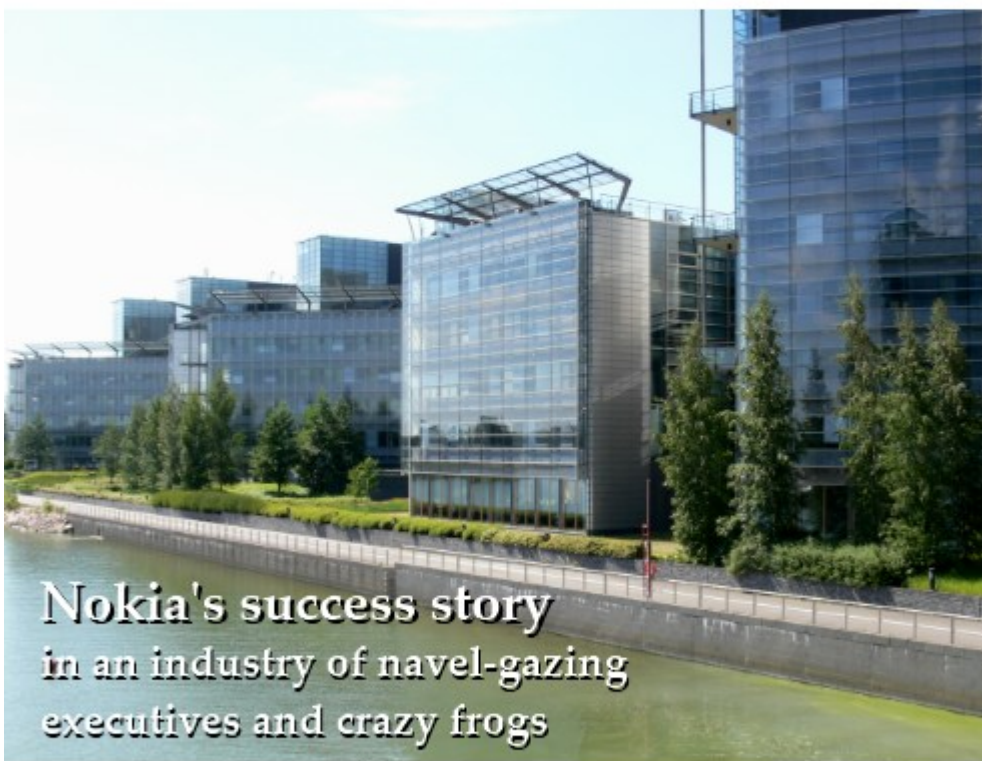


# BEHIND THE SCREEN

Ari Hakkarainen



**Nokia's success story**  
in an industry of navel-gazing  
executives and crazy frogs

**Klaava**

# Behind the Screen

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# 1 Nokia's Secret Code

On a bright summer night in Copenhagen, Denmark, three men were eating pizza and sipping beer at a restaurant. They were colleagues, working for Finland's telecommunications authority. Although the men were enjoying their dinner, their thoughts drifted away to the following day's agenda. The meeting would be about the future of mobile communications.

The year was 1984. Mobile phones were installed in cars, but not carried in a pocket or even in a bag. The pocket-sized communication device of the day was the pager. It was a small device, slightly larger than a Zippo lighter, that would beep when it received a message via radio waves. Some pagers could only display the phone number where the recipient of the paging should call, while advanced models could display a brief message as well. The system was simple for operators but troublesome for users. The person who wanted to page someone had to dial the operator and ask a customer service representative to send the message. When the recipient got the message on the pager, they had to find a telephone, dial the given number, and hope that someone would pick up the phone.

The three men at the restaurant – Matti Makkonen, Juhani Tapiola and Seppo Tiainen – were working with an analogue mobile phone technology known as Nordic Mobile Telephone (NMT), which had rapidly gained users in the Nordic countries.

The men were in Copenhagen to attend a meeting in which European operators and equipment manufacturers were going to envision how telecommunication services would develop in the digital age.

