HARVARD | BUSINESS | SCHOOL

9-714-428

REV: FEBRUARY 21, 2014

JUAN ALCÁCER

TARUN KHANNA

CHRISTINE SNIVELY

The Rise and Fall of Nokia

In 2012, Nokia, an over 100 year-old communications and technology corporation headquartered in Espoo, Finland, was the world's leading mobile handset manufacturer, a position it had held since 1998. Yet, in September 2013, Microsoft purchased Nokia's Device and Services business for €5.4 billion. "A sad ending to Nokia's once great handset business," an analyst commented.[1] For decades Nokia had led the telecommunications (telecom) industry in handsets and networking. What were Nokia's missteps over the years? What should Nokia have done differently?

Nokia evolved from a pulp and paper manufacturer in the 19th century to a consumer electronics manufacturer in the 1980s before turning its attention to mobile phones in the 1990s. The company had successfully reinvented itself several times over, relying on flexibility in response to shifting markets and a focus on design and engineering innovation. By the late 2000s, however, Nokia's position as market leader in mobile devices was threatened by competition from new lower-cost Asian manufacturers, and Apple's 2007 release of its iPhone established an entire new category—the smartphone. These moves put pressure on Nokia at both the high and low end of the market, and by 2011, the company's revenues had dropped significantly. (See **Exhibit 1** for financial data.)

In 2012, Nokia posted an operating loss of €2.3 billion[2] and was bumped from the top manufacturer position by Samsung, despite maintaining a 24% market share, largely due to sales of low-cost handsets in emerging markets. That year, CEO Stephen Elop dropped Nokia's in-house operating system, Symbian, for Microsoft's Windows Mobile OS.

By 2013, Nokia's Devices and Services business was for sale, at a deeply discounted price. Some saw the sale as a boon for Microsoft; 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."[3] Others were even more skeptical. "Microsoft and Nokia may have simply thrown a rope to one another, cried 'Save me!' and jumped off a cliff in unison."[4]

Nokia's Early History: 1865-1970s

Nokia Ab, founded in 1865 as a timber company near the town of Nokia, Finland, grew into a significant pulp and paper concern over time. By the mid-20th century, Nokia had taken several steps to move beyond its roots in timber and rubber. By the late 1960s the company had merged with

Professors Juan Alcácer and Tarun Khanna, and Associate Case Researcher Christine Snively (Case Research & Writing Group) prepared this case. This case was developed from published sources. Funding for the development of this case was provided by Harvard Business School, and not by the company. HBS cases are developed solely as the basis for class discussion. Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective management.

several Finnish concerns, including a tire and rubber footwear manufacturer and a cable and electronics manufacturer to form Nokia Corporation. The newly-merged entity had five core businesses: rubber, cable, forestry, electronics and power generation. Bjorn Westerlund was named CEO.

Nokia 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. In 1971, Nokia began selling analog car radio-telephones. That year Nokia also began developing its own computers and released the Mikro Mikko office computer. By the early 1970s Nokia had a 80% market share of computer sales in Finland.[5]

The 1970s saw Nokia take its first steps toward dominance in a nascent telecom industry. The company supplied networking infrastructure including base stations and links to Salora, Finland's top radio and television producer, to produce car telephones and network support structures. It established Telefenno Oy, a 50/50 joint venture with a state-owned telecom networking company, to develop and market network equipment for wireless networks. Throughout these years, Nokia managed delicate relations with the Finnish government.[6] During the 1970s, Finland was run by the left-wing Social Democratic Party, which had controlled much of the electronics and telecom networking industries.

Nokia Under Kairamo (1977-1988): Era of Growth

Kari Kairamo, an engineer with expertise in wood processing and the paper industry, was named CEO in 1977. In 1979 Nokia entered into a joint venture with Salora to create the radio telephone company Mobira Oy. Mobira produced the first car phones on Scandinavia's Nordic Mobile Telephone (NMT) network, launched in 1981 as the first international cellular network[7] three years after Motorola launched the Advanced Mobile Phone System (AMPS) network in the U.S.[8]

In the early 1980s, still concerned about state-owned competition, Nokia shored up its telecom infrastructure holdings and embarked on a buying spree throughout the decade. (See **Table A** for top acquisitions and details.) As a result, Nokia became the largest consumer electronics company in Scandinavia. In 1983, Nokia ventured beyond Finland to make its first international acquisition, Swedish consumer electronics company Luxor Ab, subsequently growing its exports of wireless telecom networking terminals from four Nordic countries in 1982 to over 20 countries throughout Europe, the U.K., North America, and Asia in 1987.[9] In 1987, Nokia posted €4.6 billion in revenues, up 54% from 1986; net income rose 58%, to €180 million.[10]

Kairamo was often cited as the driving force behind Nokia's rise and transformation from a paper and rubber concern to a major global electronics and telecom (networking and handsets) concern. He believed Nokia needed to expand into the world market for it to survive. He undertook a major restructuring of the company's organization and maintained research and development (R&D) investments of close to 4% of net sales through most of the decade.[11] Described as a charismatic leader with a bold vision, despite his erratic behavior—Kairamo once challenged a union leader to a naked footrace around his home to end a lockout—he put Nokia on a path to becoming a global multinational technology powerhouse.[12] He emphasized speed and immediacy over traditional formalities and processes, transforming the more staid Scandinavian aspects of the Finnish company. His number two—Nokia President Simo Vuorilehto—was often called Kairamo's alter-ego; the two formed a strong leadership team where Kairamo "drove visions," and Vuorilehto "implemented them."[13]

Table A Nokia's Top Acquisitions of the 1980s

Date	Company	Description
1981	Televa	Telecom manufacturer owned by the Finnish government.
1983	Salora	Second-largest manufacturer of televisions in Scandinavia – Nokia acquired an 18% stake.
1983	Luxor Ab	Sweden's state-owned electronics and computer firm.
1986	Sahkoliikkeiden	Largest electrical products wholesaler in Finland.
1987	Telefenno	Joint venture between Nokia and state-owned Televa Oy, established in 1978. Nokia bought out Televa's share in 1987.
1987	Maillefer	Swiss cable machinery manufacturer.
1987	Océanic	French television manufacturer and consumer electronics company
1987	Sonolar	Consumer electronics company acquired from Swedish Electrolux
1987	Televisso	Consumer electronics company acquired from Swedish Electrolux
1988	Ericsson Information Systems	Ericsson's computing division

Source: Casewriter research, compiled from Dan Steinbock, *Wireless Horizon: Strategy and Competition in the Worldwide Mobile Marketplace*, (New York: American Management Association, 2003); "Nokia Corp - Focus On Electronics," http://ecommerce.hostip.info/pages/796/Nokia-Corp-FOCUS-ON-ELECTRONICS.html; "Nokia History," August 30, 2005, http://english.cri.cn/855/2005/08/30/262@15519.htm; Martii Häikiö, *Nokia: The Inside Story,* (London, UK: Prentice Hall, 2002), accessed November 2013.

In 1987, Nokia introduced the first mobile phone designed for the Scandinavian NMT analog network—the Mobira Cityman—marketing it to business users for the 2013 equivalent of €4,500. Soviet Union president Mikhail Gorbachev was photographed making a call from Helsinki to Moscow with a Cityman in 1989 (see **Exhibit 2**). Nokia was influential in establishing the second generation network (or "2G"), the European digital network Global System for Mobile (GSM),[a] which came to replace the dozens of incompatible analog network systems and allowed phones to work throughout Europe. By 1988, Nokia was a major player in the analog[b] mobile handset market with 13.4% of the world market share, followed by U.S. manufacturer Motorola (12.8%), and Japan's NEC (11.2%), and several other Japanese manufacturers.[14]

Nokia's fiery performance continued, and by the late 1980s the Finnish economy was also booming. As markets were liberalized, banks could more easily lend, and many companies used the opportunity to grow. Wages rose 10% in 1989 alone, and unemployment was as low as 3%.[15] Between 1982 and 1987, Nokia's market value more than tripled from FIM 2.27 billion (€453 million) to FIM 8.029 billion (€1.5 billion), the largest in Finland.[16] Nokia's mergers and acquisitions activities consistently boosted revenues while also adding valuable patents in printed circuits and connectors, fiber optics, and digital computers, among others, to its growing portfolio. Investments in R&D

[a] The European Committee of Posts and Telegraphs hosted a wireless standards conference in 1982, calling for a uniform digital wireless network in Europe. Nordic countries, along with Nokia, promoted the use of the emergent 2G GSM digital wireless standard in Europe, and in 1987 the committee selected GSM as the new standard to be used throughout Europe. Roll-out first began in Finland in 1991 with network equipment installed by Nokia, a pioneer in GSM infrastructure. GSM provided European manufacturers with economies of scale, and standardization also allowed Nokia to more easily expand into deregulated European markets.

[b] 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.

continued as well, with €210 million, or 7% of net sales from the electronics sector, spent in 1987,[17] higher than the U.S. industry average of 5.4% of net sales invested in R&D at that time.[18]

Some began to feel Nokia's acquisitions hurt profitability, however. "The perception is they've bitten off more than they can chew," one industry observer said.[19] Vuorilehto defended Nokia's acquisitions ahead of the European Union formation in 1992, as Nokia did not want to be shut out of Europe: "We had to move quickly. We had no choice because the outside world is changing so rapidly. We needed the resources."[20] Yet in November 1988, Nokia reported a 39% drop in its eight-month earnings to FIM 402 million (€77 million). Nokia's consumer electronics business, which accounted for 70% of company sales, was struggling. Internally, Kairamo worried about a growing power struggle between himself and Vuorilehto, who some felt was "scheming to overthrow the current management and establish himself as [Nokia's] new leader."[21,22] Suddenly, Nokia's financial outlook looked bleak, with its "buying binge," as one analyst described Nokia's M&A activity, leaving it cash poor. In 1988, net income fell 23% to €199 million.[23] Nokia's management remained confident nonetheless: "I believe we have made the right decision," Vuorilehto said, "and [. . .] will be successful."[24]

Nokia under Vuorilehto: Challenging Times (1988-1992)

In December 1988, Kairamo, who had suffered from manic depression, committed suicide. Vuorilehto was appointed chairman and CEO. Vuorilehto had also grown up in Nokia's pulp and paper business, starting out as an engineer, and had little experience in electronics. According to some, he did not share Kairamo's ambitions for an international Nokia.[25] He focused selectively and strategically on fewer acquisitions, most notably the U.K. mobile phone manufacturer Technophone.[26] Some believed Vuorilehto took over at the right time. One analyst commented, "Kairamo was the visionary guy and Vuorilehto was the one who made things work, and for the next couple of years, with Nokia having bitten off so much, Vuorilehto is the right guy for the task they face."[27] 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."[28] The Finnish economy, meanwhile, was "overheating," according to its finance minister.[29] "Deregulation," the minister said, "encouraged companies and households to borrow at home and abroad and not save."[30] Interest rates climbed to 15% in 1989, up from 9% in 1988.[31]

In 1991, Nokia's total sales dropped 31% from the previous year.[32] The consumer electronics division witnessed a particularly large drop as color televisions sold poorly. The cables and machinery division struggled as well. Several factors contributed to Nokia's poor performance. The fall of the Soviet Union in 1991, a key trading partner, pushed Finland into an economic crisis,[c] [33] with unemployment jumping from single digits to over 20%.[34] The Finnish currency was greatly devalued, an added hardship for businesses and municipalities with loans in foreign currencies.[35] Throughout the 1980s, Nokia had built its financing on bonds. Now, however, given the faltering economy, Finnish banks were hesitant to help, leaving Nokia entirely dependent on its own cash flow.[36] While Finnish exports improved in 1993 as a result of the depreciated currency, domestic consumption remained low.[37]

[c] The Soviet Union had 20% of Finnish exports in the 1980s, but just 3% in the early 1990s.

