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The Rise and Fall of Nokia

In September 2013, Nokia, the communications and technology company headquartered in Espoo, Finland, announced the sale of its Device and Services business to Microsoft for \$7.2 billion.¹ The sale marked “a sad ending to Nokia’s once-great handset business,” an analyst noted.² An innovator from the earliest days of the mobile telecommunications (telecom) industry, Nokia’s fast response to shifting markets and its focus on design and engineering innovation had made it the world leader in handset manufacturing in 1998. Ten years on, however, Nokia’s position was crumbling. Lower-cost Asian manufacturers were competing for the low end of the market, while users at the high end were flocking to Apple’s new iPhone smartphone. By June 2011, Nokia’s share of the smartphone market had plunged to 25%, from 49% just prior to the iPhone’s launch in 2007.³ Revenues now came largely from lower-cost handsets sold in emerging markets.

In 2011, CEO Stephen Elop famously compared Nokia’s position to a man “on a burning platform”⁴ above icy ocean waters. Survival, Elop said, required “a bold and brave step into an uncertain future.”⁵ Soon after, Nokia dropped its in-house operating system (OS), Symbian, for Microsoft’s Windows Mobile OS. It was not enough. Between 2007 and 2012, the company’s market value dropped 75%.⁶ In 2012, Nokia posted an operating loss of €2.3 billion⁷ and Samsung took over as top handset manufacturer. (See **Exhibit 1** for financial data.) By 2020, Nokia had seen a sequence of three additional CEOs take the helm in futile attempts to regain the company’s magic. A year later, Nokia Devices and Services belonged to Microsoft. What were Nokia’s missteps over the years?

Nokia’s Early History: 1865-1988

Initially founded in 1865 as a timber company, by the late 1960s, Nokia AB had merged with several Finnish concerns to form Nokia Corporation. In 1971, Nokia began selling analog car radio-telephones, its first steps toward dominance in the nascent telecom industry. The company produced the first wireless phones in Scandinavia for government services such as fire brigades, police, and railways, building on requests from the Finnish defense forces to produce military radio-phones. Nokia later established Telefenno Oy, a 50/50 joint venture with a state-owned telecom networking company, to develop and market equipment for wireless networks.

From 1977 to 1988, Kari Kairamo led Nokia through an era of growth. In 1983, after becoming Scandinavia’s largest consumer electronics company, Nokia made its first international acquisition, Swedish consumer electronics company Luxor AB. Nokia also grew its exports of wireless telecom

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networking terminals from four Nordic countries in 1982 to over 20 countries throughout Europe, the U.K., North America, and Asia by 1986. In 1987, revenues reached €4.6 billion, up 54% from 1986.⁸

That year, Nokia introduced the first mobile phone designed for the Scandinavian Nordic Mobile Telephone (NMT) analog^a network—the Mobira Cityman—marketing it to business users for the 2020 equivalent of €4,849.^{b,9} The company was also influential in establishing the second-generation (or “2G”) mobile network, the European digital network Global System for Mobile (GSM), which in time replaced many incompatible analog network systems and allowed mobile phones to work throughout Europe. By 1988, Nokia was a major player in analog mobile handsets, with 13.4% of the world market share, followed by U.S. manufacturer Motorola (12.8%), and Japan’s NEC (11.2%).¹⁰

Nokia’s impressive performance continued with a series of mergers and acquisitions (M&A) that boosted revenues while adding valuable patents to its portfolio. Its investments in research and development (R&D) continued, reaching €210 million in 1987, or 7% of net sales from the electronics sector, higher than the U.S. industry average of 5.4% of net sales at that time.¹¹

However, some experts believed that Nokia’s acquisitions were hurting profitability. In November 1988, Nokia’s eight-month earnings dropped 39% to FIM 402 million (€77 million).¹² Consumer electronics, which accounted for 70% of sales, was struggling, and suddenly Nokia’s financial outlook looked bleak. Its “buying binge,” as one analyst described Nokia’s merger and acquisition (M&A) activity,¹³ had left the company cash poor. In 1988, net income fell 23% to €199 million.¹⁴

Nokia under Vuorilehto (1988-1992): Facing New Challenges

In 1988, Simo Vuorilehto took over as CEO. Vuorilehto streamlined management and restructured the firm into six business divisions: Telecom (networking), Mobile Phones, Nokia Data, Cables & Machinery, Basic Industries, and Consumer Electronics. Yet poor performance continued, and by 1989, an analyst described Nokia’s near-term prospects as “lackluster.”¹⁵

In 1991, Nokia’s total sales dropped 31% from the previous year.¹⁶ Several factors contributed to Nokia’s poor performance. The 1991 fall of the Soviet Union, a key trading partner, pushed Finland as a whole into a currency crisis. The faltering economy made Finnish banks hesitant to lend to Nokia, leaving the company entirely dependent on its own cash flow.¹⁷

Despite these problems, Nokia’s telecom networking division was thriving; its net sales rose to €323 million in 1991.¹⁸ Europe had begun to roll out GSM networks and demand for wireless network infrastructure was growing. Nokia had a head start on competitors because Finland’s telecom infrastructure sector had been deregulated before that of most European countries.¹⁹

An alternative to GSM, the Code Division Multiple Access (CDMA) digital standard network was slowly developing in the U.S.; later Canada, Hong Kong, Peru, and South Korea adopted it too. GSM was considered superior as it transferred more data and allowed users to send SMS messages, while making upgrades to a new handset a matter of simply inserting the user’s existing SIM card into the

^a The analog network, or “first-generation” (1G) wireless standards, emerged in the 1980s in Europe and North America, and provided voice service and SMS (short message service, or texting) to mobile users. Fragmented network systems, including AMPS (advanced Mobile Phone System) in the U.S., TACS (Total Access Communications Systems) in the U.K., NMT (Nordic Mobile Telephone) System in Scandinavia, NTT (Nippon Telephone and Telegraph) in Japan, and others throughout the world, were incompatible with one another. Handsets on analog networks only worked within one geographic location.

^b The European Central Bank’s consumer price index puts the original reported 2012 equivalent price of €4500 at €4,849 for 2020; CPI Inflation Calculator, <https://www.in2013dollars.com/europe/inflation/2012?amount=4500>, accessed June 2020.

new device. (See **Exhibit 2** for GSM and CDMA release dates.) In the U.S. and in Europe, users purchased handsets through their carrier, but by the late 1990s many European carriers allowed customers to purchase a handset and airtime minutes (and later data) from a separate retailer.