At the restaurant table, a new idea about using the mobile phone as a pager was thrown in the air. Perhaps in the future, the owners of digital phones could receive pager messages without having to carry actual pagers anymore. What an excellent idea!

Then, Matti Makkonen got even a better idea. What if the sender could type the message on the mobile phone, which would then transmit it directly to the recipient? If a mobile phone allowed both sending and receiving of messages, then messages could be relayed via the network automatically, without any human intervention. Then, the three men discovered a problem. How would the messages be keyed into the phone? Juhani Tapiola pulled out his HP (Hewlett-Packard) handheld device so they could estimate the space required by a keyboard. They believed that a large enough keypad could be built for text entry even in a small mobile phone. In addition to the pager application, the team discovered another useful application for the messaging technology: meetings. During a meeting, it is difficult to exchange confidential ideas with a colleague. If both colleagues had a mobile phone, they could send and receive messages silently without disturbing other people at the meeting.

It took time before Makkonen and his colleagues saw their idea become reality. The vision survived through numerous GSM specification committees and became a standard called Short Message Service (SMS). In its simplest form, a text message of up to 160 characters is composed and sent from one mobile

phone to another.

Two-way text messaging wasn't a common feature on mobile phones until 1994, when Nokia introduced the first product whose designers had thought of text messaging. Many early adopters of the new technology sent or received their first text messages on this product – the Nokia 2110. Encouraged by positive experiences from text messaging, Nokia enhanced the standard. Nokia's specification was called Smart Messaging. It allowed embedding, for example, an audio clip into the text message. Soon after that, the ringtone business was conceived, along with other services using text messages as their transmission technology.

In 2008, Matti Makkonen received the Economist Innovation Award for his work on text messaging. After the night in Copenhagen, Makkonen continued working for Finland's telecommunications authority, which eventually became TeliaSonera, where he rose to the position of Vice President. In 2000–2003, he worked for Nokia, heading the operator services business of Nokia Networks. In 2003–2005, he was the CEO of Finnet, a Finnish telecommunications group, before becoming a consultant.

Although Nokia was among the first companies to realize the potential of text messaging, the new communication method alone didn't make Nokia the world's most popular mobile phone brand.

Ever since the former forest, car tyre, cable and tissue industry conglomerate transformed into a shining star of the mobile communications revolution, journalists, entrepreneurs and industry analysts have tried to discover the ingredients behind Nokia's success. Even the MIT economist Bengt Holmström, who joined Nokia's Board in 1999, wanted to know

what was behind the company's rapid rise to the top of the world. He asked CEO Jorma Ollila, "What's your secret code? Because you've got to have something."

Jorma Ollila told Fortune magazine, "We went on for an hour or two on what it could be." The company, at the height of its growth peak, had just become the world's biggest mobile phone manufacturer. Yet, the executives were as intrigued as anyone else, trying to identify the grand scheme of things behind Nokia's success. In the end, Ollila's response was, "There is no secret code. But it is a good way of asking the question."

Instead of only one, four key factors for Nokia's success can be identified: excellent timing, sharp focus on core business, relentless cost control, and consistent brand-building.

After struggling for years about the company's future direction, Nokia's largest owners, two Finnish banks, finally came to an agreement about the company's new strategy in 1991. The starting point was to focus the diversified enterprise's resources on a few select industries. The Board could have chosen cable manufacturing, TV sets, car tyres or personal computers, among many other businesses. But, the Board decided to focus on mobile telecommunications. Nokia's other businesses were established industries where winning new market share would have been costly. Mobile communications, however, was a relatively new industry that offered vast growth opportunities. Even new contenders could stand a chance in creating a profitable business in the global market.

Nokia was one of the major proponents of the GSM standard, holding a valuable portfolio of technology patents required to build phones and network equipment. The company was one of the first to realize the inevitable transformation of mobile phones from high-end business tools to mass-market electronics. Mobile

phones would become personal objects that reflected the owner's personality and style. Design played an important role when changeable phone covers and colourful accessories were introduced. From early on, Nokia saw the bigger picture that also included services. The company introduced a feature that allowed ringtones to be embedded into text messages for further personalizing mobile phones. The launch of the Ovi Internet service in 2007 was well-timed for the era of social networking.