Despite these challenges, Nokia's telecom networking division, a complementor of the mobile phones division, was thriving.[38] It provided the infrastructure for wireless networks as GSM network roll-out began in Europe and demand for infrastructure grew. Net sales reached €323 million in 1991.[39] Nokia had a head start on competitors because the Finnish telecom infrastructure sector had been deregulated sooner than those in most European countries.[40] In North America, the 2G CDMA digital standard, incompatible with GSM handsets, was slowly developing. GSM was considered superior as it transferred more data and allowed users to send low cost SMS messages that were unavailable to CDMA handsets. GSM phones contained a SIM card which users could simply remove and insert into a new phone for easy phone upgrades. Operators could also trace the location of SIM cards. (See **Exhibit 3** 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) with a carrier separately.

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

Jorma Ollila was named Nokia president and CEO in January 1992 when Vuorilehto stepped down. Ollila, a London School of Economics graduate, began his career at Citibank before joining Nokia in 1985. As an account manager overseeing Nokia's account, Ollila had expressed concern over the firm's organization, arguing, "[It] did not match the new competitive environment and [. . .] it needed a thorough transformation. Dynamic competition required dynamic organizational capabilities."[41] Soon after, in 1985, Kairamo hired him Ollila as vice president of international operations. He became senior vice president of finance in 1990 and served as president of Nokia Mobile Phones in 1992 before becoming president and CEO.[42] Ollila implemented "The Nokia Way," highlighting Nokia's core values of customer satisfaction, respect for the individual, achievement, and continuous learning.[43]

After a period of dwindling profits, Ollila revived Vuorilehto's call to "adopt a back-to-basics approach"[44] for Nokia and made a series of major asset sales, divesting its data, forestry, and chemicals businesses. He said, "In a slow-growth situation like we're facing now, you can't afford to make mistakes. It's important to do the small things correctly—the big river of profit comes from dozens of small streams."[45] 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.[d] The only thing you could do is to start building a base for a very meaningful stock performance."[46]

Under Ollila, Nokia divested its data, forestry, and chemicals businesses, and centered the company on four key business areas: mobile telephones, consumer electronics, networks, and cables,[47] making telecommunications (networking equipment) and mobile phones the focal points of Nokia's strategy. "Those are the two areas where we have prime possibilities to grow and strengthen our market position the next few years," he predicted.[48] Ollila believed the company could be saved only by focusing on mobile phones[49] and by continuing to develop GSM networking equipment for Europe.[50] In 1992, Nokia received 25% of the GSM network equipment orders for Europe.[e,51] Industry experts predicted that the installation of new networks would cost over $75 billion between 1992 and

[d] In 1993, Finland ended its restrictions on foreign ownership of stocks, and by August 1993, foreign ownership exceeded 35% of Nokia's share capital, higher than any other Finnish company.

[e] Ericsson and Siemens also won contracts with European countries to supply GSM infrastructure.

1999,[52] an opportunity for Nokia's networking business to thrive. Nokia also controlled one third of the essential patents for GSM standards,[53] which guaranteed continuous cash flow in technology licensing. Recognizing opportunity in Japan's 70% market growth over the previous year, Nokia in 1992 signed an agreement with Japanese mobile network operator IDO[f] to design phones used on their network, the first European manufacturer to make a deal in Japan.

Nokia Mobile Phones

In 1992, Nokia launched the first mass-produced digital phone, Nokia 1011, for GSM.[54] GSM handsets were priced at €1,335 (FIM 7,013). While significantly cheaper than handsets developed for the military, which cost over €12,507 (FIM 66,009), GSM handsets far outstripped the average €314 manufacturer's price for analog consumer mobile phones in competitive markets.[55] While GSM handsets sales were growing, analog handsets remained more popular worldwide.

By late 1992, Nokia was Europe's biggest producer of mobile phones and the world's second largest producer behind Motorola (see **Exhibit 4** for competitor descriptions). Nokia exported handsets (most of which were still analog) to 70 countries,[56] expanding its reach to Latin America, Russia, Australia, and Eastern Europe.[57] Ollila predicted handset penetration in industrialized countries would exceed 20% of the population by 2000, meaning 250 million subscribers and global sales of over 40 million units per year.[58] Meanwhile, Nokia aggressively sought patents for its new technology developments. Its early patent strategy focused on acquiring new IP rights to defend the growing businesses.[59] (Refer to **Exhibit 1** for Nokia's number of new patents over time.)

Nokia anticipated rapid growth in the mobile phone market in the coming years, as countries across Asia as well as Australia and New Zealand rolled out GSM networks. Nokia identified Asia as the region with the highest growth potential. Nokia's networking unit negotiated deals to install GSM infrastructure for 17 operators.[60] Handsets became a consumer item as prices dropped. The company invested heavily in advertising in local markets,[61] and tailored features and prices to suit local demand. Nokia's product innovation, flexibility and rapid responsiveness to market differences allowed Nokia to expand globally.[62]

According to an observer, "Nokia invested in each vertical of the handset ecosystem—manufacturing, distribution, and design R&D."[63] Nokia produced its semiconductors in-house and designed its own radio chips.[64] 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.,"[65] explained Nokia India's vice president. Ericsson and Motorola were also vertically integrated at this time, providing infrastructure and handsets,[66] while other highly-diversified competitors viewed handsets as secondary products.

By 1994, Nokia accounted for 25% of the market capitalization of Finland's Helsinki Stock Exchange.[67] That year, Nokia changed its official language to English and became the first Finnish company to list on the New York Stock Exchange.[68] (See **Exhibit 5** for market capitalization over time.) Some analysts were concerned that Nokia would not be able to manage its growth. One analyst commented, "This, for Mr. Ollila, appears to be the greater threat."[69]

[f] In 1992 Japan had three mobile system operators; IDO, NTT, and DDI. IDO was the fastest growing with 25% market share.

Nokia and an Evolving Consumer Market

In 1994, mobile penetration was the highest in Sweden, where 13% of the population owned a mobile phone, followed by Finland with 10%, and the U.S. with 6%.[70] As unit and airtime prices dropped and network coverage expanded, handset sales for personal use grew.

The Nokia 2100 was the first series of the company's digital handsets offered in the U.S. The 2120, part of the 2100 line, weighed less than 7 oz., and was less than an inch thick and 5 inches long. It was the world's smallest and lightest phone in 1994,[71] in contrast to earlier Cityman models that weighed 28 oz. and were as long as 7 inches. The user-friendly phone included a five-line LCD screen display, 99 speed-dial memory slots, a soft-touch keypad, selectable ringtones that could be personalized, and a retractable antenna.[72] The suggested retail price in 1994 was just under €703, but the phone sold at a lower price when purchased with a service contract through an authorized dealer.[73] Carriers in the U.S. typically subsidized the cost of mobile phones and generated revenue through service contracts,[74] and for a long time made it difficult to switch providers and transfer numbers.[g] Nokia had to negotiate with carriers such as AT&T or Verizon to sell their models.

As the mobile phone industry took hold beyond the enterprise consumer, phones became pocket-sized and distribution spread worldwide; cellular penetration took off (see **Exhibit 6** for mobile penetration over time in developed and developing countries). Nokia, Ericsson, and Motorola collectively controlled 75% of the global handset market by the end of 1995.[75] To manage growth, Nokia had manufacturing facilities in Salo, Finland, as well as factories in Ft. Worth, Texas, Bochum, Germany, Hong Kong, China, and Masan, South Korea, where the CDMA wireless standard had been mandated. While Nokia dominated GSM networking production, it had yet to crack the CDMA network market of the U.S. and South Korea, though the company in 1995 announced that it was developing handsets (but not the network technology).[76]

Nokia began to explicitly market its mobile phones as fashion accessories. Nokia's handsets were sleek and elegant, imbued with 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,[77] and a market for colored and patterned replacement covers emerged. These covers, sometimes referred to as plates, were available for the Nokia 5110, released in 1998. Nokia phones offered a selection of ring tones as well.[78] Nokia hired young art school designers to keep up with trends. By 1998, Nokia sold products in 140 countries, tailoring its offerings to fit local demand. Increasingly Nokia behaved like a consumer-products company, introducing new models annually and encouraging users to customize their devices.[79] "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 Center in Salo.[80] (See **Exhibit 7** for the evolution of mobile phone design.)

Nokia at its Peak

In 1998, Nokia became the world's leading mobile phone manufacturer with 23% market share and 163 million units sold, surpassing Motorola's 20% market share. (See **Exhibit 8** for net sales by business unit and region.) Analysts faulted Motorola for failing to respond fast enough to the switch from analog to digital networks, and for concentrating more on CDMA technology, used by 12

[g] In 2003 the EU stipulated that all wireless carriers must allow number portability, followed by the U.S. Federal Communications Commission in 2004.

million people worldwide, rather than GSM, which was used by 100 million people in 1998.[81] Motorola also reacted slowly to the demand for more fashionable handsets. Motorola's semiconductor unit, responsible for over 20% of the corporation's global sales, was also struggling.[82] Nokia also benefited relative to Motorola, one observer noted, from Nokia's "unrivaled prowess" in logistics.[83] 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."[84] (Refer to **Exhibit 1** for Nokia R&D spending over time.)

"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."[85] Lacking production capacity, Nokia's competitors began to outsource manufacturing, while Nokia continued to produce its handsets internally. Nokia protected its technological developments and handset features by continuing to aggressively file patents. Nokia's patent total jumped from 796 in 1998 to 1469 in 1999.[86]

The success of Nokia attracted foreign investors to Finland, who sought out other tech companies with potential. In 1999, venture capitalists invested over €285 million in new Finnish companies. The mobile phone had become a national symbol of pride for Finns.[87] By 2000 Nokia maintained R&D facilities in 14 countries throughout Europe, Asia, and North America, but well over half of its R&D activities occurred in Finland. Nokia also maintained production facilities in nine countries including Hungary, China, Brazil, and other emerging markets.