Nokia under Ollila (1992-2006): A Mobile Communications Company

Jorma Ollila took over as Nokia CEO in 1992, after serving successively since 1985 as vice president of international operations, senior vice president of finance, and president of Nokia Mobile Phones in 1990.²⁰ Upon becoming CEO, Ollila announced that he would “adopt a back-to-basics approach,”²¹ following a period of dwindling profits. “In a slow-growth situation like we’re facing now, you can’t afford to make mistakes,” he said.²² “It’s important to do the small things correctly – the big river of profit comes from dozens of small streams.”²³ He recalled his first days as CEO: “It was Olli-Pekka [Kallasvuo, Nokia CFO] and me sitting in the head office trying to figure out what to do. We had unhappy Finnish shareholders, unhappy international shareholders. The only thing you could do is to start building a base for a very meaningful stock performance.”²⁴

Under Ollila, Nokia divested its chemicals, data, and forestry businesses, and centered the company on four key business areas: mobile telephones, consumer electronics, networks, and cables, making telecom (networking equipment) and mobile phones the focal points of its strategy. Ollila believed the company could be saved only by focusing on mobile phones,²⁵ and by continuing to develop GSM networking equipment for Europe.²⁶ In 1992, Nokia received 25% of all GSM network equipment orders for Europe.²⁷ Industry experts predicted that between 1992 and 1999 more than \$75 billion would be spent installing networks,²⁸ giving Nokia’s networking business the opportunity to thrive. Nokia also controlled one-third of the essential patents for GSM standards,²⁹ which guaranteed continuous cash flow from technology licensing. Outside Europe, Nokia became the first European manufacturer to sign a deal in Japan, in 1992 agreeing to design handsets for Japanese mobile operator IDO after noticing Japan’s overall 70% mobile market growth on the previous year.³⁰

Nokia Mobile Phones

In 1992, Nokia launched the first mass-produced digital phone for GSM, the Nokia 1011. Digital GSM handsets were priced at €1,335 (FIM 7,013), far more than the €314 average manufacturer’s price for analog mobile phones in competitive markets.³¹ While GSM handsets sales were growing, analog handsets remained more popular worldwide. By the end of that year, Nokia was the biggest producer of mobile phones in Europe, and the second largest producer in the world behind Motorola (see **Exhibit 3** for competitor descriptions). Nokia exported handsets (most of which were still analog) to 70 countries,³² expanding its reach to Latin America, Russia, Australia, and Eastern Europe. Meanwhile, Nokia aggressively sought patents for its new technology developments, aiming to acquire new intellectual property (IP) rights to defend the growing businesses.³³ (Refer to **Exhibit 1** for growth in Nokia’s patent portfolio over time.)

Nokia anticipated further rapid growth in handsets as Australia, New Zealand, and countries in Asia rolled out GSM networks. Nokia identified Asia as the region with the greatest potential, and its networking unit negotiated deals to install GSM infrastructure for 17 operators.³⁴ The company invested heavily in advertising in local markets, and tailored features and prices to suit local demand. Nokia’s product innovation, flexibility, and rapid responsiveness to market differences aided its global expansion.³⁵

According to an observer, “Nokia invested in each vertical of the handset ecosystem—manufacturing, distribution, and design R&D.”³⁶ Nokia produced its semiconductors in-house and

designed its own radio chips.³⁷ Unlike its larger competitors focused on multiple business units, Nokia had divested many of its non-core units. “Nokia was completely focused on mobile phones; others had consumer electronics, home appliances, etc.,” explained a Nokia India executive.³⁸ Swedish electronics company Ericsson and Motorola were also vertically integrated at this time, providing infrastructure and handsets,³⁹ while other, more highly diversified competitors viewed handsets as secondary products.

Nokia and an Evolving Consumer Market

As unit and airtime prices dropped and network coverage expanded, handset sales for personal use grew. In 1994, Nokia offered its 2100 series, the first of its line of digital handsets, in the U.S. The 2120, part of the 2100 line, was the world’s smallest and lightest phone; weighing less than 7 ounces, with a five-inch length and thickness of less than an inch. Its user-friendly features included a five-line LCD screen display, 99 speed-dial memory slots, a soft-touch keypad, ringtones that could be personalized, and a retractable antenna.⁴⁰ The 1994 suggested retail price was just under €703, but the phone sold at a lower price when purchased with a service contract through an authorized dealer.⁴¹ Carriers in the U.S. typically subsidized the cost of mobile phones and generated revenue through service contracts, and for years made it difficult to switch providers and transfer numbers.^c Nokia had to negotiate with carriers such as AT&T or Verizon to sell its handsets.

As the consumer market for mobile handsets grew, phones became pocket-sized and distribution spread worldwide; cellular penetration took off. By the end of 1995, Ericsson, Motorola, and Nokia collectively controlled 75% of the global handset market.⁴² To manage growth, Nokia ran manufacturing facilities in Salo, Finland, as well as in China, Germany, Hong Kong, South Korea, and the U.S., where the CDMA wireless standard had been mandated. Nokia had yet to crack the CDMA network market of the U.S. and South Korea.

By the mid-1990s, Nokia began to market its mobile phones explicitly as fashion accessories. (See **Exhibit 4** for the evolution of mobile phone design and Nokia handsets.) Nokia’s handsets were sleek and elegant, imbued with the minimalism and simplicity associated with Scandinavian design. The Nokia 8110, released in 1996 and featured in the movie *The Matrix*, was gently curved to rest against the user’s face and contained a sliding cover to protect the keypad. Users began to ask for special features and functions, such as patterned replacement covers and a selection of ringtones. The company patented its exchangeable phone covers and the technology used to allow ringtone downloads,⁴³ and hired young art school designers to keep up with trends. The company increasingly behaved like a consumer-products company, introducing new models annually and encouraging users to customize their devices.⁴⁴ “All the major players have access to the same technology so it’s about something else—its looks and feel and style,” explained Arto Kiema, vice president of Nokia’s Research and Development (R&D) Center.⁴⁵ By 1998, Nokia sold its products in 140 countries.

Nokia at Its Peak

In 1998, Nokia became the world’s leading mobile phone manufacturer, surpassing Motorola’s 20% market share with a 23% market share and sales of 163 million units. (See **Exhibit 5** for market share and **Exhibit 6** for net sales by region.) Analysts faulted Motorola for failing to respond fast enough to the switch from analog to digital networks, and for emphasizing CDMA over GSM technology. CDMA users numbered 12 million worldwide in 1998, compared to 100 million GSM users.⁴⁶ One observer

^c In 2003, the EU stipulated that all wireless carriers must allow number portability, making it easier for consumers to switch carriers. In 2004, the U.S. Federal Communications Commission followed suit.

noted that Nokia benefited from its “unrivaled prowess” in logistics.⁴⁷ CFO Kallasvuo boasted: “We are the only company in the world selling phones that work in every major cellular standard. We were first to segment our product line, first to build a brand identity, first to understand that design was essential in this business, and the first to make sure we could take advantage of the efficiency of global manufacturing in a business where R&D costs are high and can only be recouped with worldwide volumes.”⁴⁸ (Refer to **Exhibit 1** for R&D spending.)

“The growth was much faster than anything we could ever have imagined,” Ollila recalled. “In 1992 we projected that, in 1999, the mobile phone market, in units, would be around 40 million worldwide. The analysts thought we were too aggressive. We were both wrong. In 1999, the market exceeded 250 million units.”⁴⁹ Lacking production capacity, Nokia’s competitors began to outsource manufacturing. Nokia continued to produce handsets itself and protected its technological developments and handset features by aggressively filing patents. Nokia’s patent total jumped from 796 in 1998 to 1,469 in 1999.⁵⁰ By 2000, Nokia maintained R&D facilities in 14 countries throughout Asia, Europe, and North America, but well over half of its R&D activities occurred in Finland, where the mobile phone had become a symbol of national pride.⁵¹

Retail prices of GSM phones continued to drop. The Nokia 6160, the most popular phone of the 1990s, sold for an average price of €834 in 1998. The 1999 Nokia 7110, the first mobile phone to offer web browsing, sold for €464. By 2002, the Nokia 7650—priced between €185 and €411—was Nokia’s first camera phone (released two years after Samsung’s)⁵² and came with 30 ringtone options.