Not only was Nokia's timing perfect when it selected telecommunications as the company's core business, but also when it decided to invest in emerging markets. Nokia's rapid growth during the 1990s took place primarily in Europe, in certain markets in Southeast Asia, and in North America. After the dot-com bubble burst in 2000, the competition heated up as the South Korean companies Samsung and LG entered the market. Nokia lost market share, but recovered to become even stronger with a new line of multimedia smartphones, branded as Nseries.

Rapid economic growth in China opened up new opportunities in the early 2000s. In a well-timed move, Nokia was among the first manufacturers to build a factory in China to serve the local market as well as to export products. Nokia had created a tightly-knit web of component suppliers and subcontractors who had to follow their master to new territories. Nokia began cranking out products in China at a cost level no one else could match. The same procedure was repeated in India once the vast country's market opened up and was ready for the volumes required by Nokia's manufacturing machine.

When Jorma Ollila started as the CEO, Nokia didn't instantly focus on mobile phones alone. The company had baggage from the past that Ollila and the Board had agreed to dissolve. The

mobile phone and network business, however, grew so rapidly that resources and operations couldn't keep up with the pace. In 1995, logistical problems led to a financial crisis, reinforcing the urgency to align strategies and processes towards a single goal: mobile telecommunications.

The results were amazing. By 1998, Nokia took the number one spot from Motorola as the world's largest mobile phone manufacturer. While its original competitors have stumbled, Nokia has been able to keep its number one position against the South Korean contenders Samsung and LG. In 1998, Nokia became the darling of the stock market, the American market and the media. The joy lasted until investors pulled out their money from Internet e-commerce start-ups and telecommunications companies that had bet their own and other people's money on 3G mobile network licenses. The global technology industry was driven into a slump.

In the early 2000s, in the middle of a downturn, Nokia's management was tempted to deviate from the core business. The company ventured into set-top boxes, DSL modems, Internet security appliances, enterprise software, digital TV tuners, digital photo frames, machine-to-machine appliances, and software business, to name just a few initiatives. Nevertheless, time after time, product by product, Nokia returned to its core business, mobile phones and networks, and abandoned other businesses.

In 2001, when Nokia launched the S60 initiative in order to compete against Microsoft in software, many questioned its motives. Was Nokia planning to turn into a software company? No, it wasn't. The top management positioned the software operation as a strategic move to support the hardware business. Nokia wanted to keep the core software components in its own

hands without having to rely on companies like Microsoft, which was more than willing to extend its influence from the PC industry to telecommunications. The same underlying strategy is driving Nokia's Ovi Internet services. Ovi provides services such as navigation, photo sharing, games and e-mail for PC and mobile phone users. Although Nokia expects to generate considerable revenues from Ovi services in the future, the management is keeping its eye on the ball. The initial task for Ovi is to support the sales of mobile phones.

In its quest for focus and growth, Nokia eventually detached the Networks division from the rest of the organization. The network equipment industry never fully recovered from the 3G licensing and acquisitions mayhem, driving large corporations to mergers or bankruptcy. Alcatel and Lucent merged. Nortel filed for protection from debtors in 2009. Nokia found a partner for the networks division from Siemens. CEO Simon Beresford-Wylie opened the Nokia Siemens Networks joint venture for business in 2007.

Strict cost control provides vital competitive edge even in the high-tech industry. After the logistics crisis of 1995, Nokia was forced to renew its manufacturing, sourcing and design processes. More importantly, the crisis made the management redefine the company's key businesses and core competencies. The choice of mobile telecommunications was reinforced, and cost-efficient manufacturing was determined as the company's key competence. Nokia has stayed true to the cost control strategy, swiftly reacting to market changes. Right-sizing the organization according to the cost structure and constantly looking for ways to minimize costs in components and outsourced services are on the management's agenda even during the good times. Nokia is widely considered to have the

industry's lowest manufacturing costs per product.