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 sold for €464. At 5 ounces and with a slim, elegant design, the 7110 was the first mobile phone to offer web browsing. By 2002 the Nokia 7650, priced between €185 and €411, was the first Nokia camera phone (released two years after Samsung's first camera phone)[88] and came with 30 ringtone options.[89]

Nokia maintained lower production costs and reported a 23% profit margin in 2000, exceeding Motorola's 6%.[90] Motorola was losing money on its networking gear business and reportedly sought a merger or a buyer for the unit.[91] Analysts also speculated it would sell its semiconductor business.[92] In October 2002 Motorola's stock price dropped 26% to $7.48, a 10-year low. Meanwhile its market share in handsets declined to 17%, leaving the company vulnerable.[93]

The style of Nokia's phones continued to evolve, but some worried style began to trump usability.[94] (See **Exhibit 9** for images of Nokia handsets.) Nokia continued to innovate, introducing the first touch-screen devices in 2003—the Nokia 6108 and 3108 phones—which worked with a stylus. The 7280 phone, released in 2004, contained a scroll bar instead of a keypad.[95] In 2004, most Nokia phones weighed near four ounces, half the weight of its lightest handset in 1994 (7 oz.).[96]

Nokia's Emerging Market Strategy

By the early 2000s, Nokia turned its attention to emerging markets. It sold handsets in over 130 countries while Nokia Networks (formerly Nokia Telecommunications), the networking infrastructure business, continued to be a leading supplier of GSM network solutions and also began providing network management and customer service to Internet service providers.[97] Nokia estimated there were at least 600 million potential subscribers in Russia, China, and India.[98] In 2002,

Nokia split its handset division unit into nine separate business centers based on geography to work on specific markets. Believing that smaller divisions allowed faster responses in markets that greatly differed in terms of feature demand and usage, Nokia reorganized itself into four divisions: Mobile Phones, Multimedia Phones, Enterprise Solutions, and Networks. By 2002, Nokia controlled over 40% market share of GSM handsets and 5-7% of the CDMA handset market.[99] At that time, 60% of handsets worldwide operated on the GSM network while 21% of handsets employed CDMA technology. The remaining 19% operated on Japan's PDC network, analog networks, or other networks.[100]

In 2003, Nokia introduced two handsets, the Nokia 1100 and 2300, tailored to emerging markets with voice and SMS capabilities and longer battery life, useful in regions with unreliable power. The two models were designed with prepaid users in mind.[101] The 1616 model, also developed for emerging markets, had a durable case, AM/FM radio, extended battery life, and multiple address books for families sharing a phone. The 1616 was priced at $32 in emerging markets;[102] in contrast, in the U.S. the average retail price for a handset was over $200 with a carrier subscription.

Sales slowed in 2004, however, and Nokia's worldwide market share fell from 35% to 28.9%.[103] Many believed this was largely due to Nokia's failure to respond to new "clamshells," or, flip-phones, which were particularly popular in Asia and North America. In 2004, Motorola and Samsung had 43 and 63 clamshell models in their portfolio, respectively, while Nokia only offered two clamshell models.[104] Motorola's clamshell Razr, introduced in 2004, became the best-selling phone in the world within a few short years and revived the struggling brand.[105] Nokia responded to this competition by cutting prices on select handsets and eliminating some models.[106]

By 2005, Nokia annual revenues exceeded €29 billion. Of the 650 million mobile phones sold worldwide, Nokia sold 200 million.[107] Sales were strong in Western Europe and Asia, which compensated for weak sales in the Americas. Nokia held 45% market share in Eastern Europe, the Middle East, and Africa. In India, Nokia held 63% of the market. 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 with key operators fared poorly.[108]

Increased Competition

By the mid-2000s, the industry was increasingly competitive. New competitors from Asia, including South Korean manufacturer Samsung, entered markets in Europe that Nokia had dominated. Increased competition shortened product lifecycles to between six and nine months, dramatically increasing pressure on design, manufacturing and distribution to keep pace by offering new models more quickly than ever. Many operators in Europe and the U.S. agreed to terms with Asian contract manufacturers or handset-vendors to provide 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 brands. ODMs threatened to commoditize handset production and disrupt the vertical industry model of companies like Nokia.[109]

Several Chinese manufacturers in the largest handset market in the world also emerged. Though Nokia and Motorola still led in market share in China, brands such as TCL, Huawei, and ZTE rapidly gained traction. TCL became the largest handset manufacturer in China by 2002 (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.[110] A network of knock-off, "grey market" producers selling imitator

handsets was also growing. Illicit phones containing components from brand-name producers sold at high discounts. In 2005, up to 50 million grey market units were shipped in China.[111]

By the mid-2000s Nokia was seeking new areas of growth. The developing world was attractive, as subscriber growth in India, China, Russia, and Latin America remained strong. It was becoming harder to compete in the saturated, developed world, as handset makers encouraged subscribers to upgrade existing handsets by providing new handsets with attractive new features on short release cycles. Phones for business use were seen as another potential market. One of the early players in the smartphone market, Research in Motion (RIM), had introduced an e-mail function in its 2003 BlackBerry,[112] which led to the development of other functions and RIM's early dominance of the enterprise market. In 2005, less than 10% of office workers had mobile e-mail. "We think it's probably the single largest untapped market for Nokia," said Mary McDowell, head of Nokia's enterprise solutions group.[113]

Analysts recognized that Nokia, while leading in market share worldwide, was being pushed down-market as competitors gained market share. Samsung, for instance, ranked third in 2002 market share and was still growing. Kallasvuo, who had shifted from the role of 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."[114] An analyst agreed, "[Nokia's] efficiency made it difficult for rivals to challenge it at the low end."[115] But Nokia's substantial patent portfolio, with over 1600 new filings in 2005, also helped to 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."[116]

3G Standards and Convergence

The roll-out of third-generation ("3G") wireless technology—talked about for years, but slow to arrive—began to accelerate in 2005. 3G networks gradually replaced GSM and CDMA. Increased bandwidth provided by 3G networks allowed the mobile Internet to grow. U.S. chipmaker Qualcomm, which no longer manufactured handsets but held patents on the chips, software, and other technologies that made 3G possible, pushed for the adoption of the new 3G network, CDMA2000, in the U.S. Qualcomm also controlled key patents in the emerging WCDMA network, GSM's migration to 3G, in Europe. WCDMA and CDMA2000 were compatible, allowing phones to be used worldwide.[117] Samsung was an early player in 3G development as it supplied networks in China in 2002, and was awarded a contract that year to introduce 3G in Japan. Nokia held 25% of patents essential for WCDMA.[118] 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, unlike Nokia which produced its own.[119] "Being first is not necessarily a gateway to Heaven," Ollila remarked.[120]

Nokia under Kallasvuo (2006-2010)

Kallasvuo was named CEO in June 2006 when Ollila decided to step down after 14 years as CEO. Kallasvuo, like Ollila before him, had been with the company for many years. He was appointed assistant vice-president of Nokia's legal department in 1987 and moved to the finance division the following year. In the late 1990s, he served as head of Nokia's business operations in the U.S. before running the mobile phones division, where he worked alongside Ollila for years.

In 2006, less than a month into Kallasvuo's tenure, Nokia and Siemens agreed to combine their network infrastructure operations in response to low price competition from Asia. Nokia Siemens

Network, the joint venture replacing Nokia Networks, expected to generate an estimated €15.8 billion in revenue.[121] "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.[122]

In June 2006, Nokia exited talks with Sanyo over a joint venture to manufacture CDMA phones, announcing that it would leave the CDMA market altogether, except in the U.S. where it would offer Nokia-branded CDMA phones.[123] 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." Nokia instead shifted production to the GSM and 3G WCDMA handsets used by over 70% of the world's mobile subscribers[124] and turned away from the U.S. market.

Rise of Smartphones and Apple iPhone Launch

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 and e-mail; they also offered a camera, music player, a contacts list, and increasingly, applications (apps) such as maps, games and other features. Usage spread as retail prices on some devices dropped below $200 with U.S. carrier subsidies. Worldwide, over 80 million smartphones were sold in 2006, 8% of the 990 million total handsets sold that year.[125] Nokia's smartphones, which ran on the Symbian operating system (OS), developed as a joint venture between Nokia, Ericsson, Motorola, Siemens, and others, led with 38 million devices shipped, controlling 48% market share despite weak North American sales.[126] Motorola's Windows Mobile OS devices helped that company grow over 104% with 4.9 million devices sold in 2006.[127] RIM's popular line of BlackBerry smartphones sold over 6 million units in 2006, second in market share with 7.5%.[128]

In 2007, Apple introduced the iPhone, which ran on Apple's proprietary iOS, first released in the U.S. and available worldwide in 2008. Over 3 million units sold in 2007, and sales grew 245% in 2008 to sales of over 11 million units.[129] An Apple senior executive estimated that the iPhone cost $150 million to develop.[130] It was initially priced at $600 and available exclusively to AT&T subscribers in the U.S. The iPhone included more computing features than competing smartphones, but also delivered "cool form factor,"[131] as one industry observer noted, reminiscent of Nokia's success in turning the handset into a fashion accessory in the 1990s.[132]

Nokia and the U.S. Market

By 2007, Nokia remained the leader in the fastest growing markets including China, Southeast Asia, and India, but its handsets were largely absent from the U.S. market after eliminating CDMA handset production. In North America, 160 million phones were sold per year, approximately the same as in China. The market had become crowded and fragmented; by 2007 Nokia sold only one in 10 handsets in the U.S.[133] A few Nokia models were on display at Verizon and AT&T retail stores, but none at Sprint. T-Mobile, the distant fourth in subscribers, carried several, however. [134]

In 2007, Nokia opened a research center in Silicon Valley, the technology hub and home to Apple, Google, and other competitors. The research center, one of seven worldwide, had up to 70 researchers and interns from Stanford University working on wireless grids, user interfaces for wireless devices, and networking capabilities.[135] Bob Iannucci, head of the research centers and based in Palo Alto, was appointed the first non-Finnish Chief Technology Officer for Nokia in 2007. Nokia stated in a press

release, "With the convergence of mobile and the internet, it's made Silicon Valley a lot more important for us."[136]

Nokia's U.S. market share dropped from 33% in 2002 to 10% in 2007. An analyst explained, "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."[137] A Nokia executive admitted, "We had our head in the sand about the fact that the U.S. would evolve more toward the global market."[138] Kallasvuo realized Nokia needed a new strategy in the U.S.

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. The phone was to be outsourced entirely, a change for Nokia which had historically relied on in-house handset manufacturing and assembly.[139] Motorola, in contrast, assembled only half of the phones it sold.[140] By 2007 Nokia began to source handset chips from Texas Instruments, Broadcom, Infineon Technologies and STMicroelectronics. As part of this deal, Nokia agreed to license its modem technology to its new suppliers.[141]

Industry Shift to Software

Smartphone operating systems became as important as the hardware itself, as customer demand for new features and apps grew and operating system choice became an increasingly important factor in a manufacturer's strategy. An industry observer noted, "Apple's innovation in its mobile phone user interface has prompted a lot of design activity among competitors."[142] In 2007, Nokia's Symbian operating system remained the most widely used operating system in the world with 67% market share, followed by Microsoft with 13% and RIM with 10%.[143]

Handset producers reacted to this shift differently. By 2009 Nokia had adjusted its patent portfolio to contain over 70% software-related patents, up from 2% in 1999. Apple's portfolio, 35% software in 1999, grew to 54% with an increased focus on circuits, connectors, switches and relays, and other network infrastructure patents. Samsung sustained its focus on memories and hybrid circuits (42% in 1999 and 2009), and increased research in software (virtually 0% of its 1999 portfolio to 6.5% in 2009).