Nokia maintained lower production costs than competitors, and reported a 23% profit margin in 2000, exceeding Motorola’s 6%.⁵³ In October 2002, Motorola’s stock price dropped 26% to \$7.48, a 10-year low. Its market share in handsets declined to 17%, leaving the company vulnerable.⁵⁴

The style of Nokia phones continued to evolve, but some worried that style had begun to trump usability. Nokia continued to innovate, introducing the first touchscreen devices with a stylus in 2003—the Nokia 6108 and 3108 phones. The 7280 phone, released in 2004, contained a scroll bar instead of a keypad. In 2004, most Nokia phones weighed less than 4 ounces, nearly half the weight of its lightest handset a decade earlier.

Nokia’s Emerging Market Strategy

In 2002, Nokia reorganized itself into four divisions: Mobile Phones, Multimedia Phones, Enterprise Solutions, and Networks. The company controlled over 40% market share of GSM handsets and 5% to 7% of the CDMA handset market of the U.S. and South Korea.⁵⁵ At that time, 60% of handsets worldwide operated on the GSM network while 21% of handsets employed CDMA technology.⁵⁶ The remaining 19% operated on Japan’s PDC network, analog networks, or other networks.⁵⁷ Nokia’s networking infrastructure business, renamed Nokia Networks, continued to be a leading supplier of GSM network solutions and had begun providing network management and customer service to Internet service providers. In the early 2000s, Nokia turned its attention to emerging markets. Already Nokia sold handsets in over 130 countries, but estimated that there were at least 600 million potential mobile subscribers in China, India, and Russia alone.⁵⁸ In 2003, Nokia introduced three handsets tailored to emerging markets. The Nokia 1100 and 2300 had voice and SMS capabilities, longer battery life, and were designed with prepaid users in mind.⁵⁹ The 1616 model had a durable case, AM/FM radio, extended battery life, and multiple address books for families sharing a phone. In emerging markets, the 1616 was priced at \$32;⁶⁰ in contrast, in the U.S. the average retail price for a handset was over \$200 with a carrier subscription.⁶¹

In 2004, Motorola introduced the Razr, which quickly became the world's best-selling phone and revived that struggling brand.⁶² Nokia responded by cutting prices on select handsets and eliminating some models.⁶³ Sales slowed in developed markets and Nokia's worldwide market share fell from 35% to 29%.⁶⁴ Many believed this was largely due to Nokia's failure to respond to the new flip-phones, which were particularly popular in Asia and North America. In 2004, Motorola and Samsung had 43 and 63 flip-phone models in their portfolio, respectively, while Nokia offered two.⁶⁵

By 2005, Nokia annual revenues exceeded €29 billion.⁶⁶ Sales remained strong in Western Europe and Asia, compensating for weak sales in the Americas. Nokia held 45% market share in Eastern Europe, the Middle East, and Africa; while in India, Nokia held 63% of the market.⁶⁷ The low-end Nokia 2112 and Nokia 1100 were especially popular in Asia. Nokia also aggressively pursued the growing Russian market. In North America, however, Nokia's CDMA handsets fared poorly.⁶⁸

Increased Competition

By the mid-2000s, the industry was increasingly competitive. New Asian competitors, including South Korean manufacturer Samsung, entered European markets that Nokia had dominated. Growing rivalry shortened product lifecycles to between six and nine months, dramatically increasing pressure on design, manufacturing, and distribution. Many operators in Europe and the U.S. began working with Asian contract manufacturers or handset vendors to source lower-cost handsets. As more manufacturing was outsourced, original design manufacturers (ODMs), many of which were based in Taiwan, produced phones for other firms to sell under their own brands. ODMs produced less than 10% of handsets shipped in 2002, but more than 40% of those shipped in 2005.⁶⁹ ODMs threatened to commoditize handset production and disrupt the vertical industry model of companies like Nokia.⁷⁰

Though Nokia and Motorola still led in market share in China, new local competitors such as Huawei, TCL, and ZTE rapidly gained traction. By 2002, TCL became the largest handset manufacturer in China (and the 12th largest in the world), and some Chinese manufacturers planned to expand overseas as the domestic market became saturated. Companies such as Nokia maintained a significant advantage in economies of scale, however, because Chinese vendors sourced chips, handset designs, and other key components from other manufacturers. A network of knock-off, "grey market" producers selling imitator handsets was also growing within China. Illicit phones containing components from brand-name producers sold at high discounts. In 2005, close to 50 million grey market units were shipped in China.⁷¹ Lower-cost chip manufacturers, such as Taiwan's MediaTek, also emerged in the mid-2000s to supply chips to Chinese manufacturers, "creating a headache for Nokia and Samsung," one observer remarked,⁷² and for the select handful of companies (Ericsson, Motorola, Qualcomm, and Texas Instruments) that previously dominated the chip market. This lowered handset manufacturing entry barriers further.

Analysts recognized that Nokia was being pushed down-market as competitors gained market share. Samsung, for instance, ranked third in 2002 market share and was still growing.⁷³ Kallasvuo, who had shifted from CFO to executive vice president and general manager of Mobile Phones in 2004, said, "Being strong at the low end does not preclude strength at the high end."⁷⁴ An analyst added, "[Nokia's] efficiency made it difficult for rivals to challenge it at the low end."⁷⁵ But Nokia's substantial patent portfolio, with over 1,600 new filings in 2005, also helped ensure Nokia's dominance. Nokia's vice president for intellectual property rights explained, "We are now in a lucky position as no mobile phone manufacturer can make mobile phones without using several of our patents."⁷⁶

By the mid-2000s, business users became a new potential market for handsets. An early player in the smartphone market, Research in Motion (RIM), had introduced an e-mail function in its 2003

BlackBerry, which led to RIM's early dominance of the enterprise market. In 2005, less than 10% of office workers had mobile e-mail.⁷⁷ "We think it's probably the single largest untapped market for Nokia," said the head of Nokia's enterprise solutions group.⁷⁸

3G Standards and Convergence

The rollout of third-generation (3G) wireless technology accelerated in 2005. 3G networks gradually replaced GSM and CDMA. Increased bandwidth provided by 3G networks allowed the mobile Internet to grow. Early CDMA pioneer Qualcomm was a dominant supplier of patents on the chips, software, and other technologies that made 3G possible and enabled phones to connect to cellular networks.⁷⁹ It pushed for the adoption of the new 3G network, CDMA2000, in the U.S. Qualcomm also controlled key patents in the emerging WCDMA network, which would allow GSM to migrate to 3G in Europe. WCDMA and CDMA2000 were compatible, allowing phones to be used worldwide. Samsung was an early player in 3G development; it supplied networks in China, and in 2005 was awarded a contract to introduce 3G in Japan. Nokia held 25% of the essential WCDMA patents.⁸⁰ By 2005, Nokia released two 3G handsets in Europe, but South Korean competitor LG became the early leader in 3G handsets. LG purchased chips from Ericsson and Qualcomm, while Nokia produced its own.⁸¹ "Being first is not necessarily a gateway to Heaven," Ollila remarked.⁸²

Nokia under Kallasvuo (2006-2010): Chasing the Smartphone Revolution

In June 2006, Kallasvuo replaced Ollila as CEO. Like Ollila, Kallasvuo had spent many years with Nokia. He became assistant vice-president of Nokia's legal department in 1987 and moved to the finance division in 1988. In the late 1990s, he served as head of Nokia's U.S. business operations before running the mobile phones division, where he worked alongside Ollila.

