 6 joint ventures and one standardization consortium [31]. Furthermore, the company adopted an ambidextrous approach to ensure both exploitation predominant and existing technologies as a significant and ideally a cost-effective basis with high volumes in one hand, and exploration by establishing a venturing fund on the other

hand [3]. In addition, Nokia adopted an acquisition strategy that led to acquiring more than 50 companies and/or businesses during 1997-2013 [32]. These acquisitions included advanced technologies (e.g. Sega.com, Intellisync Corporation), product concepts (e.g. MetaCarta), access to content (e.g. music: Loudeye Corporation; maps: Navteq). However, this strategy was not very successful since many ideas, projects, and plans, with few exceptions, did not materialize [3].

VIII. PRODUCT SEGMENTATION

One explanation how Nokia succeeded in becoming the choice for the majority of the users is the clear identification of the users' segmentation and the development of distinctive value propositions to meet each segment's wants and needs, which was a strategy that has been adopted since the era of Nokia's Talkman and Cityman [33]. This strategy was developed to cope with the market expansion, portability, design, style, and services as shown in figure 6, which illustrates the segmentation based on three generations; technology G1, lifestyle G2, and functionality G3 [34]. Nokia launched a variety of mobile phones devices that have been innovated to meet the strategy for market segmentation. In 2007 and 2008, a new segmentation structure was developed to comprise 12 user categories strategized along two dimensions; higher involvement-lower involvement, and rational-aspirational [35].

Table 1 in Appendix A lists all the feature phones series and smartphones that Nokia has developed and released. This outstanding list proves how various and innovative products Nokia has delivered to the world [36]. Importantly, Nokia released 406 different models during 1995-2013, making the highest number in 2008 by releasing 47 different models, followed by 44 in 2009, 28 in 2010, 36 in 2011, 30 in 2012, and 25 in 2013. However, Nokia's strategy represented by launching so many products every year and the development of this type of detailed segmentation have led to an overabundance of product-market combinations, which has been criticized as a lack of product focus, and a main reason why Nokia couldn't develop and release the one product that would compete with its rivals' [3].

IX. RECOGNITION OF SMARTPHONES

The question that often been asked is what makes a smartphone is a smartphone? However, a smartphone is a mobile phone that offers more advanced computing ability and connectivity than a contemporary basic feature phone [37]. In other words, a smartphone is a handheld device that integrates mobile phone capabilities with the more common features of a handheld computer or PDA [38]. A smartphone allows users to store information, send and receive e-mails, install programs, socialize and browse online, and along with using a mobile phone in one device [39]. We will intensively discuss Nokia's recognition and demonstration of smartphones (both hardware and software) based on two stages. The early stage, or the stage of Nokia's dominance, which started in the early 2003 and lasted until early 2008, and the disruption stage, or the stage of

deterioration, which started in early 2008 and lasted until when Nokia sold its mobile devices and services business in early 2014.

1) Early Stage – Nokia's Dominance

Since an early stage, Nokia strongly acknowledged that the development of smartphones and the software platforms were the new path for mobile communications industry [4]. In 2003 Nokia released its first smartphone based on Symbian OS v7.0 kernel software, the Nokia 6600, although its screen was a TFT "non-touch" [3]. Moreover, in 2004 the company introduced Nokia 7710 (feature-packed multimedia smartphone with pen input and handwriting recognition), as the first TFT resistive touchscreen, Symbian OS powered smartphone, which might be defined as the early prototype of today's smartphones [40] as shown in figure 7. However, according to various technological defects, this smartphone was not made commercially available in the market [4]. According to [42], in 2005, Nokia brought together some researchers from NRC and academia to brainstorm the future of sensor networks. Within this brainstorming, the researchers discussed how the phone could serve as a user interface and an entry for existing sensor networks [42]. In fact, the category of smartphones as part of the Nokia's strategy regarding mobile phone business unit was officially announced in the 2005 annual report due to the adaptation of various features and rapid evolvement of mobile devices [43].