The industry solidified its transition from being handset-focused to software-focused with the release of Apple's iPhone. Taiwan's HTC, Motorola, and several other manufacturers developed their own smartphones, many of which used Google's open-sourced Android operating system, while Nokia continued to use Symbian. Google's Open Handset Alliance was a consortium of 84 firms formed to develop open standards for mobile devices. Android was the flagship software of the alliance, opening the software up to manufacturers. HTC and T-Mobile were early adopters of the Android OS for their handsets. Sony Ericsson, Vodafone, Garmin, Sprint, Motorola, and Samsung also all joined the Alliance over the next two years to manufacture smartphone models using the Android OS. RIM, HTC, and Samsung all saw smartphone sales increase in 2008, while Nokia's sales remained flat.[144]

Smartphones became part of an ecosystem of consumer devices. The iPhone, for example, could be synchronized with a user's iTunes music library, allowing music streaming through the device. The rise of social media, new apps, additional mobile features such as video and audio streaming, and other complementors allowed smartphones to deliver more than just making phone calls or sending e-mail and text messages. Users in developed markets generally replaced their phones every 18 months,[145] and manufacturers spent an estimated $30 million on engineering a new smartphone model.[146]

Nokia's Response

In August 2007, Nokia launched its online store Ovi to sell songs, games and maps compatible with Nokia's Symbian OS phones as part of a shift to a more service-oriented business.[147] Nokia was also developing MeeGo, another mobile computing OS. In October 2007, Nokia paid $8.1 billion (€5.7 billion) for Navteq, the digital-map database that created digital maps used by Yahoo, Google, Garmin, and others. An analyst estimated Nokia's revenue from mobile maps and music could total $2 billion.[148] 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."[149]

Pressure was mounting as iOS and Android devices gained market share in the smartphone market. To compete with Google's open-sourced Android OS, Nokia announced in 2008 that it would acquire all Symbian shares from its partners and spin it off into a not-for-profit venture, the Symbian Foundation, to establish Symbian as a royalty-free, open platform. "It offers us an opportunity to innovate faster on a bigger, united, more widely accepted platform,"[150] Kai Oistamo, head of Nokia's devices business, told Reuters. "It also enables us to deliver new products, we believe, faster to the market. I'm convinced we will sell more products."[151] Nokia continued to focus on selling low-end feature phones (phones that could access the internet but did not contain full smartphone capabilities) to emerging markets, where it profited from high production volumes and low costs. Competitors without Nokia's scale struggled to sell profitably in the low end of the market. Nokia continued to experience sales growth in China and India, while its strongest growth in sales came from the Middle East and Africa with a 52% increase in shipments.[152]

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.[153] In 2008, as Apple's App Store, the iPhone 3G, and Google's first Android device were released, Nokia released several "candy bar"-style smartphone handsets. The following year, the Android 2.0, Motorola Droid, and iPhone 3Gs were released. While some analysts felt Nokia was on the right track with its new devices, one said, "Unless it fields a competitive device, it will continue to see its share of the smartphone market erode."[154] (See **Exhibit 10** for Nokia's market share by region, 2007-2010.) Despite these concerns, Nokia maintained the highest market share in 2009 with 34%, followed by South Korean Samsung and LG, with 18% and 9% respectively, and China's ZTE with 5%. Motorola fell to out of the top five in 2009.[155]

Stephen Elop's Burning Platform (2010-2013)

In September 2010, Stephen Elop was named the new CEO to replace Kallasvuo, who remained on the board of Nokia Siemens Networks. 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 served as president of Microsoft's Business Division.[156] Nokia's website explained, "The core strategy is solid and Nokia will continue to power through what is a substantial transformation."[157] The board believed Nokia would benefit from Elop's experience at Microsoft as Nokia transitioned from a hardware company to a software company.

While Nokia controlled 40.3% of world market share in June 2010[158] (and 8.1% market share in the U.S.),[159] profit margins had 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.[160] Elop recognized the challenges Nokia faced, 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, urging the company to jump before it was too late. After the man in the story jumped into the icy water and was rescued, he noted that he would not have jumped into the water under normal circumstances, but the burning platform caused a "radical change in his behavior."[161] 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 fuelling 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.[162]

A New Operating System

The company needed a change in direction, and Elop singled out the Symbian OS, explaining Symbian was "an increasingly difficult environment in which to develop."[163] Industry experts estimated that R&D costs associated with developing a new operating system ranged from $100-$200 million, in addition to costs necessary to maintain the ecosystem.[164] Many critics believed Symbian was partially to blame for Nokia's struggling smartphone offerings. It was described as clunky, and developers chose not to write applications for it.[165] Many industry observers preferred the Apple App store or Google's Android Marketplace to Nokia's Ovi store.[166] The Apple App store contained over 300,000 apps in 2010, while the Android Marketplace grew six times in 2010 to include 130,000 apps.[167] Ovi contained 30,000 apps, while RIM and Microsoft's Windows Phone had 16,000 and 6,500 apps, respectively.[168]

Elop decided to abandon Symbian and replace it with Microsoft's Windows Phone 7 software. Symbian support was outsourced to management consultancy Accenture, which would maintain the operating system on 400 million phones through 2016.[169] Reportedly Elop also approached Google to discuss using Android,[170] 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!"[171] Nokia shares fell 14% the day of the Windows announcement.[172] 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 due to continued pricing pressure in Asia and "mismanagement" with a high inventory of unsold smartphones on the shelves in China.[173] In addition to competition from Android, CDMA handsets that Nokia no longer produced were experiencing an increase in 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."[174] Already selling at a 13-year low, Noki'a share price dropped 19% to $6.70. By June 2011, Nokia's smartphone market share, which had been 49% in 2007, prior to the launch of the iPhone, had dropped to 25%.[175] From 2007 to 2011, its total market value had dropped 75%.

In the summer of 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. Elop decided to focus on selling through traditional wireless carriers which would subsidize the retail price of its phones. Nokia replaced all Symbian-based smartphones in North America with Windows Phone products.[176]

In 2012, Nokia moved its U.S. operations from White Plains, New York, to Sunnyvale, California. Nokia hoped that the new location in Silicon Valley could attract software developers lured to the region by Apple, Google, and social networking site Facebook.[177]

Elop announced that Nokia would officially exit the Japanese market in July 2011. The company had stopped supplying Japanese carriers with phones in 2008, but continued to operate stores for its high-end Vertu line of handsets, which cost between ¥600,000 (€ 5,142) and ¥20 million (€ 171,420). The Vertu line struggled to compete with smartphones in that market.[178] Meanwhile, China overtook the U.S. as the world's biggest market for smartphones in 2012. Chinese manufacturers Huawei, ZTE, and Lenovo utilized the Android operating system and were among the world's top five smartphone manufacturers (behind Samsung and Apple), particularly successful in the low-end market. Materials cost for low-end smartphones dipped below 400 yuan (€50); complete handsets sold for 2,000 yuan (€250) or less. Chinese company Xiaomi, founded in April 2010, immediately attracted a large, enthusiastic fan base and positioned itself as a mobile Internet company rather than a manufacturer with its MIUI Android-based operating system, Miliao social network, and Xiaomi phone. Xiaomi relied on online word-of-mouth marketing instead of traditional television or online advertising, and only sold its products online. By 2012, Xiaomi handset sales reached 719 million units.[179]

Microsoft Deal

As the company struggled, Nokia had announced a series of layoffs in 2012 that carried into 2013. Over 1,000 jobs were cut from its plant in Salo, Finland, one of the last cell phone manufacturing centers in Western Europe. In February 2012, 2,300 jobs were eliminated in Hungary, and 700 in Mexico, as manufacturing shifted to China and India. This round of layoffs was in response to the €1 billion loss reported in the fourth quarter of 2011.[180] After another €1.7 billion in losses the first quarter of 2012, Nokia announced in June 2012 that it would eliminate 10,000 more positions by the end of 2013 as part of a restructuring effort.[181] In 2012, Ollila resigned as chairman of the board.[182]

In September 2013, Microsoft purchased Nokia's devices and services business and provided access to Nokia's patents for ten years for €5.44 billion ($7.2 billion). The deal built upon the partnership formed in 2011 when Nokia agreed to use the Microsoft operating system in its smartphones and helped Microsoft to vertically integrate by teaming up with a hardware manufacturer.[183] Nokia expected the deal to strengthen its financial position and provide the basis for future investment in its continuing businesses. Upon the announcement of the deal, Nokia's share price increased 40%.[184] Microsoft's stock dropped 5% to below $32 a share.[185]

Exhibit 1 Selected Nokia Financial Data and Growth Indicators, 1989-2012.

	1989	1994	1999	2004	2008	2009	2010	2011	2012
Total Revenue (€ m)	€4,720	€5,177	€18,777	€29,267	€50,710	€40,984	€42,466	€38,659	€30,176
Operating Income (€ m)	178	617	3,908	4,304	6,204	2,408	2,308	980	(644)
As a % of net sales	3.6%	11.1%	19.7%	14.7%	12.2%	5.8%	5.4%	6.6%	-
Net Income (€ m)	(56.5)	675.7	2,577.00	3,192.00	3,988.00	891	1,850.00	(1,164.00)	(3,106.00)
Cash from Ops. (€ m)	-	436	3,102	4,343.00	3,197.00	3,247.00	4,774.00	1,137.00	(354)
Cash from Investing (€ m)	-	-266	(1,359)	(329)	(2,905.00)	(2,148.00)	(2,421.00)	1,499.00	562
Cash from Financing (€ m)	-	218	(574)	-4,318	-1,545	(696)	(911)	(1,099)	(465)
Net Change in Cash (€ m)	-	388	1,268	(327)	(1,302)	378	1,666	1,644	(284)
Total Assets (€ m)	4,535	4,777	14,279	22,669	39,582	35,738	39,123	36,205	29,949
Total Liabilities (€ m)	3,797	2,552	6,779	8,270	23,072	20,989	22,892	22,289	20,502
Total Equity (€ m)	738	2,225	7,500	14,399	16,510	14,749	16,231	13,916	9,447
Total Liabilities And Equity (€ m)	4,535	4,777	14,279	22,669	39,582	35,738	39,123	36,205	29,949
R&D Spending (€ m);	246	355	1,755	3,733	5,968	5,909	5,863	5,584	4,782
As a % of net sales	*5.1%*	*6.4%*	*8.8%*	*12.9%*	*11.8%*	*14.4%*	*13.3%*	*14.4%*	*15.8%*
Selling and Marketing Spending (€ m)	-	-	1,220	2,552	4,380	3,933	3,877	3,769	3,205
As a % of net sales	-	-	6.2%	8.7%	8.6%	9.6%	9.1%	9.7%	10.6%
Avg. Number of Employees	41,300	28,000	55,260	55,505	121,723	123,553	132,427	130,050	97,798
Operating Income/Employee (€)	4,305	22,030	70,720	77,542	50,968	19,489	17,428	7,535	(6,585)
EPS (€)	-	0.92	2.24	0.70	1.05	0.24	0.50	(0.31)	(0.84)
P/E Ratio	-	15.9	80.4	16.6	10.37	37.17	15.48	nm	nm
Interbrand Ranking	N/A	N/A	N/A	#8	#5	#5	#8	#14	#19
Number of New Patents	51	188	1,469	1,995	1,385	1,061	746	585	605
Finnish Composition of Board of Directors	100%	100%	77%	63%	60%	54%	44%	45%	29%
Finland GDP per capita (€)	21,400	16,700	23,700	29,100	34,900	32,299	33,300	35,000	35,600
% of Finnish GDP	0.5%	0.75%	4.0%	3.0%	2.6%	1.6%	1.0%	0.5%	-
Average Selling Price- all phones (all manufacturers) (€)	2,792	306	187	110	80	65	62	62	60

Source: Casewriter research; Compiled from Capital IQ and Nokia Annual Reports, 1994-2012; Finland GDP Per Capita, http://countryeconomy.com/gdp/finland; 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.

Exhibit 2 USSR President Mikhail Gorbachev using a Mobira Cityman, 1989

Source: "The '80s Called, and They Want Their Cellphones Back," *Wall Street Journal,* March 27, 2012, http://online.wsj.com/news/articles/SB10001424052702303812904577297763321318488, accessed October 2013.