Less than a month into Kallasvuo's tenure as CEO, Nokia and Siemens agreed to combine their network infrastructure operations in response to low-priced competition from Asia. Nokia Siemens Network, the new joint venture, expected to generate an estimated €15.8 billion in revenue each year.⁸³ "The communications industry is converging, and a strong and independent Nokia Siemens Networks will be ideally positioned to help customers lower costs and grow revenue while managing the challenges of converging technology," said Kallasvuo.⁸⁴

In June 2006, Nokia exited talks with Japanese consumer electronics producer Sanyo over a joint venture to manufacture CDMA phones, announcing that it would leave the CDMA market altogether, except in the U.S.⁸⁵ The high cost of making CDMA handsets, due to lower market volumes, convinced Nokia that the devices were too expensive for emerging markets. Kai Oistamo, then-head of Nokia Mobile Phones, explained, "In this fragmented market, making money with low-end CDMA handsets is very difficult."⁸⁶ Instead, Nokia shifted emphasis to making the GSM and 3G WCDMA handsets used by over 70% of the world's mobile subscribers.⁸⁷

By 2006, manufacturers were working to meet the growing demand for smartphones. Smartphones were powered by operating systems similar to that of a computer, operated on 3G networks, and typically provided web-browsing, e-mail, and applications (apps). Worldwide, over 80 million smartphones were sold in 2006, 8% of the total handsets sold that year.⁸⁸ Nokia's smartphones ran on the Symbian operating system, developed as a joint venture between Nokia, Ericsson, Motorola, Siemens, and others. They led the market with 38 million devices shipped, controlling 48% market share despite weak North American sales.⁸⁹ RIM's popular line of BlackBerry smartphones sold more than 6 million units in 2006 and was second in market share with 7.5%.⁹⁰

The U.S. Market and the iPhone

In 2007, Apple introduced the iPhone, which an Apple executive estimated cost \$150 million to develop.⁹¹ It ran on Apple's proprietary operating system (iOS), first released in the U.S. and available worldwide in 2008. First priced at \$600, it was available in the U.S. exclusively to AT&T subscribers. The iPhone included more computing features than rival smartphones, plus a "cool form factor,"⁹² as an industry observer noted, reminiscent of Nokia's 1990s success in turning handsets into fashion accessories. Over 3 million units sold in 2007, and by 2008, sales grew to over 11 million units.⁹³

In 2007, Nokia remained the leader in the fastest-growing markets, including China, India, and Southeast Asia, but the decision to eliminate CDMA production meant its handsets were largely absent from the U.S. market, which had become crowded and fragmented, and where Nokia's market share had declined from 35% in 2002,⁹⁴ to 15% in 2005 and 8% in 2007.⁹⁵ One analyst noted, "In Europe and Asia people buy the coolest, most feature-packed mobile they can afford and then pick a network to use it on. In the U.S. consumers buy whichever phones the guy at the network store gives away for a two-year contract."⁹⁶ Nokia executives had predicted that the U.S. market would ultimately become less dependent on wireless carriers, and operate like the rest of the global market.⁹⁷ Rather than continuing to wait, however, Kallasvuo realized Nokia needed a new U.S. strategy.

In 2007, Nokia partnered with AT&T and released the Nokia 6555. Nokia also signed a deal with an Asian contractor to develop a phone for Verizon to be released in 2008. In 2008, AT&T and Verizon led the U.S. in carrier market share with 28.5% and 26.3%, respectively, followed by Sprint Nextel with 17.9% and T-Mobile with 12.1%.⁹⁸ In a departure for Nokia, the phone for Verizon would be wholly outsourced.⁹⁹ Nokia began to source chips from Broadcom, Infineon Technologies, STMicroelectronics, and Texas Instruments, and agreed to license its modem technology to its new suppliers.¹⁰⁰ Companies such as Motorola, which for years saw its chips as a competitive advantage, made that transition several years earlier. "[If] your phones aren't unique, you'd better make sure you maximize your value capture by selling your technology to everyone," said a Motorola executive.¹⁰¹

Industry Shift to Software

As customer demand for new features and apps grew, the choice of operating system became an increasingly important factor in a manufacturer's strategy. By the end of 2007, Nokia's Symbian operating system remained the most widely used in the world with 65% market share, followed by Microsoft's with 12%, RIM's with 11%, Apple's with 7%, and Linux with 5%.¹⁰²

Handset producers reacted differently to this new reality. By 2009, Nokia had adjusted its patent portfolio to contain over 70% software-related patents, up from 2% in 1999. In 2010, Nokia and Motorola began to license their patents widely.¹⁰³ In contrast, Apple's portfolio adjustments were more balanced. Between 1999 and 2009, Apple's software patents increased from 35% to 54% of the portfolio, while hardware patenting continued apace. Samsung, meanwhile, sustained its focus on hardware patents in the form of memories and hybrid circuits (42% in 1999 and 2009) while increasing research in software (from virtually 0% of its 1999 portfolio to 6.5% in 2009). (See **Exhibit 7**.)

The success of Apple's iPhone solidified the industry's transition from handset-focused to software-focused. Taiwan's HTC, Motorola, and several other manufacturers developed their own smartphones, many of which used Google's open-sourced Android operating system, first released in 2007, while Nokia continued to use Symbian. Android was the flagship software of Google's Open Handset Alliance, a consortium of 84 firms formed to develop open standards for mobile devices, opening the software to manufacturers. HTC and T-Mobile were early adopters of Android OS for their handsets. Garmin, Motorola, Samsung, Sony Ericsson, Sprint, and Vodafone also joined the Alliance over the

next two years to manufacture smartphone models using Android. HTC, RIM, and Samsung all saw smartphone sales increase in 2008, while Nokia's sales remained flat.¹⁰⁴

Smartphones became part of an ecosystem of consumer devices. The iPhone, for example, could be synchronized with a user's iTunes music library, allowing for music streaming. The iPhone's gross margins were nearly 60%.¹⁰⁵ Users in developed markets generally replaced their phones every 18 months,¹⁰⁶ and manufacturers spent an estimated \$30 million to engineer a new smartphone model.¹⁰⁷