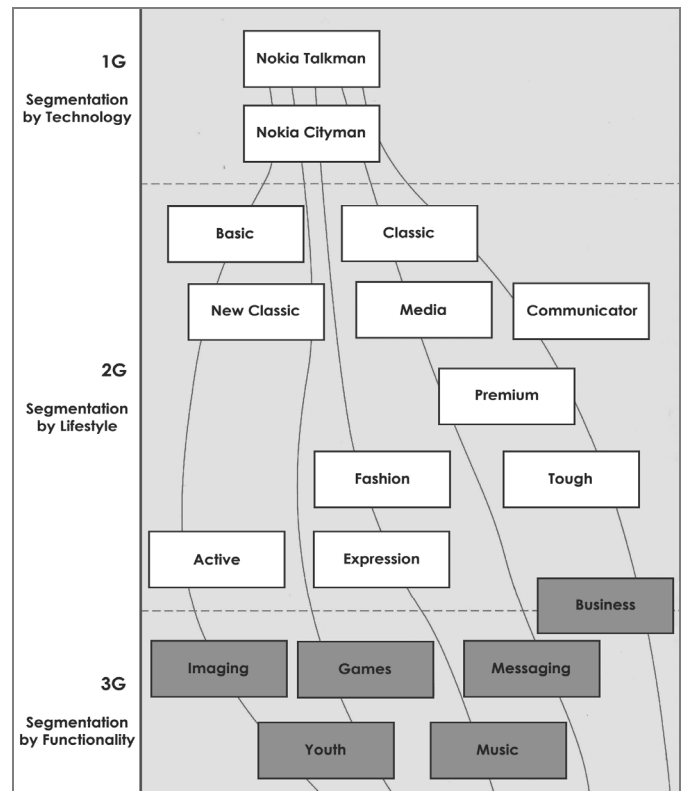


Figure 6 - Nokia mobile phones development – Adopted from [35]

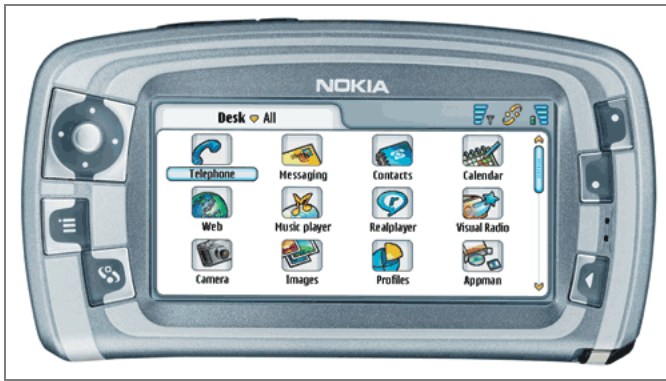


Figure 6 - Nokia 7710 smartphone prototype in 2004 – Source [41]

The emergence of mobile phones new features, which meant that the new generation of the mobile phones would be capable of running computer's applications such as email, web browsing and enterprise software in addition to the capabilities of having built-in features such as music players, video recorders, mobile TV and other multimedia features [4]. In 2006, Nokia released 35 mobile phones [3] included the release of the traditional products; the 4-digit series, as well as the release of both N and E-series [44]. During the same year, the market trends have marked the shift in Nokia's strategy to diversify the activities of the company to further the focus on consumer internet services, network solutions and the increase in professional and enterprise services [4]. In fact, 2006 considered as a milestone for Nokia's development in Asia, particularly in China, where the annual sales and exports in this country reached more than 10 billion euros, marking China as the largest market for Nokia globally [8].

The release of Nokia's N-series (i.e. Nokia smartphones), enabled the users to send and receive emails over multiple networks, and enjoy the Universal Plug and Play, mobile TV, music, photo sharing, and games, have all reflected the convergence in the market strategies and product developments [3]. In Spring 2007, Nokia released N95 (see figure 8) as an early smartphone [46], which was equipped with an accelerometer and GPS (i.e. Nokia maps) [3, 46]. The N95 was a flagship smartphone that was developed to beat its rivals' [4]. It was also a complete multimedia computer with a list of functionalities that have never integrated before into a single, pocket-sized device [47]. This version of Nokia's smartphones had a high-end rear and front-end camera for video calls, play audio and video and included business applications [3]. However, its operating system "Symbian" and Java Micro Edition (JME) virtual machine rather limiting since they both have been developed to use a limited portion of the memory and computational resources [46]. Two months later, Nokia global market share has jumped from 33% to 36%, while the smartphone market share reached around 70% [3]. A year later, Nokia announced that more than 7 million units of this model were sold worldwide [47].



Figure 7 - Nokia 95 - Source [45]

2) Disruption Stage – Nokia's Deterioration

In June 2007, Apple launched its first iPhone 3G [3, 4], to make obvious differences in the technical specifications compared with Nokia N95's [13]. The N95's features such as the small and non-touchscreen, complicated interface, slow Symbian OS, non-user-friendly app customization compared to those of the iPhone have proved that the iPhone outperformed [36]. Although the iPhone was criticized for the lack of 3G support and poor camera quality, however, its big touchscreen and the iOS platform have caught the users' imagination, and therefore, it thoroughly shortened the time to compete and surpass [47]. Obviously, Nokia failed to recognize that the users were no longer interested in power, but instead in the ease of use [48]. However, by Q4 of 2007, Nokia's market share regarding smartphones was still the largest compared to Apple and other major players as shown in figure 9 below [49].