Exhibit 3 GSM and CDMA Network Launch Dates, 1991-1998

GSM Launch Timeline

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

CDMA Launch Timeline

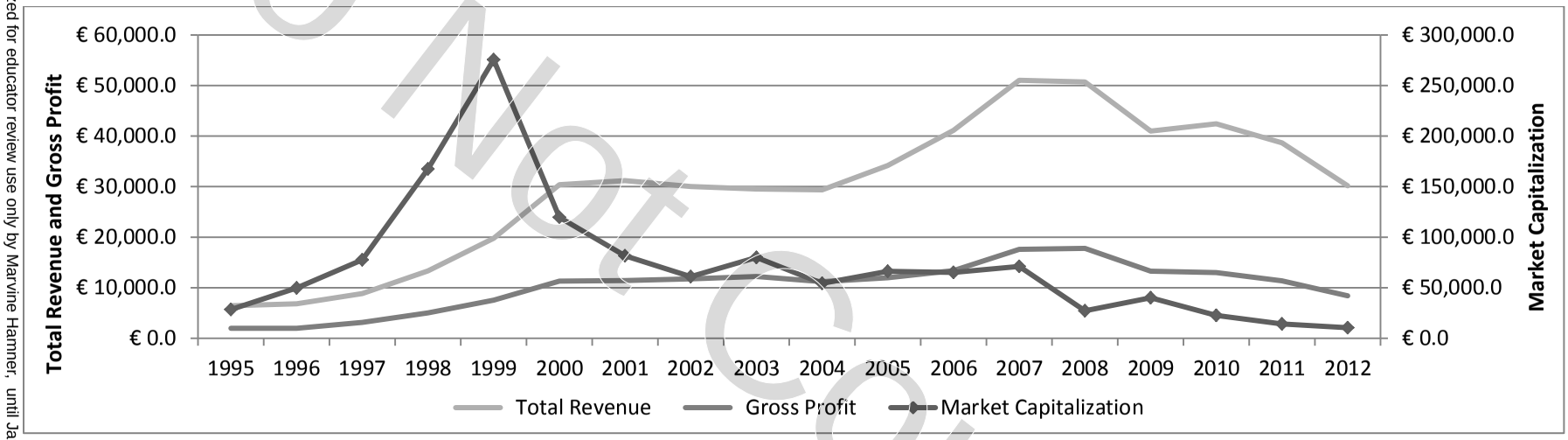
Source: Casewriter research, compiled from "Brief History of GSM & the GSMA," http://www.gsma.com/aboutus/history; "CDMA History," http://www.cdg.org/resources/cdma_history.asp; Garry A. Garrard, *Cellular Communications: Worldwide Market Development,* (Boston, MA: Artech House, Inc., 1998).

Exhibit 4 Nokia's Global Competitors

	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	($1.82)B	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%)

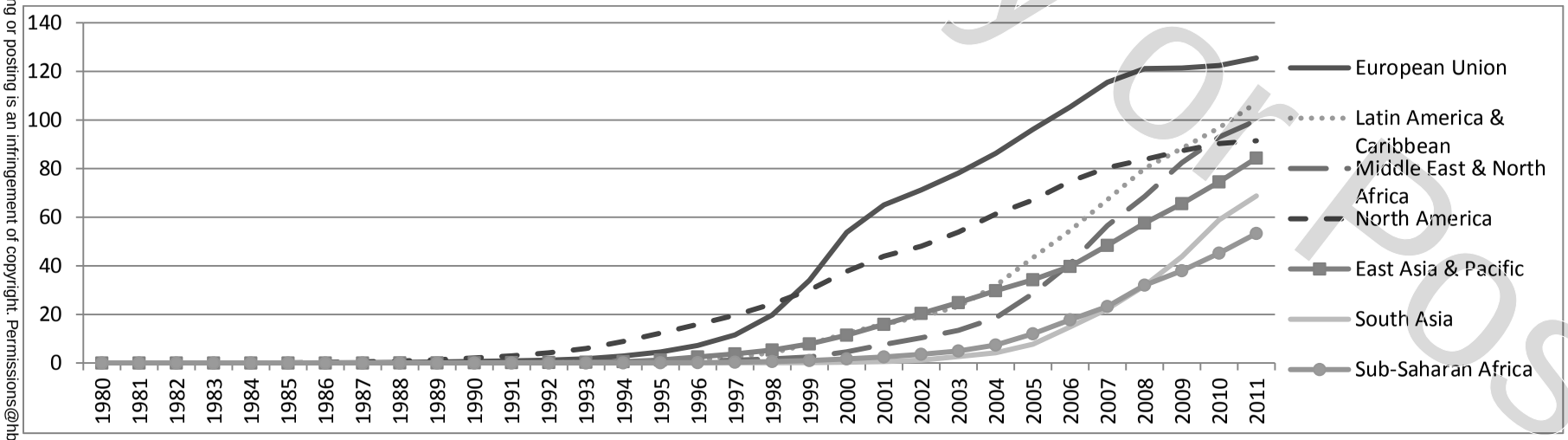
Source: Casewriter Research; Compiled from Motorola Solutions Company Overview and Products and Operations, Hoover's, Inc.; Motorola Solutions, "Products," http://www.motorolasolutions.com/US-EN/Business+Product+and+Services; Siemens Aktiengesellschaft Historical Financials and Products and Operations, 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.;accessed December 2013.

Exhibit 5 Nokia Market Capitalization, Revenue, and Gross Profit over time, 1995-2012 (in millions EUR).



Source: Compiled from Capital IQ, accessed November 2013.

Exhibit 6 Global Mobile Telephone Penetration - Mobile Subscribers per 100 people, 1980-2011.



Source: Compiled from World Development Indicators, World Bank, accessed November 2013.

Exhibit 7 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 8 Nokia Sales by Business Unit and Market Regions, 1999-2012

Net Sales by Business (EUR million)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Devices and Services	-	-	-	-	-	-	-	-	-	35,099	27,853	29,134	23,943	15,686
Enterprise Solutions	-	-	-	-	-	830	861	1,031	2,070	-	-	-	-	-
NAVTEQ	-	-	-	-	-	-	-	-	-	361	670	1,002	-	-
Nokia Networks	5,673	7,714	7,534	6,539	5,620	-	-	-	-	-	-	-	-	-
Nokia Siemens Networks	-	-	-	-	-	6,367	6,557	7,453	13,393	15,309	12,574	12,661	14,041	13,779
Nokia Ventures Organization	-	854	585	459	366	-	-	-	-	-	-	-	-	-
Mobile Phones	13,182	21,887	23,158	23,211	23,618	18,507	20,811	24,769	25,083	-	-	-	-	-
Multimedia	-	-	-	-	-	3,659	5,981	7,877	10,538	-	-	-	-	-
Location and Commerce	-	-	-	-	-	-	-	-	-	-	-	-	1,091	1,103
Interbusiness Group Eliminations	(78)	(79)	(86)	(193)	(149)	(96)	(19)	(9)	(26)	(59)	(113)	(331)	(416)	(392)
Net Sales, Total	18,777	30,376	31,191	30,016	29,455	29,267	34,191	41,121	51,058	50,710	40,984	42,466	38,659	30,176
Net Sales by Major Markets														
Americas	25%	25%	25%	22%	21%	-	-	-	-	-	-	-	-	21%
North America	-	-	-	-	-	12%	8%	7%	5%	4%	5%	5%	4%	-
Latin America	-	-	-	-	-	9%	8%	9%	8%	10%	7%	9%	11%	-
Europe	53%	52%	49%	54%	-	41%	42%	38%	39%	37%	36%	34%	31%	33%
Europe, Middle East, and Africa	-	-	-	-	57%	-	-	-	-	-	-	-	-	-
Middle East and Africa	-	-	-	-	-	12%	13%	13%	14%	14%	14%	13%	14%	-
Middle East and Asia	-	-	-	-	-	-	-	-	-	-	-	-	-	46%
Asia-Pacific	22%	23%	26%	24%	22%	16%	18%	20%	22%	22%	22%	21%	23%	-
China	-	-	-	-	-	10%	11%	13%	12%	13%	16%	18%	17%	-

Source: Compiled from Nokia Annual Reports, 1999-2012, accessed October 2013.

Exhibit 9 Nokia Handsets (2003-2010)

Nokia 3310 (2003)

Clamshell (2005)

Nokia 8800 (2005)

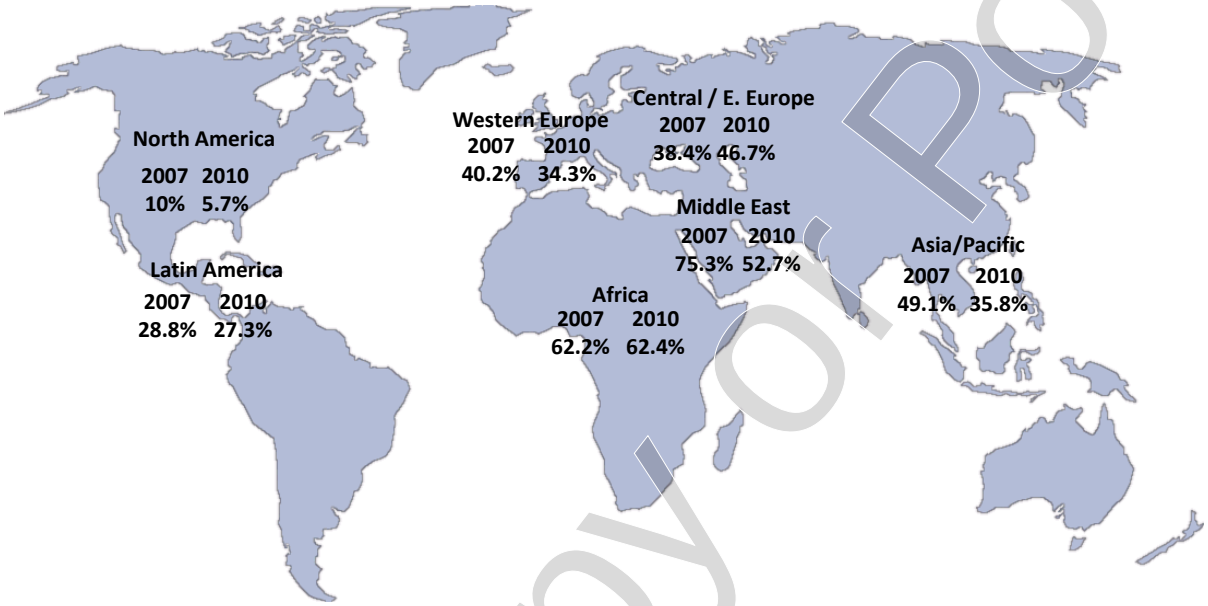
Nokia 5000 (2008)

Nokia N8 (2010)

New Models (2008)

Source: Compiled from Nokia quarterly reports, http://i.nokia.com/blob/view/-/165142/data/5/-/Q1-2008-earnings-preso-pdf.pdf, http://i.nokia.com/blob/view/-/165142/data/5/-/Q1-2008-earnings-preso-pdf.pdf, http://i.nokia.com/blob/view/-/164994/data/5/-/Q1-2003-preso-pdf.pdf, http://i.nokia.com/blob/view/-/165060/data/6/-/Q1-2005-preso-pdf.pdf, accessed December 2013.