Nokia's Response

In August 2007, as part of a shift to a more service-oriented business, Nokia launched its online store, Ovi, to sell songs, games, and maps compatible with Nokia phones running Symbian.¹⁰⁸ Nokia was also developing MeeGo, another mobile computing OS. In October 2007, Nokia bought Navteq, the digital-map database that created maps used by Garmin and Google, for \$8.1 billion (€5.7 billion).¹⁰⁹ An analyst estimated Nokia's revenue from mobile maps and music could total \$2 billion.¹¹⁰ Kallasvuo said, "The industry as a whole is in the middle of a transformation. It's moving from a device industry to an experience industry and we're making a conscious long-term effort to capitalize on that."¹¹¹

Pressure mounted on Nokia as smartphones running iOS and Android gained market share. In 2008, Nokia announced that it would acquire all Symbian shares from its partners and spin Symbian off into a not-for-profit venture, the Symbian Foundation, as a royalty-free, open platform. "It offers us an opportunity to innovate faster on a bigger, united, more widely accepted platform,"¹¹² said Kai Oistamo, head of Nokia's devices business. "It also enables us to deliver new products, we believe, faster to the market. I'm convinced we will sell more products."¹¹³ Meanwhile, Nokia continued to sell low-end feature phones—phones that could access the Internet but did not contain full smartphone capabilities—in emerging markets, where it profited from high production volumes and low costs.¹¹⁴

In 2008, Nokia created a new business group based on Internet services and software, separate from the main phone business. The new setup emphasized two primary units: handsets and services. In 2008, as Apple's App Store, the iPhone 3G model, and Google's first Android device were released, Nokia released several "candy bar"-style smartphone handsets. The following year, the Motorola Droid and iPhone 3G S were released. Materials and manufacturing teardown costs per unit for each device totaled \$187¹¹⁵ and \$178,¹¹⁶ respectively, excluding R&D, marketing, and distribution costs. One analyst cautioned, "Unless [Nokia] fields a competitive device, it will continue to see its share of the smartphone market erode."¹¹⁷ Despite these concerns, in 2009 Nokia maintained a leading market share with 36%, followed by Samsung (19.5%) and LG (10%), and several other players—including SonyEricsson, Motorola, China's ZTE, RIM and Apple—each with 5% or 4.5%.¹¹⁸

Nokia under Elop (2010-2013): Confronting the "Burning Platform"

In September 2010, Stephen Elop replaced Kallasvuo as Nokia CEO. Shareholders were unhappy with Nokia's failure to release a product that could compete with the iPhone. Elop, a Canadian and the first non-Finnish CEO of Nokia, had previously led Microsoft's Business Division.¹¹⁹ He had a strong software background, having worked before Microsoft for Adobe, Juniper (as COO), Lotus, and Macromedia. Nokia announced, "The core strategy is solid and Nokia will continue to power through what is a substantial transformation,"¹²⁰ from a hardware company to a software company.

In 2010, Nokia maintained a 40.3% share of the global market for mobile phones¹²¹ and 8.1% market share in the U.S.,¹²² but its profit margins declined. Apple dominated the high-end smartphone market while manufacturers using Android flooded the low-end and middle market. While Nokia

concentrated on selling marginally profitable low-end phones in Asia, Android's smartphone share jumped from single-digits to 23% in 2010.¹²³ Elop recognized the challenges, and in a memo to staff, compared the company to the story of a man standing on a burning oil platform in the middle of the North Sea. He urged the company to embrace its own "radical change in behavior" before it was too late.¹²⁴ Elop's memo stated:

I have learned that we are standing on a burning platform. And, we have multiple points of scorching heat that are fueling a blazing fire around us [. . .]. Why did we fall behind when the world around us evolved? [. . .] Some of it has been due to our attitude inside Nokia. We poured gasoline on our own burning platform. I believe we have lacked accountability and leadership to align and direct the company through these disruptive times. [. . .] We haven't been delivering innovation fast enough. [. . .] The burning platform [. . .] caused the man to shift his behaviour, and take a bold and brave step into an uncertain future. He was able to tell his story. Now, we have a great opportunity to do the same.¹²⁵

A New Operating System

The company needed a change in direction, and Elop singled out the Symbian OS. Many critics believed Symbian was partially to blame for Nokia's struggles. Developers chose not to write applications for the "clunky" OS.¹²⁶ The Apple App Store contained over 300,000 apps in 2010 and the Android Marketplace grew six-fold in 2010 to include 130,000 apps.¹²⁷ Nokia Ovi contained 30,000 apps, while RIM and Microsoft's Windows Phone had 16,000 and 6,500 apps, respectively.¹²⁸ Industry experts estimated that R&D costs of developing a new OS ranged from \$100 million to \$200 million, in addition to costs necessary to maintain the ecosystem.¹²⁹

Elop decided to abandon Symbian and replace it with Microsoft's Windows Phone 7 OS and hired management consultancy Accenture to support the OS on 400 million Nokia phones through 2016.¹³⁰ Elop reportedly also approached Google to discuss adopting Android,¹³¹ but as he explained in a speech to employees, "It just didn't feel right. We'd be just another company distributing Android. That's not Nokia! We need to fight!"¹³² At least one Nokia veteran criticized manufacturers who opted for Android as being "no better than Finnish boys who 'pee in their pants' for warmth in the winter."¹³³ Yet Nokia shares fell 14% the day of the Windows announcement.¹³⁴ The transition to Windows was expected to take one year, leaving Nokia vulnerable to competitors.

In May 2011, Elop announced that sales and profits for the second quarter would be "substantially" below expectations given continued pricing pressure in Asia and "mismanagement," due to a high inventory of unsold smartphones on the shelves in China.¹³⁵ In addition to competition from Android, CDMA handsets that Nokia no longer produced were gaining market share in China. Elop explained, "There's definitely a situation here [in China] where it's not only the Symbian range of devices but also feature phone devices that are under competitive pressure."¹³⁶ Already selling at a 13-year low, Nokia's share price dropped a further 19% to \$6.70. By June 2011, Nokia's smartphone market share dropped to 25%.¹³⁷ From 2007 to 2011, the company's total market value had dropped 75%.¹³⁸

In summer 2011, prior to the Windows Phone launch, Nokia made its largest marketing push to date to reestablish a presence in the U.S., a key market for Microsoft. Nokia replaced all Symbian-based smartphones in North America with Windows Phone products, and decided to focus on selling through traditional U.S. wireless carriers, which subsidized the retail price of its phones.¹³⁹ In 2012, Nokia moved its U.S. operations from White Plains, New York, to Sunnyvale, California. Nokia hoped that a bigger presence in Silicon Valley would help it attract more software developers.¹⁴⁰

Elop also announced that Nokia would officially exit the Japanese market in July 2011. In 2008, the company had stopped supplying Japanese carriers with phones, but continued to operate stores for its high-end Vertu handsets, which cost between ¥600,000 (€5,142) and ¥20 million (€171,420) and struggled to compete with smartphones in that market.¹⁴¹ Meanwhile, in 2012, China overtook the U.S. as the world's biggest market for smartphones. Using the Android OS, Chinese manufacturers Huawei, Lenovo, and ZTE were among the world's top five smartphone manufacturers behind Samsung and Apple, and were particularly successful in the low-end market. Material costs in China for low-end smartphones dipped below 400 yuan (€50); complete handsets sold for 2,000 yuan (€250) or less.¹⁴² Founded in April 2010, China's Xiaomi also made Android-based handsets but used its Miliiao social network to position itself as a mobile Internet company rather than a manufacturer, immediately attracting a large, enthusiastic fan base. Xiaomi relied on online word-of-mouth marketing instead of TV or online advertising, and only sold its products online. By 2012, Xiaomi sold 719 million units.¹⁴³

A Deal with Microsoft

Nokia's struggle led to a series of layoffs in 2012 that carried into 2013, including over 1,000 jobs at its Salo plant, one of the last cell phone manufacturing sites in Western Europe. In February 2012, in response to a €1 billion loss in the fourth quarter of 2011, Nokia eliminated 2,300 jobs in Hungary and 700 in Mexico, shifting its manufacturing to China and India.¹⁴⁴ A further €1.7 billion loss in the first quarter of 2012 led Nokia to announce in June 2012 that it would eliminate 10,000 more positions by the end of 2013 as part of a restructuring effort.¹⁴⁵ Ollila resigned as chairman of the board.