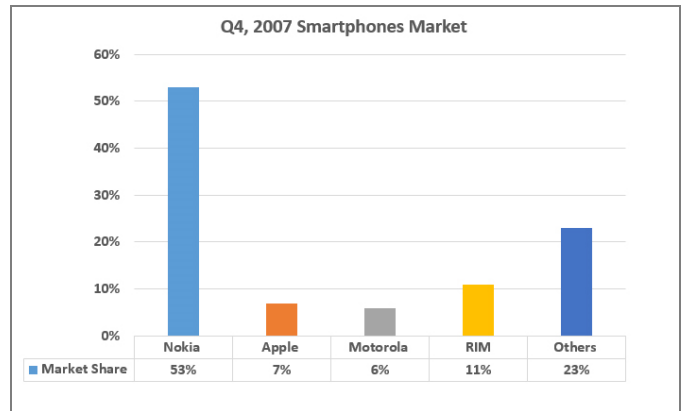


Figure 8 – Q4, 2007 Smartphones Market - Adopted from [49]

The threat of Apple's iPhone and the release of the first Google's Android version 1.0 in 2008 forced Nokia to respond strategically by introducing Nokia 5800 Xpress Music with Symbian OS and first touchscreen [13, 25]. Although around 8 million units of this model were sold [50] yet, this smartphone did not manage to compete with the quality of the iPhone, since it was designed based on Series 60 5th Edition, which was later criticized for its user interface as it was not optimized for a touchscreen and was nowhere comparable to Apple's iPhone [25]. As a result of this new failure, Nokia's profit by Q3 of 2008 dropped by 30% and sales by 3.1% [13]. On the contrary, iPhone's sales increased steeply and quickly by around 330 %

during the same period [50]. However, Nokia continued to launch new smartphones (e.g. N97 in 2009), which was designed to take over the iPhone, but according to one of Nokia's top managers, this smartphone was a total fiasco [16]. Taking into the consideration that Nokia did not penetrate in the North American market, even after the competition became fierce with Apple [3]. Yet, Nokia's battle continued, and hence, an "iPhone Killer" and a flagship N8 powered by the improved Symbian^3 [4] with AMOLED capacitive touchscreen [51] was introduced in Spring 2010. Nonetheless, 2010 witnessed the introduction of two remarkable smartphones; iPhone 4 and Samsung Galaxy S1[25]. In fact, the introduction of these smartphones caused Nokia's smartphones market share to decline from 38% in 2009 to 27.6% by the end of 2010 [2, 52, 53] as shown in figure 10, while the mobile devices market share as well has dropped from 34% in 2009 to 32% in 2010 [4]. Nokia persistently struggled to release a smartphone that either matches its rivals' high-end smartphones (e.g. Apple, Samsung, HTC) or competes with much cheaper manufacturers such as ZTE or Huawei [52].

In June 2011, Nokia introduced a new smartphone, N9 with an AMOLED capacitive touchscreen and powered by MeeGo 1.2 [54, 55]. Yet, the operating system of this smartphone was a hybrid that is mainly built on Harmattan, the legacy Maemo 6 code base that Nokia closed when it committed to MeeGo 1.2. This means that the distinction will be little more than an implementation detail as far as users and application developers are concerned [56]. In fact, N9 was developed to be the only Nokia's MeeGo smartphone [25, 57]. However, in October 2011, Nokia launched Lumia 800 and Lumia 710 to be powered for the first time by Microsoft Windows Phone 7.5 Mango [25, 57]. Nevertheless, these Lumia smartphones did not make any success, but instead, they have incurred Nokia more losses regarding its smartphone market share, which dropped to 12.2% by the end of 2011 [53]. Not surprisingly, net sales dropped from 38.66 billion euros by the end of 2011 to 30.80 by the end of 2012 [58], while the market share fell extremely to (2.9%) as shown in figure 10.

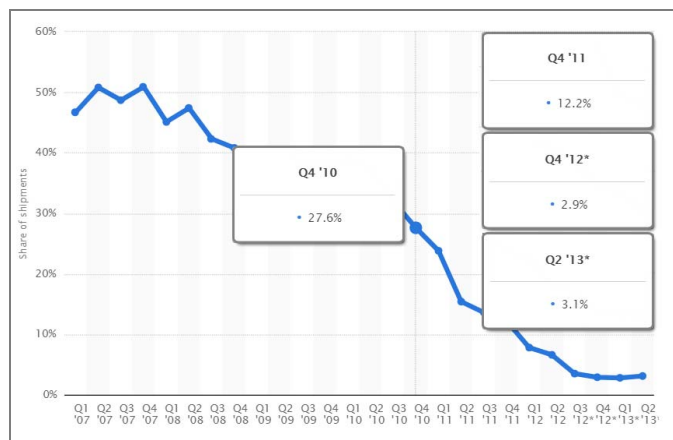


Figure 9 - Nokia's market share, Q1,2007 - Q2, 2013 - Reproduced from [53]