Nokia has developed a cluster of component suppliers that it keeps physically, mentally and logistically close to its manufacturing processes. There have been times when market analysts have been able to forecast Nokia's sales by tracking the financial reports of its largest suppliers. Many suppliers are so closely tied to Nokia that they rise and fall with their powerful client. Unlike its competitors, Nokia can make high-volume products at a lower cost than dedicated contract manufacturers.

Having the industry's most cost-efficient logistics and manufacturing processes is a moving target. Nokia is constantly looking for a location where it might set up the next factory. While a whole new industrial campus built around a Nokia plant is a welcomed sign of prosperity for locals in Romania or India, it troubles people in communities where Nokia has left empty factory buildings, like Bochum in Germany, or Kilo in Espoo, Finland.

Having lower product manufacturing costs than competitors ensures competitive advantage in two ways. Nokia can record higher margins in its balance sheet, or it can sell products below competitors' prices. Either way, customers get quality products at competitive prices from Nokia. For instance, in India even low-income workers can afford a Nokia phone. It may be an entry-level model with a black-and-white screen, torch and dust-proof shell, but it's good for calls and text messages. In mature markets, Nokia has to compete with other means. But even there, the mass-market tends to favour lower-priced products, if the features, design and brand image are roughly equal between competing products.

Practically everyone from a schoolchild in Iceland to a grandma in Manila knows what Nokia is. The company is

marketing its products and employing people practically all over the world. At the end of 2009, only about half of Nokia's 123,000 employees were working in Europe. About 19 per cent in the Asia-Pacific region (excluding China), 12 per cent in China, 11 per cent in Latin America, 6 per cent in North America and 3 per cent in the Middle East and Africa.

Originating from a small country, Nokia has had to be open to the ways business is conducted in different parts of the world. It would be pretty much a waste of time to try to introduce a purely Finnish way of working to cultures with a long and mighty history like China or the UK. There are, however, two things that Nokia is holding on to across the world: brand and corporate values.

The Nokia Values consist of four components. Engaging You addresses the importance of getting the corporate culture close to customers and employees. Achieving Together is about collaboration at work and sharing the results with colleagues. Passion for Innovation values the courage to leap into the – occasionally uncertain – future. Very Human is about being a caring company that respects people and the environment.

In many enterprises, these kind of high-level values tend to remain abstract. Employees may find it difficult to apply the values to their daily work. Additionally, even though the values may sound right, they simply can't be implemented in every single culture. For instance, in the Nordic countries, it's common for managers and employees to work together in order to find a solution to a given task. The learning and results can be shared. In other cultures, for instance in some parts of Asia, managers and employees can't work together because that's the way the society works. The respect for long-term customer and peer relationships, on the other hand, is often more valued in Asia

than in Western cultures. It is extremely difficult for any company, big or small, to change these traditions.

At the end, there is one thing that can be exactly the same across the world – the Nokia brand. Since the early 1990s, when Anssi Vanjoki nailed down the brand strategy for Nokia, the company has been acknowledged as the most trusted and valued brand multiple times in many markets.

Brand values are often measured by surveys. If surveys are regarded as the right way to measure brand value, Nokia is doing pretty well. In 2009, 1,500 business executives were asked to put prominent global brands in their favourite order. Nokia was ranked fifth. India's most trusted brand in 2008 was Nokia. Incidentally, Nokia's market share in India has been fluctuating between 40 and 60 per cent during recent years. The brand has such a strong image that many consumers consider the mobile phone and Nokia to be the same thing.

It took almost ten years for Nokia to build a global brand, which is a relatively short time in a business where physical goods have to be moved around the world. Nonetheless, it's a fragile asset. When Nokia closed a factory in Bochum, Germany, leaving 2,300 people unemployed, the negative impact was reflected on the financial results. Nokia was regarded as a stable and trusted corporation in Germany, but suddenly leaving personnel on their own caused a nationwide movement against the company. Demonstrations were held, and nationwide anti-Nokia campaigns were organized. Even though Nokia agreed to pay extra compensations later, its sales dropped in Germany, directly affecting the bottom line and damaging the brand image.