In September 2013, Nokia sold its Devices and Services business to Microsoft for €5.44 billion (\$7.2 billion).¹⁴⁶ The deal terms gave Microsoft access to Nokia's brand name¹⁴⁷ and patents (including key patents related to 4G/LTE technology)¹⁴⁸ for ten years. The cash strengthened Nokia's financial position and provided funds to invest in its network equipment arm. Upon the announcement of the deal, Nokia's share price surged 40%.¹⁴⁹ Microsoft's stock dropped 5%, to below \$32 a share.¹⁵⁰

Some saw the sale as a boon for Microsoft; as one analyst said, "Microsoft had to do this. The future is in mobile devices, not PCs, and they need to increase their focus and investment on mobile. I am not sure this will work, but I also don't see that they had a choice."¹⁵¹ Another was more skeptical: "Microsoft and Nokia may have simply thrown a rope to one another, cried 'Save me!' and jumped off a cliff in unison."¹⁵²

Beyond a Burning Platform

The September 2013 sale of Nokia's Device and Services business to Microsoft signaled the end of Nokia's devices business. The company reported second-quarter operating losses of €115 million, with revenues plummeting 24%, representing operating losses totaling €4.1 billion over the preceding nine quarters.¹⁵³ Nokia's network equipment business remained its sole source of operating profit.¹⁵⁴

Nokia Refocuses

In April 2014, Rajeev Suri succeeded Elop as CEO. Suri came to the role after turning around Nokia's network equipment business. As head of Nokia Solutions and Networks since 2009, Nokia credited him with growing its revenues from €1 billion to more than €10 billion.¹⁵⁵ Now as CEO, Suri aimed to provide end-to-end 5G equipment to mobile operators and corporations.

In 2015, Suri purchased Nokia's smaller French rival, Alcatel-Lucent in an all-stock deal worth \$16.6 billion, making Nokia the world's second-largest mobile equipment manufacturer with a market share

of 35%, ahead of Huawei (with 20%) and trailing Ericsson (40%).¹⁵⁶ The acquisition added optical transmission and Internet router technologies to Nokia's portfolio while strengthening its competitive position in Europe, China, and the U.S.¹⁵⁷ Nokia expanded into other new verticals as well, focusing specifically on building out its network expertise. An acquisitions spree from 2016 to 2019 brought several new companies into Nokia's fold, giving it access to cable service providers, and bringing new capabilities in software, Wi-Fi applications, Internet of Things applications, machine learning analytics, and analytics for security and network performance management.¹⁵⁸

Nokia also sought to revive its presence in the handset market. In May 2016, Microsoft had sold the Nokia brand in two parts: one to HMD, a new Finnish company formed by former Nokia employees, and the other to the contract iPhone manufacturer, Foxconn. HMD aimed to leverage nostalgia for the Nokia brand to produce new Nokia-branded smartphones and tablets; Foxconn would become the exclusive licensee of Nokia-branded products. Suri created a strong partnership with HMD that brought Nokia royalties from HMD's sales of Nokia-branded phones and gave Nokia Technologies an HMD board seat to help ensure that HMD upheld Nokia values.¹⁵⁹

One More CEO

Nokia continued to struggle, despite Suri's efforts to refocus the firm. Competitive pressures and geopolitical dynamics between China and the West made 5G network opportunities increasingly uncertain. In October 2019, Nokia suspended its dividend until 2020, sending its stock price down 23%.¹⁶⁰ With shares down 37% for the year through February 2020, in early March, Nokia announced Pekka Lundmark would replace Suri as CEO in September 2020.¹⁶¹ Lundmark had run Finnish energy group Fortum and the crane manufacturer Konecranes after 10 early years in executive positions at Nokia.¹⁶² Nokia shares rose as much as 4.9% in Helsinki after the announcement.¹⁶³

Exhibit 1 Selected Nokia Financial Data and Growth Indicators, Select Years Between 1994 and 2018

	1989	1994	1999	2004	2008	2010	2012	2014	2016	2018
Total Revenue (€ m)	€4,720	€5,177	€19,772	€29,267	€50,710	€42,446	€30,176	€12,732	€23,614	€22,563
Operating Income (€ m)	178	617	3,908	4,304	6,204	2,308	(644)	170	(1,100)	(59)
As a % of total revenue	3.6%	11.1%	19.7%	14.7%	12.2%	5.4%	—	1.3%	—	—
Net Income (€ m)	(56)	676	2,577	3,192	3,988	1,850	(3,106)	3,462	(766)	(340)
Cash from Ops. (€ m)	—	436	3,102	4,343	3,197	4,774	(354)	1,275	(1,454)	360
Cash from Investing (€ m)	—	(266)	(1,359)	(329)	(2,905)	(2,421)	562	886	6,836	(315)
Cash from Financing (€ m)	—	218	(574)	(4,318)	(1,545)	(911)	(465)	(4,576)	(4,923)	(969)
Net Change in Cash (€ m)	—	388	1,268	(327)	(1,302)	1,666	(284)	(2,463)	502	(1,108)
Total Assets (€ m)	4,535	4,777	14,279	22,669	39,582	39,123	29,949	21,063	44,901	39,517
Total Liabilities (€ m)	3,797	2,552	6,779	8,270	23,072	22,892	20,502	12,394	23,926	24,146
Total Equity (€ m)	738	2,225	7,500	14,399	16,510	16,231	9,447	8,669	20,975	15,371
Total Liabilities And Equity (€ m)	4,535	4,777	14,279	22,669	39,582	39,123	29,949	21,063	44,901	39,517
R&D Spending (€ m):	246	355	1,755	3,733	5,968	5,863	4,782	2,493	4,904	4,620
As a % of total revenue	5.1%	6.4%	8.8%	12.9%	11.8%	13.3%	15.8%	19.6%	20.8%	20.5%
Selling and Marketing Spending (€ m)	—	—	1,220	2,552	4,380	3,877	3,205	1,634	3,819	3,463
As a % of total revenue	—	—	6.2%	8.7%	8.6%	9.1%	10.6%	12.8%	16.2%	15.3%
Average Number of Employees	41,300	28,000	55,260	55,505	121,723	132,427	97,798	57,566	102,687	103,083
Operating Income/Employee (€)	4,305	22,030	70,720	77,542	50,968	17,428	(6,585)	2,593	(10,712)	(572)
Market Capitalization (in € m)	—	—	275,554.9	54,270.8	27,107.1	22,557.0	10,356.7	26,575.5	28,427.1	30,874.4
EPS (€)	—	0.92	2.24	0.70	1.05	0.50	(0.84)	0.94	(0.13)	(0.06)
Number of Shares Outstanding (m)	N/A	N/A	N/A	4,434	3,698	3,710	3,711	3,648	5,721	5,593
P/E Ratio	—	15.9	80.4	16.6	10.37	15.48	Neg.	21.16	Neg.	Neg.
Dividend Payout Ratio	N/A	5.4%	23.2%	44.1%	51.4%	82.1%	N/A	12.3%	N/A	N/A
Interbrand Ranking	N/A	N/A	N/A	#8	#5	#8	#19	#98	—	—
Number of New Patents	53	255	739	1,607	2,668	2,368	2,067	1,819	2,122	2,158
Finnish Composition of Board of Directors	100%	100%	77%	63%	60%	44%	29%	33%	25%	30%
Finland Nominal GDP per Capita (€)	17,043	17,798	24,542	30,317	35,473	35,002	37,046	37,812	39,525	42,338
Nokia as % of Total Finland Employment	N/A	0.73%	1.01%	0.97%	0.93%	0.86%	0.58%	0.28%	0.27%	0.24%
Nokia Average Selling Price (€)	N/A	N/A	168	110	74	64	47	N/A	N/A	N/A
Average Selling Price - all manufacturers (€)	2,792	306	187	110	80	62	60	N/A	N/A	N/A