Later in 2012, Nokia released Lumia 920 [59], which is powered by Microsoft Windows Phone 8, and became one of

the best-selling smartphones in many countries as well as at Amazon.com [25]. Nonetheless, there is a debate about the competitiveness of this model. In one hand, some reviewers viewed this model as a high-quality build, good camera features, and a top-notch suite of integrated apps [13]. In fact, Lumia 920 helped Nokia to become profitable during Q4 of 2012 (+ 202 million euros) after six consecutive quarters of huge losses [60]. It also helped to make a very slight increase of the smartphone market share in Q2 of 2013 (see figure 10) [53]. On the other hand, users of this smartphone lost the interest due to many factors such as the lack of third-party applications support, the device weight and dimensions, overheating issue, battery life when using GPS or Maps, blurry captured images, slow picture taking, and difficulty to transfer video to YouTube, in addition to a relatively high price for such specifications [61]. In a short, Lumia 920 failed to compete with the Apple's iPhone and Samsung's Galaxy [13]. Therefore, Nokia's sales by the end of 2013 dropped to more than half of its sales in 2012, making only 12.7 billion euros [58], and the company started to make losses again during the entire 2013 [60]. In the 2013 annual report, Nokia justified the declination in smartphone's net sales primarily to lower volumes, which affected by the competitive industry dynamics including the strong momentum of competing for smartphone platforms, in addition to the transitioning portfolio from Symbian products to Lumia products [62].

X. SMARTPHONE'S OPERATING SYSTEMS

The era of smartphones goes beyond just the product innovation to significantly comprise the innovations of the operating systems OS that operating them [63]. In other words, to integrate both hardware and software in the making of one successful product. Originally, Nokia's phones were powered by Nokia's OS, which lasted until 1998 when the company started the Symbian initiative; a platform launched by Psion, a PDA-provider as an alternative to its branded OS [3]. Nokia has extensively exploited two options; first, to continue the development of its Symbian OS, and second, to develop a new MeeGo capability before turning to Windows Phone OS in 2011 [4]. In this chapter, we will review the smartphones' operating systems at Nokia; Symbian, MeeGo and Windows Phones.

1) Symbian OS

As discussed before, Nokia approached the smartphones' market since 2003 by introducing the Nokia 6600, but its N95 in 2007 was considered as the first real smartphone, powered by Symbian OS and Java Micro Edition (JME), as both were developed to use limited portion of the memory and computational resources [46]. However, Nokia's dominance of the market till the end of 2007 was principally due to the Symbian OS [3]. As listed in table 1 in Appendix A, most of Nokia's phones series (i.e. both featured phones and some smartphone) were developed to be powered by Symbian OS. Although the core strengths of the Symbian powered devices characterized in its technological dominance, such as better camera, Bluetooth, 3G connectivity, and GPS features (Nokia's map) however, they did not offer such exciting user interface as

Apple's iOS and Google's Android have had [4]. Furthermore, although Apple's iOS and the Linux based Android open platform became major threats to Nokia's Symbian since 2007 [3] yet, the Symbian was the most popular smartphone OS on a worldwide level until the end of 2010 [64]. According to [65], the Symbian OS made a market share of (32.3%) by Q4, 2010, followed by Android (30.5%) and Apple iOS came third with a global market share of (15.8%) as shown in figure 11 below.

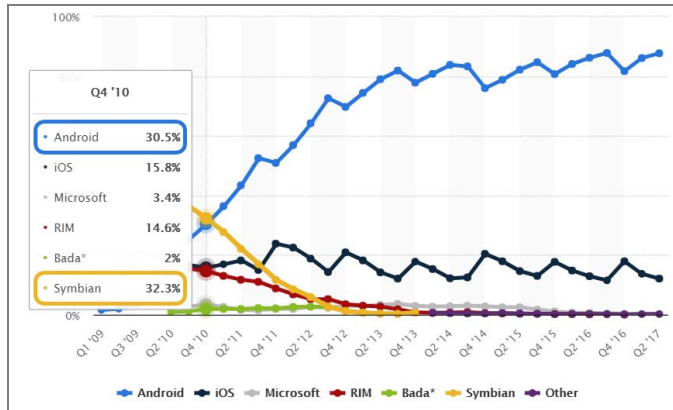


Figure 10 – Smartphones' OSs (Q4, 2010) - Reproduced from [65]

However, the Symbian OS failed in creating an ecosystem and providing enough applications for its users, since its developers did not understand that the basic functions were not enough in the growing smartphone market, adding to that the technical problems with the operating system, which was slowed down the developers of the applications [2, 3, 4, 66].

The problem behind the failure of the Symbian OS urged to be the fragmentation of the software architecture [4]. In addition, the Symbian in the early stage was written to run on very low power CPUs, which led to even less processing power than for instance, the Linux OS or iOS in achieving similar tasks [64]. The Symbian has not been developed to support several devices or integrate different features at the same time, which led to creating complicated issues for the whole Nokia's software development. According to [4], "the biggest difference between Symbian and the most popular operating systems today, such as Android or iOS, was that the device development was driving the platform development-the product-specific software was in many cases only compatible with that certain device" [4, p. 33]. Furthermore, according to [67, 68] the Symbian failed due other reasons such as; outdated interface, lack of applications, perpetual hanging, and outdated browser. However, in February 2011, the Symbian era and its development have come to an end, particularly when Nokia announced the partnership with Microsoft in making Windows Phone as the smartphones' primary platform [3, 4, 25]. Yet, Nokia continued to ship devices based on Symbian [69] until the last Symbian device has been shipped in Summer 2013 [4].