In Germany, Nokia had to pay a hefty price for determinedly following its key strategy. Since it could manufacture products at

a lower cost in another location, in this case Romania, it made the move sooner rather than later. At Nokia's home turf in Finland, however, the company's status is even more sensitive because it is so deeply married to the society.

With a population 5.3 million, the fairly small country of Finland faces unique challenges when dealing with the massive global corporation. Nokia's revenues exceed the annual state budget of Finland. Nokia alone pays 19 per cent of the nation's taxes collected from corporations and other institutions. Nokia accounts for 46 per cent of all private sector R&D investments in Finland. It directly employs 23,000 taxpaying citizens in Finland. The second-largest corporation in Finland, Stora Enso, has less than half as many employees.

Even though Nokia hired former Prime Minister Esko Aho as its head lobbyist in 2008, Aho's job in Finland involves fairly peaceful behind-the-scenes work. Because of the company's economic power, it remains firmly in the minds of the society's decision-makers without the top management having to rave about its needs too loudly.

For young Finns, Nokia is a dream employer. Those who get a job, get to work in an international setting. They learn how a big organization works and how big business is conducted, which are valuable assets if they decide to pursue a career outside of Nokia. On the flip side, frequent cost-management measures keep employees constantly worried about their jobs. At times, team members have to reapply for their position, making elbow tactics a more important value than team work or the Nokia Values. In a rare incident, managers and experts at Nokia's Tampere and Oulu offices went on strike in 2007 because they felt mistreated regarding annual bonuses.

Nokia is also a dream customer for many component

suppliers, as well as a dream client for many service providers. Once an enterprise gets its first deal and proves itself to Nokia, the growth opportunities seem endless. They are, but on the flip side, Nokia can cut the cord in an instant. As the first signs of the global financial crisis hit Nokia in 2008, it sent a letter to service providers telling them to cut prices by 15 per cent. Another letter was sent to contract manufacturers, letting them know that their services wouldn't be needed anymore, because Nokia would now assemble more products at its own factories.

Nokia is a dream corporation for any nation that wants to collect taxes from a respected enterprise employing both highly-educated knowledge workers and uneducated labour. In the Finnish society, the flip side is that with so much welfare at stake at a national level, Nokia tends to get what it wants. A mere rumour hinting at Nokia's unfounded plans to move its head office out of Finland has been used as a lobbying weapon. Years before the rumour broke out, Nokia had requested an amendment to Finnish privacy legislation that would allow it monitor the activities of its employees on the company network. In 2009, the so-called Lex Nokia was passed by the Parliament, giving institutions limited rights to inspect e-mail and Internet traffic on their networks.

The Nokia executives, managers and employees who created the valuable brand, cost-efficient manufacturing machinery, focused business strategy and go-to-market timing, are no longer responsible for the business. During his CEO tenure, Jorma Ollila assembled a coherent and efficient management team, referred to as his dream team. Matti Alahuhta, Pekka Ala-Pietilä, Sari Baldauf, Mikko Heikkonen, Olli-Pekka Kallasvuo, Yrjö Neuvo, Veli Sundbäck and Anssi Vanjoki were among the executives who held top positions at Nokia during the 1990s.

Ollila had planned to hand over the CEO position to Pekka Ala-Pietilä in the early 2000s, but a sharp downturn in the technology industry and major internal restructuring convinced Ollila to hold on to his job. His trusted management team, however, wanted something else and was largely disbanded by 2005.

Olli-Pekka Kallasvuori started as Nokia's CEO in 2006. By 2010, he had assembled a new management team comprised of Esko Aho (Corporate Relations and Responsibility), Timo Ihamuotila (Chief Financial Officer), Mary McDowell (Mobile Phones), Tero Ojanperä (Services), Niklas Savander (Markets), Alberto Torres (Smartphones), Anssi Vanjoki (Mobile Solutions), Juha Äkräs (Human Resources), and Kai Öistämö (Mobile Devices).

While the top management is laying out the strategy and overseeing its implementation, product designers and sales representatives carry out their daily work with the customer in mind. Nokia has developed fine-grained methods and tools that product designers and marketers can use to identify customer groups matching a particular product.