Exhibit 10 Nokia Market Share by Region (2007-2010)



Source: Compiled from EMEA Mobile Phone Tracker, IDC, March 2012, accessed October 2013.

Endnotes

[1] Hakan Wranne, "D&S now Microsoft's problem," Swedbank analyst report, September 4, 2013, via Thomson One, accessed October 2013.

[2] Nokia Corporation Q4 and full year 2012 Interim Report, January 24, 2013, http://press.nokia.com/2013/01/24/nokia-corporation-q4-and-full-year-2012-interim-report/, accessed November 2013.

[3] Mark Hachman, "The Microsoft-Nokia deal: Fail plus fail equals more fail," *PCWorld,* September 3, 2013, http://www.pcworld.com/article/2048063/the-microsoft-nokia-deal-fail-plus-fail-equals-more-fail.html, accessed November 2013.

[4] Mark Hachman, "The Microsoft-Nokia deal: Fail plus fail equals more fail," *PCWorld,* September 3, 2013, http://www.pcworld.com/article/2048063/the-microsoft-nokia-deal-fail-plus-fail-equals-more-fail.html, accessed November 2013

[5] Martti Häikiö, *Nokia: The Inside Story,* (London, UK: Prentice Hall, 2002), p. 57.

[6] Häikiö, Nokia: The Inside Story, p. 59.

[7] The Nokia Story, http://www.nokia.com/global/about-nokia/about-us/the-nokia-story/, accessed October 2013.

[8] "Testing the First Public Cell Phone Network," AT&T Tech Channel, http://techchannel.att.com/play-video.cfm/2011/6/13/AT&T-Archives-AMPS:-coming-of-age, accessed January 2013.

[9] Dan Steinbock, *Wireless Horizon: Strategy and Competition in the Worldwide Mobile Marketplace*, (New York, NY: American Management Association, 2003), p. 57.

[10] Joyce Heard, "Nokia Skates Into High Tech's Big Leagues: The Finnish Company Is Becoming An Electronics Powerhouse," *BusinessWeek,* April 4, 1988, via Factiva, accessed January 2013.

[11] Steinbock, *Wireless Horizon*, p. 57.

[12] Cecil Johnson, "How Nokia Roared to Top of Global Wireless Industry," *Orlando Sentinel,* July 15, 2001, http://articles.orlandosentinel.com/2001-07-15/news/0107140353_1_nokia-finnish-erratic, accessed November 2013.

[13] Steinbock, *Wireless Horizon,* p. 286.

[14] Terry Dodsworth, Hugo Dixon, "Europe Dials Up The Future: A Nascent Cellular Telephone Network," *Financial Times,* August 5, 1988, via Factiva, accessed December 2013.

[15] Lars Jonung, Jaakko Kiander, Pentti Vartia, "The Great Financial Crisis in Finland and Sweden," (Cheltenham, UK: Edward Elgar Publishing Limited, 2009), p. 30.

[16] Dan Steinbock, *The Nokia Revolution,* (New York, NY: American Management Association, 2001), p. 51.

[17] Elaine Williams, "100-year-old Nokia Experiences Fast-Growth Pains," *Electronic Business Buyer,* June 26, 1989, via Factiva, accessed November 2013.

[18] Industrial Research and Development Information System, Historical Data 1953-2007, http://www.nsf.gov/statistics/iris/search_hist.cfm?indx=13, accessed December 2013.

[19] Alan Elsner, "Nokia Acquisition Ambitions Hurting Profitability," *Reuters,* November 22, 1988, via Factiva, accessed November 2013.

[20] Steve Lohr, "Risk Inherited at Finnish Concern," *New York Times,* December 29, 1988, via Factiva, accessed November 2013.

[21] Cecil Johnson, "How Nokia Roared to Top of Global Wireless Industry," *Orlando Sentinel,* July 15, 2001, http://articles.orlandosentinel.com/2001-07-15/news/0107140353_1_nokia-finnish-erratic, accessed November 2013.

[22] Häikiö, Nokia: The Inside Story, p. 85.

[23] Elaine Williams, "100-year-old Nokia Experiences Fast-Growth Pains," *Electronic Business Buyer,* June 26, 1989, via Factiva, accessed November 2013.

[24] Steve Lohr, "Risk Inherited at Finnish Concern," *New York Times,* December 29, 1988, via Factiva, accessed November 2013.

[25] Steinbock, *Wireless Horizon*, p. 286.

[26] Steinbock, *Wireless Horizon,* p. 286.

[27] Steve Lohr, "Risk Inherited at Finnish Concern," *New York Times,* December 29, 1988, via Factiva, accessed October 2013.

[28] Elaine Williams, "100-year-old Nokia Experiences Fast-Growth Pains," *Electronic Business Buyer,* June 26, 1989, via Factiva, accessed November 2013.

[29] Robert Taylor, "Survey of Finland: A Casualty of Overheating," *Financial Times,* December 18, 1989, via Factiva, accessed November 2013.

[30] Robert Taylor, "Survey of Finland: A Casualty of Overheating," *Financial Times,* December 18, 1989, via Factiva, accessed November 2013.

[31] Robert Taylor, "Survey of Finland: A Casualty of Overheating," *Financial Times,* December 18, 1989, via Factiva, accessed November 2013.

[32] Robert Taylor, "Jorma Ollila- Putting Nokia Back in the Black," *Financial Times,* January 23, 1992, via Factiva, accessed October 2013.

[33] "EU-Finland, First-Year Impressions," EIPA, http://www.eipa.eu/files/repository/eipascope/Scop95_3_2.pdf, accessed November 2013.

[34] Erkki Koskela, "Unintended convergence – how Finnish unemployment reached the European level," http://ideas.repec.org/p/hhs/bofrdp/2004_006.html, accessed November 2013.

[35] Risto Penttila, "Finland's Quiet Revolution, 1989-1999," *Scandinavian Review,* Vol. 87, Issue 3, January 1, 2000, via Factiva, accessed October 2013.

[36] Häikiö, Nokia: The Inside Story, p. 148.

[37] Risto Penttila, "Finland's Quiet Revolution, 1989-1999," *Scandinavian Review,* Vol. 87, Issue 3, January 1, 2000, via Factiva, accessed October 2013.

[38] Robert Taylor, "Jorma Ollila- Putting Nokia Back in the Black," *Financial Times,* January 23, 1992, via Factiva, accessed October 2013.

[39] Steinbock, *Wireless Horizons,* p. 284.

[40] Karime Mimoun*, Strategic Exploration of Nokia's Success*, (Norderstedt, Germany: GRIN Verlag, 2009), p. 4.

[41] Steinbock, *Wireless Horizon,* p. 289.

[42] Steinbock, *Wireless Horizon*, p. 289.

[43] Häikiö, Nokia: The Inside Story, p. 142.

[44] Stephen D. Moore, "Nokia Appoints Jorma Ollila to Top Posts; Unexpected Reshuffle Sends Stocks Falling," *Wall Street Journal Europe,* January 17, 1992, via Factiva, accessed October 2013.

[45] Stephen D. Moore, "Nokia Appoints Jorma Ollila to Top Posts; Unexpected Reshuffle Sends Stocks Falling," *Wall Street Journal Europe,* January 17, 1992, via Factiva, accessed October 2013.

[46] Steinbock, *The Nokia Revolution*, p. 124

[47] Robert Taylor, "Jorma Ollila- Putting Nokia Back in the Black," *Financial Times,* January 23, 1992, via Factiva, accessed October 2013.

[48] Stephen D. Moore, "Nokia Appoints Jorma Ollila to Top Posts; Unexpected Reshuffle Sends Stocks Falling," *Wall Street Journal Europe,* January 17, 1992, via Factiva, accessed October 2013.

[49] Steinbock, *The Nokia Revolution*, p. 124

[50] Steinbock, *Wireless Horizon*, p. 289.

[51] Stephen D. Moore, "Nokia's Hopes Boosted by Phone Sales – Consumer-Electronics Unit May Hamper Recovery," *Wall Street Journal Europe,* October 19, 1992, via Factiva, accessed October 2013.

[52] Cynthia Johnson, "Roam Europe with Your Mobile Phone," *Reuters,* November 30, 1992, via Factiva, accessed November 2013.

[53] Nokia- Our Innovation Record, http://inventwithnokia.nokia.com/why-invent-with-nokia/nokias-innovation-record, accessed December 2013.

[54] Caleb Cox, "20 years of GSM digital mobile phones," *The Register,* November 9, 2012, http://www.theregister.co.uk/2012/11/09/20_years_of_gsm_digital_phones/, accessed December 2013.

[55] Simon Loe, "GSM Standard Starting to Spark a Real Market," *Electronic World News,* November 9, 1992, via Factiva, accessed October 2013.

[56] Steinbock, *Wireless Horizon*, p. 289.

[57] Steinbock, *The Nokia Revolution*, p. 115.

[58] "Nokia Predicts Dynamic Growth for Cellular Phones," *Bangkok Post,* May 26, 1993, via Factiva, accessed November 2013.

[59] "Profiles in Innovation: Nokia – Honing IP to Business Needs," *WIPO Magazine,* February 2006, http://www.wipo.int/wipo_magazine/en/2006/01/article_0003.html, accessed December 2013.

[60] "Nokia Predicts Dynamic Growth for Cellular Phones," *Bangkok Post,* May 26, 1993, via Factiva, accessed November 2013.

[61] Steinbock, The Nokia Revolution, p. 128

[62] Steinbock, The Nokia Revolution, p. 129

[63] "How Did Nokia Succeed in the Indian Mobile Market, While Its Rivals Got Hung Up?" Knowledge@Wharton, August 23, 2007, http://knowledge.wharton.upenn.edu/article/how-did-nokia-succeed-in-the-indian-mobile-market-while-its-rivals-got-hung-up/, accessed November 2013.

[64] "Nokia Ending Vertical Integration?" Open IT Strategies, August 8, 2007, http://blog.openitstrategies.com/2007/08/nokia-ending-vertical-integration.html, accessed November 2013.

[65] "How Did Nokia Succeed in the Indian Mobile Market, While Its Rivals Got Hung Up?" Knowledge@Wharton, August 23, 2007, http://knowledge.wharton.upenn.edu/article/how-did-nokia-succeed-in-the-indian-mobile-market-while-its-rivals-got-hung-up/, accessed November 2013.

[66] Darcy Travlos, "The Significance of Ericsson's Departure from Handsets," *Forbes,* October 31, 2011, http://www.forbes.com/sites/darcytravlos/2011/10/31/the-significance-of-ericcsons-departure-from-handsets/, accessed December 2013.

[67] "The Upwardly Mobile Phone Firm – Nokia," *The Times,* September 15, 1994, via Factiva, accessed October 2013.

[68] Häikiö, Nokia: The Inside Story, p. 161.

[69] "Survey of Finland – Mobile Phone Success Story," *Financial Times,* November 9, 1994, via Factiva, accessed September 2013.

[70] Tuija Junnila, "Nokia Mobile Phones Aims to Increase Market Share," *Reuters,* December 14, 1994, via Factiva, accessed October 2013.

[71] "Nokia Corp. Introduction of New Cellular Phones," *Regulatory News Service,* January 7, 1994, via Factiva, accessed November 2013.

[72] "Nokia Introduces Lightest Digital Cellular Phone," *BusinessWire,* January 6, 1994, via Factiva, accessed November 2013.