2) MeeGo OS

Under the name of Open Source Software Operations, the MeeGo development team was formulated and started in 2005 to explore alternatives for the Symbian OS [4], which was renamed in 2007 as the Maemo team [3]. The Linux-based,

open-source software platform, was announced in 2010 by merging the Maemo team (renamed again in 2010 to be the MeeGo team [3]) with Intel's Moblin to jointly create the MeeGo OS [3, 4]. According to 2011 annual report, the MeeGo was expected to be a winning platform in the smartphone market and a direct competitor to Apple's iOS and Google's Android [57]. While Nokia N9 was launched successfully to the market to be powered by the MeeGo OS for the first time as a Nokia's smartphone [57], which was considered as a peak of MeeGo development [4] however, the eco-system around the MeeGo platform never went beyond Nokia and Intel [3]. In other words, the platform has not been supported, neither by the hardware providers, nor the operators. The announcement of Nokia's new strategy in February 2011 and decision made to choose Microsoft Windows Phone as the new operating system for Nokia's smartphones turned the MeeGo to be a project of an open source mobile operating system, which in the long term, would be used for market research on next-generation devices, platforms, and user experiences [70]. Anyway, the strategic partnership with Microsoft has ended Nokia's involvement in the MeeGo OS [3, 4, 25]. As mentioned before, Nokia released only one MeeGo smartphone (i.e. N9) as an outcome of two years of the platform development [70]. In fact, Elop has made a clear decision that there is no returning to MeeGo, even if N9 significantly succeeded [71]. Moreover, two aspects should be taken into the consideration; first, Nokia did not launch the N9 in the United States [72, 73], which means that there was no chance for the MeeGo to be tested and used in the North American market, and second, Nokia did not release the market share that the MeeGo has made, and there is no clear information even about how many units have been sold worldwide. Moreover, the development of the MeeGo has been in parallel with the development of the Symbian, which considered a highly resource consuming, especially that these two operating systems were not the only platforms that Nokia's R&D was investigating [4]. For that, some urged that the "Burning Platform" metaphor of Elop was not incorrect [3].

3) Windows Phone OS

In February 2011, Nokia announced a partnership with Microsoft to bring together the respective corresponding assets and expertise of both parties to build a new global mobile ecosystem for smartphones [57]. This partnership, under which Nokia adopted and licensed Windows Phone from Microsoft as the primary platform [69]. However, at the time when this strategic partnership was announced, the market share of Windows Phone OS was only 2.6%, whereas Symbian's was 27.7%, and the Android's was 36.4% as shown in figure 12. These apparent variances in the platforms market shares have created a debate around Nokia's decision to abandon the Symbian OS and to favor Windows phone OS on Android. In one hand, many technologists urged that the steady pace whereby Nokia develops new hardware would have made perfect sense to have chosen Android [74], or it might have leveraged the investment on the Symbian OS. Yet, Nokia's CEO at that time justified the decision to choose Windows Phone OS since Nokia would have been a late entrant into the Android space, while many strong rivals were already in there

XI. THE NEW NOKIA (2014-PRESENT)

[75]. Elop added that his leadership was concerned that a one hardware manufacturer (implicitly meant Samsung) could have dominated Android OS due to its resources and vertical integration.

By April 2014, Nokia has completely closed the business of the mobile devices and services after it has been substantially sold to Microsoft [77, 78]. This deal was originally announced in September 2013, and it has included license patents to Microsoft. Nokia considered the year 2014 as a new transformation and a start of various essential changes, particularly the appointment of Rajeev Suri as the President and CEO, in addition to the allocation of five billion euros as a capital structure optimization program [78]. The company has newly emerged from the transaction with a firm financial footing and three strong businesses; Nokia Networks, HERE and Nokia Technologies [77, 78]. Each of these businesses is a leader in its respective field, proved by the global presence of the R&D facilities in Europe, North America, and Asia, while the sales started to take over in 140 countries [78]. Nokia in fact started to make profits in Q2, 2014 [60], although it has decreased in the subsequent quarters yet, this change has been considered a major positive transformation resulted from the new leadership and converged strategies. According to [77], the reflection of this transformation can also be seen in the company financial performance (net sales, gross profit, dividend per share, and net cash in million euros) during 2014, 2015 and 2016 [79]. Furthermore, as a part of the new transformation and strategies, Nokia announced a strategy to create new businesses and licensing opportunities in the consumer eco-system [77]. Indeed, in May 2016, a strategic brand and intellectual property licensing agreement were signed to grant HMD Global Oy (HMD), a newly-established Finnish private venture based in Helsinki, Finland an exclusive global license to create Nokia branded mobile phones (both feature phones and smartphones) and tablets for the next ten years [11, 12]. The agreement entered into effect on December 1st, 2016, allowing HMD to begin the operations as the new home of Nokia phones [77]. HMD and FIH Mobile Ltd., a subsidiary of Taiwanese firm Foxconn Technology have bought the feature phone assets from Microsoft for \$350 million euros [9, 10]. The deal included brands, software and services, customer contracts and supply agreements as well as the transfer of 4,500 employees [80]. Nokia also announced that the remainder of Microsoft feature phone business assets, including manufacturing, sales, and distribution, would be acquired by FIH Mobile Ltd, while Nokia Technologies and HMD have signed an agreement with FIH to establish a collaboration framework to support the building of a global business for Nokia-branded mobile phones and tablets [12].