Nokia favours customer grouping, or segmentation, models where people are divided into categories by their lifestyle rather than their wealth, cultural background, age or gender. In their book called *Mobile Usability*, Johanna Järnström and Harri Kiljander presented a segmentation model widely adopted at Nokia. Users categorized to the Balancers customer segment are being targeted with products belonging to the Expression product category. Balancers are people who have a mobile phone because they need it, but it is not top priority for them. They are likely to purchase a basic Expression category product. The customer segment called Controllers is a group that prefers products that are efficient, productive and reliable. Nokia

designs the Classic phone models with Controllers in mind. The customer group Experiencers appreciates individuality and design. The Fashion product category is targeted at them. Impressors is a user segment that doesn't mind showing off their status in a variety of ways, including with a mobile phone. They are prime customers for the products in the Premium category.

Grouping customers into categories based on their needs and behaviour isn't pulled out of thin air. Some customer segmentation models have been created by interviewing people, while others have been drawn on a blackboard during a brainstorming session between marketers and designers. Some customer groups are discovered only by visiting people at their homes.

Jan Chipchase is a British designer who is working for Nokia – as he likes to call it – as a corporate anthropologist. His job in the Nokia Design organization is to research human behaviour at a very practical level. He is mingling with people from Manhattan to remote rural villages in Ghana and Mongolia, studying their lives. Typically, Jan Chipchase interviews ordinary people at their homes, workplaces, or at a café on a street corner. He can take hundreds of pictures of people's homes and belongings with his digital camera. He complements the images with notes before transmitting the information to the design team working in a comfortable air-conditioned office in London, Dallas, Helsinki, or somewhere else.

Features like a built-in torch and dust-proof casing on a low-cost phone model were small things that contributed to Nokia's phenomenal success in markets like India. When Chipchase made a field trip to the Dharavi slum in Mumbai, he managed to talk via an interpreter to a family who already owned a mobile phone. The father used the phone primarily for running errands

for his employer. At the time of the visit, it happened to be the monsoon season. Chipchase noted that the father held the phone in a plastic bag, not only to protect it from rain, but because there was nowhere else to lay it down. Floor space was minimal and occasionally flooded with rain or sewage. The family used to hang their belongings on the wall in order to save space and to keep things dry.

It is such a simple idea. Why not design a phone with a small hook in it? This, among many other ideas may eventually appear in a commercial product, but it's a long shot. Tens, maybe hundreds of experts will be dealing with the details of a product that could be the home of the new feature. If the components required for the hook prove to be costly, or if it slows down the manufacturing process or takes too much space in the product box, the hook may never get to see the light of day.

Rather than acquiring a proper floor or furniture where to store their belongings, the family in Mumbai had decided to invest in a mobile phone the moment they could afford it. Allen Hammond of the World Resources Institute has studied how the poor in developing countries spend their money. He discovered that if income increases, for instance, from USD 1 to USD 4 a day, telecommunications gets the biggest share of the money, instead of health, housing or education. "What people are voting for with their pocketbooks, as soon as they have more money and even before their basic needs are met, is telecommunications," Hammond said.

A mobile phone is not only a communication aid, but also a business tool. Farmers and fishers can negotiate a better price for their products because they have access to market prices. A local dealer is now unable to pay below market price to people who previously had limited access to information. Jan Chipchase also

discovered an ingenious mobile banking system in Uganda. A worker in Kampala who had a mobile phone could wire money back to his home village via a so-called phone lady. The worker would purchase a pre-paid phone card, for instance, for five dollars, but wouldn't use it to top up his own account. Instead, he would call the phone lady, the owner of a small business with a mobile phone, and would give her the code. She would add the credit to her pre-paid account. Then, the phone lady would pass on five dollars in cash, minus her commission, to the intended recipient.

Nokia has succeeded in emerging markets not only because it has been able to produce the right products at the right price, but because it has been able to create efficient sales channels even in large countries. India is one example of a market where the telecommunications service providers don't control the distribution of mobile phones. Nokia has been able to penetrate the vast country's every nook by building an extensive sales network with retail chains and local merchants. Nokia has the marketing resources to raise brand awareness to a level at which consumers are likely recall Nokia when they shop for their next phone.