[73] "Nokia Introduces Lightest Digital Cellular Phone," *BusinessWire,* January 6, 1994, via Factiva, accessed November 2013.

[74] Chris Ziegler, "Editorial: the American phone subsidy model is a RAZR way of thinking in an iPhone world," *Engadget,* http://www.engadget.com/2010/02/23/editorial-the-american-phone-subsidy-model-is-a-razr-way-of-thi/, accessed December 2013.

[75] Garry A. Garrard, *Cellular Communications: Worldwide Market Development,* (Boston, MA: Artech House, 1998), p. 140.

[76] "Finland's Nokia Develops Handset for CDMA Technology," *Dow Jones International News,* August 3, 1995, via Factiva, accessed December 2013.

[77] Steinbock, *The Nokia Revolution,* p. 136.

[78] Nokia Fashion Phones, Mobile Phone History, http://www.mobilephonehistory.co.uk/nokia/nokia_fashion_phones.php, accessed November 2013.

[79] Steinbock, *The Nokia Revolution,* p. 136.

[80] Steinbock, *The Nokia Revolution,* p. 136.

[81] Simon Elegant, "Companies: Comeback Kid: Motorola seeks a second chance in the Chinese market it once dominated; Is it too late?" *Far Eastern Economic Review,* September 3, 1998, via Factiva, accessed December 2013.

[82] Simon Elegant, "Companies: Comeback Kid: Motorola seeks a second chance in the Chinese market it once dominated; Is it too late?" *Far Eastern Economic Review,* September 3, 1998, via Factiva, accessed December 2013.

[83] "Nokia's Turnaround: The Giant in the Palm of your Hand," *The Economist,* February 10, 2005, via Factiva, accessed October 2013.

[84] Steinbock, The Nokia Revolution, 146.

[85] "How Ollila Created Nokia," *Electronics Weekly,* January 25, 2008, http://www.electronicsweekly.com/mannerisms/wireless/how-ollila-created-nokia-2008-01/#sthash.5tP9ToWf.dpuf, accessed October 2013.

[86] Z. L. He, "Snakes and Ladders: A Patent Analysis of Ericsson, Motorola, and Nokia in the Wireless Communications Industry, 1980-2000," July 7, 2004, University of Otago, New Zealand, http://kwanghui.com/wireless-200407.pdf, accessed December 2013.

[87] Örjan Sölvell, Michael Porter, "Finland and Nokia: Creating the World's Most Competitive Economy," HBS No. 702-427 (Boston: Harvard Business School Publishing, 2011), p. 16.

[88] Simon Hill, "From J-Phone to Lumia 1020: A Complete History of the Camera Phone," *Digital Trends,* August 11, 2013, http://www.digitaltrends.com/mobile/camera-phone-history/, accessed November 2013.

[89] "Infographic: Historical Cost of Mobile Phones," *Marketing Tech Blog,* December 20, 2011, http://www.marketingtechblog.com/history-mobile-phone-cost/, accessed October 2013.

[90] Norbert Turek, "Motorola Plays Catch-Up," *InformationWeek,* November 13, 2000, via Factiva, accessed December 2013.

[91] Barbara Rose, "Talk of Possible Motorola, Siemens Deal Heats Up," *Chicago Tribune,*October 1, 2002, via Factiva, accessed December 2013.

[92] Sam Omatseye, "Could Motorola Exit other Business to Focus on Handsets?" *RCR Wireless News,* October 21, 2002, via Factiva, accessed December 2013.

[93] Sam Omatseye, "Could Motorola Exit other Business to Focus on Handsets?" *RCR Wireless News,* October 21, 2002, via Factiva, accessed December 2013.

[94] Nokia Fashion Phones, Mobile Phone History, http://www.mobilephonehistory.co.uk/nokia/nokia_fashion_phones.php, accessed November 2013.

[95] Nokia Fashion Phones, Mobile Phone History, http://www.mobilephonehistory.co.uk/nokia/nokia_fashion_phones.php, accessed November 2013.

[96] Kulbinder Gorcha, "Nokia- Losing Ground," Credit Suisse analyst report, May 4, 2004, via Thomson, accessed December 2013.

[97] Steinbock, The Nokia Revolution,p. 162.

[98] "Inside Gartner Top View," Gartner, September 24, 2004, via Gartner, accessed October 2013.

[99] Scott W. Searle, "Nokia," SG Cowen analyst report, June 4, 2002, via Thomson One, accessed December 2013.

[100] Kulbinder Gorcha, "Nokia- Losing Ground," Credit Suisse analyst report, May 4, 2004, via Thomson, accessed December 2013.

[101] "Inside Gartner Top View," Gartner, September 24, 2004, via Gartner, accessed October 2013.

[102] Matthew Miller, "CES 2010: Liveblogging the CES Keynote with OPK," *Nokia Experts,* January 8, 2010, http://nokiaexperts.com/ces-2010-liveblogging-ces-keynote-opk/, accessed December 2013.

[103] "The giant in the palm of your hand," *The Economist,* February 10, 2005, http://www.economist.com/node/3644543, accessed December 2013.

[104] Kulbinder Gorcha, "Nokia- Losing Ground," Credit Suisse analyst report, May 4, 2004, via Thomson, accessed December 2013.

[105] Dan Frommer, "Hottest Cellphones 2006," *Forbes*, December 8, 2006, http://www.forbes.com/2006/12/08/phones-music-internet-tech-cx_df_1208cellphones.html, accessed November 2013.

[106] "Nokia's Turnaround: The Giant in the Palm of your Hand," *The Economist,* February 10, 2005, via Factiva, accessed October 2013.

[107] "Nokia's Turnaround: The Giant in the Palm of your Hand," *The Economist,* February 10, 2005, via Factiva, accessed October 2013.

[108] "Market Share: Mobile Terminals Worldwide, 3Q05," Gartner, November 21, 2005, accessed October 2013.

[109] "Battling for the palm of your hand," *The Economist,* April 29, 2004, via Factica, accessed December 2013.

[110] Duncan Clark, "China's Handset Makers," China Business Guide 2005, p. 545, accessed December 2013.

[111] Dean Wilson, "Chinese mobile phone grey market will slow in 2011," TechEye, December 16, 2010, http://news.techeye.net/mobile/chinese-mobile-phone-grey-market-will-slow-in-2011

[112] "A Short History of the BlackBerry," BlackBerry Smartphones, http://www.bbscnw.com/a-short-history-of-the-blackberry.php, accessed December 2013.

[113] "Nokia's Turnaround: The Giant in the Palm of your Hand," *The Economist,* February 10, 2005, via Factiva, accessed October 2013.

[114] "Nokia's Turnaround: The Giant in the Palm of your Hand," *The Economist,* February 10, 2005, via Factiva, accessed October 2013.

[115] "Nokia's Turnaround: The Giant in the Palm of your Hand," *The Economist,* February 10, 2005, via Factiva, accessed October 2013.

[116] "Profiles in Innovation: Nokia – Honing IP to Business Needs," *WIPO,* February 2006, http://www.wipo.int/wipo_magazine/en/2006/01/article_0003.html, accessed December 2013.

[117] Om Malik, "The Next Monopoly," *CNN Money,* March 1, 2005, http://money.cnn.com/magazines/business2/business2_archive/2005/03/01/8253101/, accessed December 2013.

[118] Nokia- Our Innovation Record, http://inventwithnokia.nokia.com/why-invent-with-nokia/nokias-innovation-record, accessed December 2013.

[119] "Nokia's Turnaround: The Giant in the Palm of your Hand," *The Economist,* February 10, 2005, via Factiva, accessed October 2013.

[120] "Nokia's Turnaround: The Giant in the Palm of your Hand," *The Economist,* February 10, 2005, via Factiva, accessed October 2013.

[121] Mark Tran, "Nokia and Siemens Announce Joint Venture," *The Guardian,* June 19, 2006, http://www.theguardian.com/business/2006/jun/19/money.mobilephones, accessed November 2013.

[122] Mark Tran, "Nokia and Siemens Announce Joint Venture," *The Guardian,* June 19, 2006, http://www.theguardian.com/business/2006/jun/19/money.mobilephones, accessed November 2013.

[123] Nokia Pulls Out of CDMA," Phone Scoop, June 22, 2006, http://www.phonescoop.com/articles/article.php?a=1787, accessed November 2013.

[124] "Market shocked as Nokia abandons CDMA," *Telecom TV,* June 23, 2006, http://www.telecomtv.com/comspace_newsDetail.aspx?n=40169&id=e9381817-0593-417a-8639-c4c53e2a2a10, accessed October 2013.

[125] "Gartner Says Worldwide Mobile Phone Sales Increased 16 Per Cent in 2007," Gartner, February 27, 2008, http://www.gartner.com/newsroom/id/612207, accessed December 2013.

[126] Jo Best, "Nokia Tops in 2006 Smartphone Sales," *BusinessWeek,* February 27, 2007, http://www.businessweek.com/stories/2007-02-27/nokia-tops-in-2006-smartphone-salesbusinessweek-business-news-stock-market-and-financial-advice, accessed November 2013.

[127] Jo Best, "Nokia Tops in 2006 Smartphone Sales," *BusinessWeek,* February 27, 2007, http://www.businessweek.com/stories/2007-02-27/nokia-tops-in-2006-smartphone-salesbusinessweek-business-news-stock-market-and-financial-advice, accessed November 2013.

[128] Jo Best, "Nokia Tops in 2006 Smartphone Sales," *BusinessWeek,* February 27, 2007, http://www.businessweek.com/stories/2007-02-27/nokia-tops-in-2006-smartphone-salesbusinessweek-business-news-stock-market-and-financial-advice, accessed November 2013.

[129] Philip Elmer-DeWitt, "iPhone sales grew 245% in 2008 – Gartner," *CNN Money,* March 12, 2009, http://tech.fortune.cnn.com/2009/03/12/iphone-sales-grew-245-in-2008-gartner/, accessed December 2013.

[130] Fred Vogelstein, "And Then Steve Said, 'Let There Be an iPhone,'" *New York Times,* October 4, 2013, http://www.nytimes.com/2013/10/06/magazine/and-then-steve-said-let-there-be-an-iphone.html?pagewanted=all&_r=2&, accessed December 2013.

[131] Darcy Travlos, "The Significance of Ericsson's Departure from Handsets," *Forbes,* October 31, 2011, http://www.forbes.com/sites/darcytravlos/2011/10/31/the-significance-of-ericcsons-departure-from-handsets/print/, accessed December 2013.

[132] Darcy Travlos, "The Significance of Ericsson's Departure from Handsets," *Forbes,* October 31, 2011, http://www.forbes.com/sites/darcytravlos/2011/10/31/the-significance-of-ericcsons-departure-from-handsets/print/, accessed December 2013.

[133] Bruce Upbin, "The Next Billion; Nokia covers the globe, but its phones are a flop in the U.S.," *Forbes,* November 12, 2007, via Factiva, accessed October 2013.

[134] Bruce Upbin, "The Next Billion; Nokia covers the globe, but its phones are a flop in the U.S.," *Forbes,* November 12, 2007, via Factiva, accessed October 2013.

[135] Chris Nuttall, "Telecoms Tap into Silicon Valley Expertise," *Financial Times,* December 17, 2007, via Factiva, accessed December 2013.

[136] Chris Nuttall, "Telecoms Tap into Silicon Valley Expertise," *Financial Times,* December 17, 2007, via Factiva, accessed December 2013.