This agreement gave HMD Global full operational control of sales, marketing, and distribution of Nokia-branded mobile phones and tablets, with exclusive access to a prominent global sales and distribution network to be acquired from Microsoft by FIH, access to FIH world-leading device manufacturing, supply chain and engineering capabilities, and to its growing suite of proprietary mobile technologies and components [12]. However, in order for HMD to complete its portfolio of Nokia branding rights, the company has conditionally agreed to acquire the rights to use the trademark of Nokia on feature

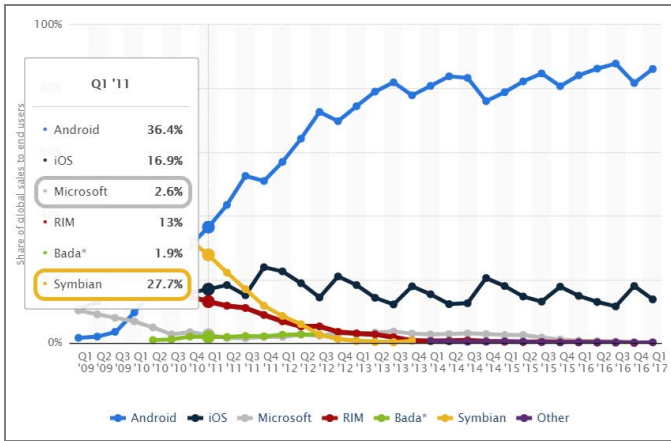


Figure 11 - Smartphones' OSs (Q1, 2011) - Reproduced from [65]

On the other hand, others viewed the alliance with Microsoft as a strategy to penetrate the US and North American market since this market is a core for Windows [3] and was important but untapped for Nokia. Yet, the Nokia Lumia came about and the OVI store was integrated with the Windows Phone Store and since then Nokia has collapsed [3]. Indeed, Nokia Lumia by all its models proved that the decision to switch to Windows Phone OS was a misguided strategic decision, which illustrated by the losses Nokia has incurred since Q1, 2011 as shown in figure 13 below [58]. The failure in nailing the smartphones' market based on the strategic partnership with Microsoft is in fact associated with the failure of the Windows Phone OS itself. From figures 11 and 12 above, the market share of Windows phone OS has never exceeded (3.6%) at best. In fact, this share continued to drop quarter by quarter until it was (0%) market share by Q1, 2016. According to [76], there were several reasons why Microsoft's Mobile Business failed to take off, especially that Microsoft was too late to the game, and the emerging market didn't respond the way Microsoft designed, planned and expected.

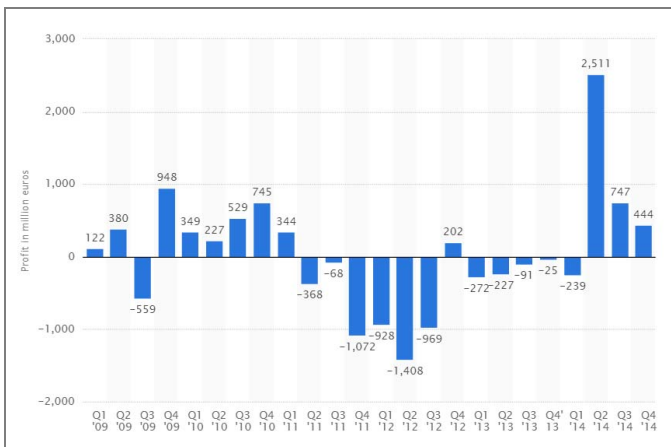


Figure 12 - Nokia's net profit/loss from 2009 to 2014 – Source [58]

phones until 2024 from Microsoft, and to design rights relating to Microsoft feature phone business, where these agreements will make HMD the sole global licensee for all types of Nokia branded mobile phones and tablets [11]. Importantly to mention that Nokia is not an investor in HMD Global, but it has a representation on its board and will receive a royalty on every Nokia branded device that HMD Global makes and sells [77, 81, 82].