Source: Casewriter research and analysis, compiled from Capital IQ and Nokia Annual Reports, 1994-2019; "Labour force survey," Statistics Finland, https://www.stat.fi/til/tyti/index_en.html; Interbrand, Best Global Brand Rankings 2013-2019; Jyrki Ali-Yrkkö, "Nokia and Finland in a Sea of Change," The Research Institute of the Finnish Economy, 2010, <http://www.etla.fi/wp-content/uploads/2012/09/B244.pdf>; "Experts Analyse Deep Impact of Nokia Decline," Helsingin Sanomat, <http://www.hs.fi/english/article/Experts-analyse+deep+impact+of+Nokia+decline/1329104318689>; Luke T. Szymczak, "Nokia Corp.," Prudential Securities, September 16, 1996, via Thomson ONE; "Nokia," Indigo Equity Research, April 20, 2012, via Thomson ONE; accessed November 2013 and May 2020.

Exhibit 2 GSM and CDMA Network Launch Dates, 1991-1998**GSM Launch Timeline**

	UK						
	Germany						
	Sweden						
	France					Belgium	
	Denmark	Norway				Ireland	
	Portugal	Greece				Austria	
	Finland	Switzerland	Italy	Spain		Russia	
	Australia	Luxembourg	Thailand	Netherlands	China	United States	
1991	1992	1993	1994	1995	1996	1997	1998
		South Korea	United States	Hong Kong	Peru	Canada	

CDMA Launch Timeline

Source: Casewriter research, compiled from "Brief History of GSM & the GSMA," <http://www.gsma.com/aboutus/history>; "CDMA History," http://www.cdg.org/resources/cdma_history.asp, both accessed December 2013; Garry A. Garrard, *Cellular Communications: Worldwide Market Development*, (Boston: Artech House, 1998).

Exhibit 3 Nokia's Global Competitors over Time

Company	Country of Origin	2012 Net Income	Business Units Over the Years	Competed with Nokia (time period):	Top Sales Locations (2012)
Motorola	United States	\$881M	Devices; Systems and Networks; Software and Applications; Services Automation;	1980s – early 2000s	US (55%), China (4%)
Siemens	Germany	\$5.73B	Energy; Financial Solutions; Healthcare; Mobility	1980s – 1990s	US (19%), Germany (15%), China (8%)
Alcatel	France	(\$1.82B)	IP; Wireless; Telecom Services; Enterprise; Optics; Wireline; Network Applications	1980s – 1990s	US (36%), Europe (29%)
Ericsson	Sweden	\$887.04M	Mobile Broadband; Managed Services: Operations and Business Support Systems; Communications Services: Fixed Broadband and Convergence; TV and Media Management	1980s – 1990s	North America (25%), China & North East Asia (16%)
Samsung	South Korea	\$21.72B	Visual Display; Mobile Communications; Telecom Systems; Digital Appliances; IT Solutions; Digital Imaging; Memory Systems LSI (mobile application processors and image processors); LCD	2000s - present	Asia/Pacific (49%), America (28%)
HTC	Taiwan	\$576.26M	Handset Manufacturing	2000s - present	Taiwan (4%)
LG	South Korea	\$62.55M	Home Entertainment; Mobile Communication; Home Appliance; Air Conditioning; Business Solutions	2000s - present	North America (28%), Europe (20%)

Source: Casewriter research, compiled from Motorola Solutions Company Overview and Products and Operations, Hoover's, Inc.; Motorola Solutions, "Products," <http://www.motorolasolutions.com/US-EN/Business+Product+and+Services>; Siemens Aktiengesellschaft Historical Financials and Products and Operations, Hoover's, Inc.; Siemens, "Products & Solutions," <http://www.siemens.com/entry/cc/en/>; Alcatel-Lucent Company Overview and Products and Operations, Hoover's, Inc.; Telefonaktiebolaget LM Ericsson Company Overview and Products and Operations, Hoover's, Inc.; Ericsson, "Our Business," http://www.ericsson.com/thecompany/investors/financial_reports/2012/annual12/our-business/our-key-products-and-services/mobile-broadband; Samsung Electronics Co., Ltd. Company Overview and Products and Operations, Hoover's, Inc.; HTC Corporation Company Overview and Products and Operations, Hoover's, Inc.; LG Electronics Inc. Company Overview and Products and Operations, Hoover's, Inc.; all accessed December 2013.

Exhibit 4a Evolution of Mobile Phones

From left to right: Motorola 8900X-2, Nokia 2146 orange 5.1, Nokia 3210, Nokia 3510, Nokia 6210, Ericsson T39, HTC Typhoon.

Source: Wikipedia, http://en.wikipedia.org/wiki/File:Mobile_phone_evolution.jpg, accessed February 2014.

Exhibit 4b Nokia Handsets (2003-2010)

Nokia 3310 (2003) Clamshell (2005) Nokia 8800 (2005) Nokia 5000 (2008) Nokia N8 (2010)



New Models (2008)

Source: Casewriter, compiled from Nokia quarterly reports, <http://i.nokia.com/blob/view/-/165142/data/5/-/Q1-2008-earnings-presos.pdf>, <http://i.nokia.com/blob/view/-/165142/data/5/-/Q1-2008-earnings-presos.pdf>, <http://i.nokia.com/blob/view/-/164994/data/5/-/Q1-2003-presos.pdf>, <http://i.nokia.com/blob/view/-/165060/data/6/-/Q1-2005-presos.pdf>; all accessed December 2013.