[137] Bruce Upbin, "The Next Billion; Nokia covers the globe, but its phones are a flop in the U.S.," *Forbes,* November 12, 2007, via Factiva, accessed October 2013.

[138] Bruce Upbin, "The Next Billion; Nokia covers the globe, but its phones are a flop in the U.S.," *Forbes,* November 12, 2007, via Factiva, accessed October 2013.

[139] Bruce Upbin, "The Next Billion; Nokia covers the globe, but its phones are a flop in the U.S.," *Forbes,* November 12, 2007, via Factiva, accessed October 2013.

[140] Bruce Upbin, "The Next Billion; Nokia covers the globe, but its phones are a flop in the U.S.," *Forbes,* November 12, 2007, via Factiva, accessed October 2013.

[141] Paul Snell, "Nokia begins outsourcing strategy," CIPS – Supply Management, August 10, 2007, http://www.supplymanagement.com/news/2007/nokia-begins-outsourcing-strategy/, accessed October 2013.

[142] "Smart mobile device shipments hit 118 million in 2007, up 53% on 2006," Canalys, http://www.canalys.com/newsroom/smart-mobile-device-shipments-hit-118-million-2007-53-2006, accessed December 2013.

[143] "Smart mobile device shipments hit 118 million in 2007, up 53% on 2006," Canalys, 2006, http://www.canalys.com/newsroom/smart-mobile-device-shipments-hit-118-million-2007-53-2006, accessed December 2013.

[144] Philip Elmer-DeWitt, "iPhone Sales Grew 245% in 2008 – Gartner," *CNN Money,* March 12, 2009, http://tech.fortune.cnn.com/2009/03/12/iphone-sales-grew-245-in-2008-gartner/, accessed October 2013.

[145] Mobile Phone Lifecycles, GSM Association, http://www.gsma.com/publicpolicy/wp-content/uploads/2012/03/environmobilelifecycles.pdf, accessed December 2013.

[146] Mary Branscombe, "Who's making money from your smartphone?" August 16, 2011, *TechRadar,* http://www.techradar.com/us/news/phone-and-communications/mobile-phones/who-s-making-money-from-your-smartphone-992247, accessed December 2013.

[147] Bruce Upbin, "The Next Billion; Nokia covers the globe, but its phones are a flop in the U.S.," *Forbes,* November 12, 2007, via Factiva, accessed October 2013.

[148] Gary Arlen, Limar Schafman, "Opportunities in Mobile Marketing and Advertising 2008-2009," Simba Information, via MarketResearch.com, accessed October 2013.

[149] Gary Arlen, Limar Schafman, "Opportunities in Mobile Marketing and Advertising 2008-2009," Simba Information, via MarketResearch.com, accessed October 2013.

[150] John Paczkowski, "Nokia Announces Symbianese Liberation Army," *AllThingsD,* June 24, 2008, http://allthingsd.com/20080624/symbianese-liberation-army/, accessed December 2013.

[151] John Paczkowski, "Nokia Announces Symbianese Liberation Army," *AllThingsD,* June 24, 2008, http://allthingsd.com/20080624/symbianese-liberation-army/, accessed December 2013.

[152] Marguerite Reardon, "Nokia's success tied to emerging markets," *CNET*, January 24, 2008, http://news.cnet.com/8301-10784_3-9857676-7.html, accessed December 2013.

[153] Bruce Upbin, "The Next Billion; Nokia covers the globe, but its phones are a flop in the U.S.," *Forbes,* November 12, 2007, via Factiva, accessed October 2013.

[154] Kevin C. Tofel, "When Will Nokia's Smartphone Transition End," *GigaOm*, June 27, 2010, http://gigaom.com/2010/06/27/when-will-nokias-smartphone-transition-end/, accessed October 2013.

[155] Communities Dominate Brands: Business and Marketing Challenges for the 21st Century, April 1, 2010, http://communities-dominate.blogs.com/brands/2010/03/final-2009-mobile-phone-market-numbers-as-all-have-reported-we-have-big-news.html, accessed December 2013.

[156] Ina Fried, "Microsoft exec Elop named Nokia CEO," *CNET,* September 9, 2010, http://news.cnet.com/8301-13860_3-20016032-56.html, accessed October 2013.

[157] "Stephen Elop to Join Nokia as President and CEO," The Official Nokia Blog, September 10, 2013, http://conversations.nokia.com/2010/09/10/stephen-elop-to-join-nokia-as-president-and-ceo/, accessed October 2013.

[158] Kevin J. O'Brien, "Nokia's New Chief Faces Culture of Complacency," *New York Times,* September 26, 2010, http://www.nytimes.com/2010/09/27/technology/27nokia.html?pagewanted=all&_r=0, accessed October 2013.

[159] Kevin J. O'Brien, "Nokia's New Chief Faces Culture of Complacency," *New York Times,* September 26, 2010, http://www.nytimes.com/2010/09/27/technology/27nokia.html?pagewanted=all&_r=0, accessed October 2013.

[160] Kevin J. O'Brien, "Nokia's New Chief Faces Culture of Complacency," *New York Times,* September 26, 2010, http://www.nytimes.com/2010/09/27/technology/27nokia.html?pagewanted=all&_r=0, accessed October 2013.

[161] Chris Siegler, "Nokia CEO Stephen Elop rallies troops in brutally honest 'burning platform' memo? (update: it's real!)," *Engadget,* February 8, 2011, http://www.engadget.com/2011/02/08/nokia-ceo-stephen-elop-rallies-troops-in-brutally-honest-burnin/, accessed October 2013

[162] Chris Siegler, "Nokia CEO Stephen Elop rallies troops in brutally honest 'burning platform' memo? (update: it's real!)," *Engadget,* February 8, 2011, http://www.engadget.com/2011/02/08/nokia-ceo-stephen-elop-rallies-troops-in-brutally-honest-burnin/, accessed October 2013

[163] Chris Siegler, "Nokia CEO Stephen Elop rallies troops in brutally honest 'burning platform' memo? (update: it's real!)," Engadget, February 8, 2011, http://www.engadget.com/2011/02/08/nokia-ceo-stephen-elop-rallies-troops-in-brutally-honest-burnin/, accessed October 2013.

[164] Jason Ankeny, "R&D costs could force mobile OS consolidation," Fierce Developer, August 3, 2009, http://www.fiercedeveloper.com/story/r-d-costs-could-force-mobile-os-consolidation/2009-08-03, accessed December 2013.

[165] Peter Borrows, "Stephen Elop's Nokia Adventure," *BusinessWeek* June 2, 2011, http://www.businessweek.com/magazine/content/11_24/b4232056703101.htm, accessed October 2013.

[166] Kevin Tofel, "Nokia's Troubles Deepen: As Devs Flee Platform, Handset Maker Cuts Forecast," *GigaOm,* June 15, 2012, http://gigaom.com/2010/06/15/3-reasons-nokia-isnt-attracting-more-mobile-developers/, accessed November 2013.

[167] Ralph-Gordon Jahns, "6 Major Trends Shaping the Smartphone app Ecosystem in 2010," *Research2Guidance*, October 4, 2010, http://www.research2guidance.com/6-major-trends-shaping-the-smartphone-app-ecosystem-in-2010/, accessed December 2013.

[168] "Nokia Ovi Store app total tops 30,000," *Mobile World Live,* January 31, 2011, http://www.mobileworldlive.com/nokia-ovi-store-app-total-tops-30-000, accessed December 2013.

[169] Christopher Null, "The end of Symbian: Nokia ships last handset with the mobile OS," *PCWorld,* June 14, 2013, http://www.pcworld.com/article/2042071/the-end-of-symbian-nokia-ships-last-handset-with-the-mobile-os.html, accessed December 2013.

[170] Peter Borrows, "Stephen Elop's Nokia Adventure," *BusinessWeek* June 2, 2011, http://www.businessweek.com/magazine/content/11_24/b4232056703101.htm, accessed October 2013.

[171] Peter Borrows, "Stephen Elop's Nokia Adventure," *BusinessWeek* June 2, 2011, http://www.businessweek.com/magazine/content/11_24/b4232056703101.htm, accessed October 2013.

[172] Peter Borrows, "Stephen Elop's Nokia Adventure," *BusinessWeek* June 2, 2011, http://www.businessweek.com/magazine/content/11_24/b4232056703101.htm, accessed October 2013.

[173] Larry Dignan, "Nokia's Elop: Android is killing us in China, Europe," *ZDNet,* May 31, 2011, http://www.zdnet.com/blog/btl/nokias-elop-android-is-killing-us-in-china-europe/49665, October 2013.

[174] "Nokia's Elop: Android is killing us in China, Europe," ZDNet, May 31, 2011, http://www.zdnet.com/blog/btl/nokias-elop-android-is-killing-us-in-china-europe/49665, December 2013.

[175] Peter Borrows, "Stephen Elop's Nokia Adventure," *BusinessWeek*, June 2, 2011, http://www.businessweek.com/magazine/content/11_24/b4232056703101.htm, accessed October 2013.

[176] Ina Fried, "Exclusive: Nokia to Exit Symbian, Low-End Phone Businesses in North America," *All Things D,* August 9, 2011, http://allthingsd.com/20110809/exclusive-nokia-to-exit-symbian-low-end-phone-businesses-in-north-america/, accessed November 2013.

[177] John D. Stoll, "Nokia Late to the Silicon Valley Party," *Wall Street Journal,* June 21, 2012, http://online.wsj.com/news/articles/SB10001424052702304441404577478912407116358, accessed December 2013.

[178] "Nokia to exit Japan cellphone market by August: report," *Reuters,* July 1, 2011, http://www.reuters.com/article/2011/07/01/us-nokia-idUSTRE7604A620110701, accessed October 2013.

[179] Gang Qiu, "China Emerges as a Smartphone Power," SERI Quarterly, 2013, accessed December 2013.

[180] Dan Graziano, "Nokia to cut 1,000 jobs from Finnish phone plant," *BGR,* March 22, 2012, http://bgr.com/2012/03/22/nokia-to-cut-1000-jobs-from-finnish-phone-plant/, accessed October 2013.

[181] Zach Epstein, "Nokia sells Vertu, shuffles execs, announces plans to cut 10,000 more jobs," *BGR,* June 14, 2012, http://bgr.com/2012/06/14/nokia-layoffs-2012-vertu-restructuring/, accessed October 2013.

[182] "Jorma Ollila resigns as Nokia chairman after 13 years," *Bangkok Post,* May 4, 2012, http://www.bangkokpost.com/tech/computer/291683/jorma-ollila-resigns-as-nokia-chairman-after-13-years, accessed December 2013.

[183] Farhad Manjoo, "R.I.P. Windows," *Slate,* September 3, 2013, http://www.slate.com/articles/technology/technology/2013/09/microsoft_nokia_deal_a_great_idea_that_came_too_late_and_killed_windows.html, accessed November 2013.

[184] "Nokia Stock Rise Catches Out Short Sellers," *Wall Street Journal,* September 3, 2013, http://blogs.wsj.com/moneybeat/2013/09/03/nokia-stock-soars-on-microsoft-deal/, accessed November 2013.

[185] Seth Fiegerman, "Microsoft Stock Drops 5% After Nokia Deal," *Mashable,* September 3, 2013, http://mashable.com/2013/09/03/microsoft-nokia-stock/, accessed December 2013.