XII. NOKIA PHONES ARE BACK

On December 1st, 2016, HMD has officially announced its entry to the market to bring Nokia-branded phones [83]. A week later, HMD announced the introduction of its first mobile phone; Nokia 150 and Nokia 150 Dual SIM phones, and they would be officially available in the Market by January 2017 [84]. Later in February of the same year, the very famous Nokia 3310 (new look) has been announced and then released in May at a price of 49 euros [85]. However, no clear information available about how many units have been sold from both Nokia 150, and Nokia 3310 to date, and how was the impact of these new versions on the market of the feature phones. Furthermore, in January 2017, HMD launched its first Android-based smartphone (Nokia 6) into China, explaining that the Chinese market was selected preliminary to reflect the company’s desire in meeting the real world needs of consumers in different markets around the globe [86, 87]. HMD viewed the Chinese market as the best option based on the increasing number of the users with over 552 million in 2016 and expected to grow to more than 593 million by 2017 [87]. This was considered an important strategic decision since premium design and quality are highly valued by Chinese consumers [87]. However, during the Mobile World Congress, which held in Barcelona in February 2017, HMD announced a new era for Nokia smartphones by launching Nokia 6 globally [88]. Perhaps, it was the 100,000 units sold of this smartphone in one minute in a flash sale in China for approximately \$250 per unit [89, 90] what really encouraged HMD to launch this model globally. According to [91], “While we are not sure how many units actually were available, it is not entirely surprising given that the handset had received over a million registrations for its first flash sale”. During the same event, HMD unveiled that a new generation of Nokia smartphones would be released; Nokia 5 and Nokia 3. This announcement remarked the new standard in design, quality, and user experience throughout the range. Nokia 5 would be retailed at an average global retail price of 189 euros [92] while Nokia 3 for 139 euros [93]. In Appendix B, Nokia 5 and Nokia 3 are shown in figures 15 and 16 and briefly described in tables 2 and 3 respectively. The new range of Nokia smartphones all run Android™ Nougat and offer a pure, secure and up to date experience and will all feature Google Assistant. [88].

It is early to review and analyze the users’ desirability based on the performance of these smartphones and to judge whether they would compete strongly although they are operated by Android and would be sold for highly competitive prices. However, the smartphones industry is a very well-established and has a very advanced technology. The players in

this industry (e.g. Apple, Samsung, Huawei, HTC, etc.) are already having powerful brands, which have been built according to their high-quality and high reliability products for long period of time. Therefore, creating and sustaining competitive advantages will require not only financial capabilities and R&D strategies, but also strong brand names, and customer base, experience and loyalty. Nonetheless, Nokia’s brand name is currently having no market share (see figure 14), but it has a powerful brand name as well as a long and outstanding history in the mobile phone industry regardless of the failure in nailing the smartphone market caused by the strategic gaps discussed in this research.

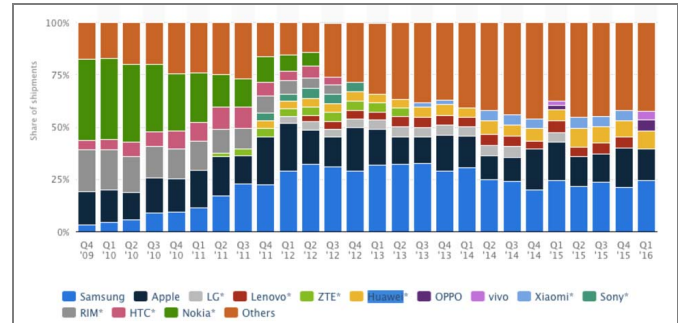


Figure 13 – Smartphones’ market shares, Q4, 2009 to Q2, 2017 - Source [94]

Furthermore, the smartphone market is a very price sensitive with customers seek out the best value for money. HMD strategy in setting low prices is reflecting a high consideration of this critical factor. Generally, the smartphones market is highly competitive as the number of options is considered significant, which is creating a high power for the smartphones’ users to compare, select and eventually make decisions regarding which brand they select to meet their wants, needs, desires, and budget. According to [95], the users of products such as smartphones in fact, make their decisions regarding the brand based on many factors that involve not only how appealing is the product, but also on factors that drive their emotions and engage them for long time as loyal customers, particularly the drivers of the product and brand experiences [95].

XIII. CONCLUSION

It is obvious that Nokia’s story of success has negatively impacted its later strategies and performance since success adversely developed a high level of complacency, that is clearly seen in underestimating the rivals’ capabilities. However, we have concluded that Nokia did not miss the opportunity of the smartphones as it was fully aware of its disruption. The huge investments in R&D, the variety of inventions and innovations, and the market research and performance are all proving that the company was very well prepared for this disruption. Indeed, the problem at Nokia was not the lack of innovation, but rather, it was the lack of forecasting the right time to market. In addition, Nokia during the time when smartphones became a necessity in people’s lives, has misunderstood that the market needs were not just about a mobile phone that makes calls, texts and connects to

the web, but also about the platform that operates all these functions together while the users are delighted to achieve more functionalities.