Exhibit 5 Market Share by Handset Manufacturer, 1998, 2003, 2008, and 2013

	1998	2003	2008	2013
Apple	0%	0%	1%	9%
LG	0%	5%	7%	4%
Motorola	20%	15%	9%	3%*
Nokia	23%	35%	40%	14%
Samsung	2%	11%	17%	24%
Sony Ericsson	15%	5%	7%	2%
Other	40%	29%	19%	44%

Source: Compiled from Juan Alcácer, Tarun Khanna, Mary Furey, and Rakeen Mabud, "Emerging Nokia?" HBS No. 710-429; Kate Holten, "Nokia's Market Share Slumps in First Quarter: Gartner," Reuters, May 14, 2013, <http://www.reuters.com/article/us-mobile-nokia-gartner-idUSBRE94D0B320130514>, accessed April 2017; Steve Kovach, "Samsung Is Still Crushing Apple In Smartphone Market Share," Business Insider, November 14, 2013, <http://www.businessinsider.com/samsung-apple-smartphone-market-share-2013-11>; "Gartner Says Annual Smartphone Sales Surpassed Sales of Feature Phones for the First Time in 2013," Gartner Press Release, February 13, 2014, <http://www.gartner.com/newsroom/id/2665715>; Mike Flaminio, "Apple Hit 2008 iPhone Market Share Goal," IGM, January 30, 2009, <https://www.insanely-great.com/10111/apple-hit-2008-iphone-market-share-goal>, accessed April 2017.

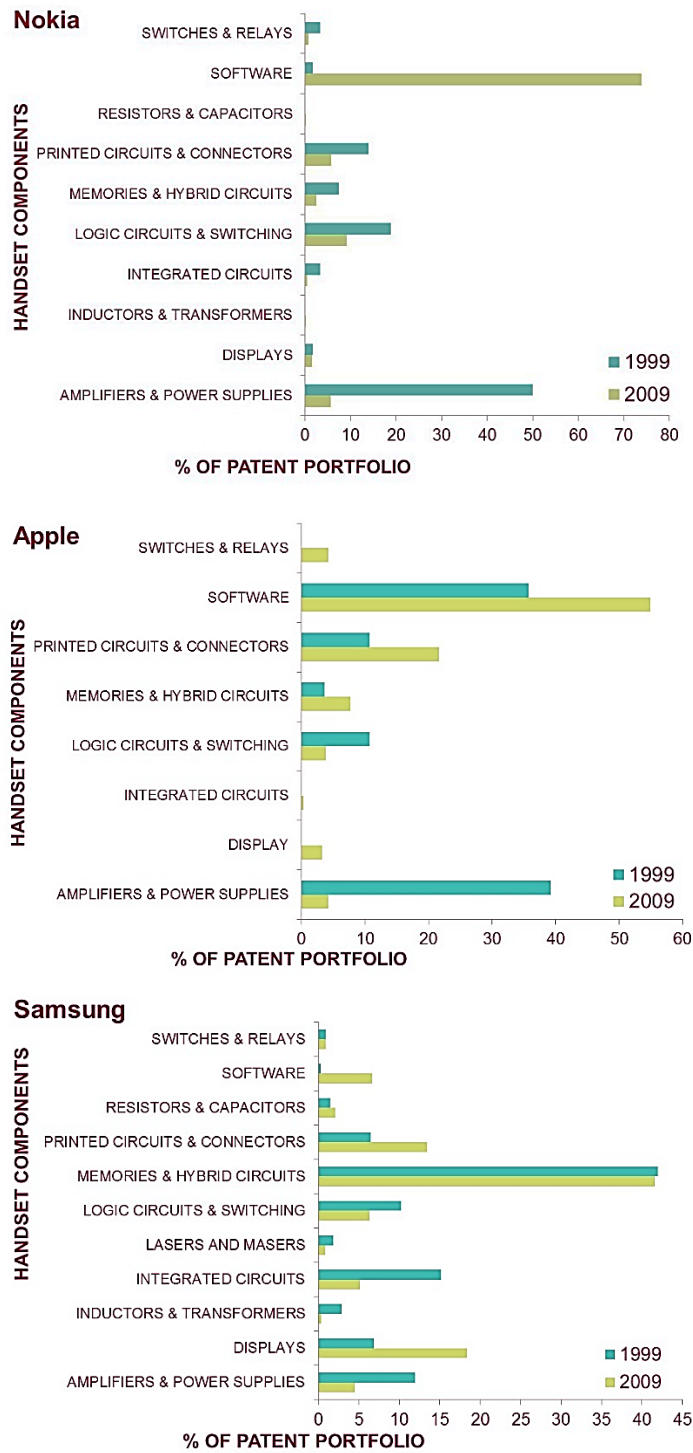
*Including Lenovo, which purchased Motorola from Google in 2013.

Exhibit 6 Nokia Sales by Business Unit and Market Regions, Select Years Between 2000 and 2018

Net Sales by Business (€ million)	2000	2002	2004	2006	2008	2010	2012	2014	2016	2018
Nokia Ventures Organization	854	459	-	-	-	-	-	-	-	-
Multimedia	-	-	3,659	7,877	-	-	-	-	-	-
Enterprise Solutions	-	-	830	1,031	-	-	-	-	-	-
Mobile Phones	21,887	23,211	18,507	24,769	-	-	-	-	-	-
Devices and Services	-	-	-	-	35,099	29,134	15,686	-	-	-
Nokia Networks	7,714	6,539	-	-	-	-	-	11,198	21,800	20,121
Nokia Siemens Networks	-	-	6,367	7,453	15,309	12,661	13,779	-	-	-
NAVTEQ	-	-	-	-	361	1,002	-	-	-	-
Location and Commerce	-	-	-	-	-	-	1,103	-	-	-
HERE	-	-	-	-	-	-	-	970	-	-
Nokia Technologies	-	-	-	-	-	-	-	578	1,053	1,501
Group Common and Other	-	-	-	-	-	-	-	1	1,145	1,021
Interbusiness Group Eliminations	(79)	(193)	(96)	(9)	(59)	(331)	(392)	(15)	(53)	(63)
Unallocated Items	-	-	-	-	-	-	-	-	(331)	(17)
Net Sales, Total	30,376	30,016	29,267	41,121	50,710	42,466	30,176	12,732	23,614	22,563
Net Sales by Major Markets										
Americas	25%	22%	-	-	-	-	21%	-	-	-
North America	-	-	12%	7%	4%	5%	-	15%	30%	29%
Latin America	-	-	9%	9%	10%	9%	-	8%	6%	6%
Europe	52%	54%	41%	38%	37%	34%	33%	31%	27%	29%
Middle East and Africa	-	-	12%	13%	14%	13%	-	9%	8%	8%
Middle East and Asia	-	-	-	-	-	-	46%	-	-	-
Asia-Pacific	23%	24%	16%	20%	22%	21%	-	26%	18%	18%
China	-	-	10%	13%	13%	18%	-	11%	11%	10%

Source: Compiled from Nokia Annual Reports, 2000-2018.

Exhibit 7 Patent Portfolio Compositions, Nokia, Apple, and Samsung, 1999 and 2009



Source: Casewriter analysis based on U.S. Patent and Trademark Office data.

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