One can urge that the platforms that Nokia developed and employed to power its smartphones since 2007 have achieved all these tasks together, but Nokia still failed. That is a true argument, however, all these platforms lacked the integration into the eco-system that Apple's iOS and Google's Android have had. In other words, it was not about the product (hardware) and platforms (software) alone, but it was about the eco-system that supported both. In fact, some viewed the battle between platforms became a battle between eco-systems. Importantly, although Nokia strategies to innovate, develop, and release so many models each year was considered a success as Nokia was keen to meet the needs and wants of different segments of its customers however, this was considered as a lack of the focus on the one product that can attract most of the customers and compete perfectly with the rivals' products.

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APPENDIX A

TABLE 1 - NOKIA PRODUCT SERIES BASED ON GSMERENA.COM AND WIKIPEDIA.COM (1996-2017) – ADOPTED FROM [36]

Nokia Series	Year(s)	Descriptions
Nokia 1xxx	1996–2010	Most affordable phones. Mostly targeted towards developing countries and users needing only calls and SMS, alarm clock, and reminders.
Nokia 2xxx	1994–2010	Entry-level phones. More advanced features than the 1000 series, newer models with color screens and some feature cameras, Bluetooth and even A-GPS.
Nokia 3xxx	1997–2009, 2017	Mostly mid-range phones. Later targeted towards the youth market.
Nokia 5xxx	1998–2010	Similar in features to the 3000 series. Often more features towards active individuals, extra features for music playback.
Nokia 6xxx	1997–2010	Mid-range to high-end phones. High number of features, conservative, unisex designs, business use.
Nokia 7xxx	1999–2010	Targeted towards fashion-conscious users, especially women; consumer-oriented; fancy design, test features.
Nokia 8xxx	1996–2007	Ergonomics and attractiveness; exclusive, high-end materials.
Nokia 9xxx	1996–2007	Communicators prior E90 (the latest Communicator)
C-series	2010–2011	Affordable series optimized for social networking and sharing; OS Series 40 and C-5xx Symbian 60 5th ed., C-6/7 Symbian^3.
E-series	2006–2011	Enterprise-class, business-use; Symbian S60 and E7 Symbian^3.
N-series	2005–2011	Highly advanced smartphones, with strong multimedia and connectivity features; mainly S60 3rd, but Maemo in N900, MeeGo in N950, N8 Symbia^3.
X-series	2009–2011	Targeted to a young audience with a focus on music and entertainment; OS mainly Series 40, but X5 (updated) and X6 with S60 and X7-00 with Symbian^3.
3-digit series	2011–2012	Since the Nokia 500, Nokia has changed the naming rule for Symbian^3 phones.
Asha - Series	2011–2014	Affordable, optimized for social networking and sharing, meant for first time users.
Lumia- Series	2011–2014	Smartphones running Windows Phone. It also includes the Nokia Lumia 2520, a Windows RT-powered tablet computer. The series was sold to Microsoft in 2014 who branded these products under the name Microsoft.
X Family	2014	A range of Android smartphones from Nokia. These were the first ever Nokia phones to run on Google's Android OS.
3-Digit - Series feature phones	2011–2016	Those phones are entry-level, classic mobile phones platform (with long work on battery). The series was sold in 2014 to Microsoft which continued branding these products under Nokia. Microsoft sold this series to HMD Global in 2016 which also continues branding these products under Nokia.

APPENDIX B

TABLE 2 - NOKIA 5 TECHNICAL SPECIFICATIONS - SOURCE [92]

Nokia 5 - Technical Description	
Launch	Announced: February 2017 Status: Released June, 2017
Body	Dimensions: 149.7 x 72.5 x 8 mm
	SIM: Single SIM (Nano-SIM) or Dual SIM
Display	Type: IPS LCD capacitive touchscreen, 16M colors
	Size: 5.2 inches
Platform	OS Android 7.1.1 (Nougat)
Memory	Card slot: microSD, up to 256 GB
	Internal: 16 GB, 2 GB RAM
Camera	13 MP, f/2.0
Features	Fingerprint, accelerometer, gyro, proximity, compass
Battery	Non-removable Li-Ion 3000 mAh battery
Colors	Tempered Blue, Silver, Matte Black, Copper



Figure 14 - Nokia 5 - Source [92]

TABLE 3 - NOKIA 3 TECHNICAL SPECIFICATIONS - SOURCE [93]

Nokia 3 - Technical Description	
Launch	Announced: February 2017 Status: Released June, 2017
Body	Dimensions: 143.4 x 71.4 x 8.5 mm
	SIM: Single SIM or Dual SIM
Display	Type: IPS LCD capacitive touchscreen, 16M colors
	Size: 5.0 inches
Platform	OS Android 7.1.1 (Nougat)
Memory	Card slot: microSD, up to 256 GB
	Internal: 16 GB, 2 GB RAM
Camera	8 MP, f/2.0
Features	Accelerometer, gyro, proximity, compass
Battery	Non-removable Li-Ion 2650 mAh battery
Colors	Silver White, Matte Black, Blue, Copper



Figure 15 - Nokia 3 - Source [93]