The US represents another type of market where, after initial success, Nokia has practically disappeared into oblivion. In the US, the largest mobile network operators outweigh Nokia in revenue and personnel. They are more powerful than Nokia on their home soil, but above all, they control the sales channels. If Nokia doesn't please the operators, as it hasn't during the 2000s, the operators will sell another manufacturer's mobile phones to subscribers. CEO Olli-Pekka Kallasvuo has taken the recovery of Nokia's former glory in the US as his personal mission.

A new era began for Nokia when Olli-Pekka Kallasvuo

started as the CEO in 2006. Nokia was no longer competing against other mobile phone manufacturers or traditional network equipments companies. Microsoft wanted its share of the smartphone market and RIM Blackberry had won the hearts of people who needed always-on access to their e-mail. Nokia shipped the largest number of digital cameras, GPS receivers and portable MP3 music players in the world, because these features were integrated into many phone models. Also Apple ventured into the telecommunications industry. Its phenomenally successful iPhone forced all other manufacturers to follow Apple with their own touch-sensitive display concepts. Nokia regarded Apple a niche player, ridiculed by traditional telecom engineers. The company became truly worried when Google entered the telecommunications industry.

In 2007, Google introduced Android, an open source software platform targeted at smartphones. Android was built on Linux, which Google made available for free along with the source code and software development tools. Nokia responded by taking over all assets of Symbian Ltd, whose software Nokia was using for smartphones. Nokia announced that it would gradually make also Symbian an open source, free software. Google's ambitions in mobile phones reached beyond the device software. Its objective was to convince smartphone owners to access online services, such as e-mail (Gmail), online documents (Google Docs) and maps (Google Maps and Earth) already popular among PC users. The services were integrated into the Android phone software, making it a tempting package for operators and phone manufacturers.

In addition to investing in Symbian software, Nokia began investing heavily in its own Internet service suite Ovi. The company's mission was to bring useful Internet services like

maps, e-mail, games and social networking to mobile phones and PCs. The owner of a Nokia phone wouldn't need to access Google's services at all.

Nokia's brand power, focused business strategy, cost-effective manufacturing and market timing are still keeping the company competitive. Nokia survived the self-created financial crisis of 1995 caused by rapid growth. It suffered during the technology sector slump in 2001–2003, but came out of it even stronger and entered new markets in Asia. The global financial crisis hit Nokia in 2008, when consumers delayed purchases of new mobile devices. The management swiftly began to adjust Nokia's organization to the new situation.

Reshuffling the organization, however, didn't help. In June 2010, Nokia's share price had dropped to the lowest level in ten years. The Apple iPhone and Google Android smartphones were eating Nokia's market share in high-end product category and Samsung phones in low-end product category. Kallasvuo had to issue a profit warning for weaker than expected financial results for the second quarter 2010.

The man behind the successful Nseries smartphones, Anssi Vanjoki, was assigned a tough job; reviving Nokia's dull and lagging product range. His first action was to replace Symbian software with Linux operating system in smartphones.

In a large corporation, it can be difficult to pinpoint who, where and when made an initiative that kicked off a wildly successful project. Still, there is a human behind each key innovation and strategy. Someone made the decision to choose telecommunications, someone came up with the original idea for the hit product N95, someone thought of the possibilities of text messages, someone created the vision for the Nokia Communicator smartphone, and someone laid out the concept

for the Ovi Internet services.

Here are the true origins of Nokia's secret code. They are in the determined, number-minded Jorma Ollila, in the pragmatic strategist Olli-Pekka Kallasvuo, in the anthropologist Jan Chipchase, in the creator of the first smartphone Reijo Paajanen, in the developer of the Snake game Taneli Armanto, and in someone who invented the internal antenna for the mobile phone.

As Nokia's Udo Szabo, who has been designing the Ovi services for humans instead of virtual people, put it, "It's all about real people and real places."

## 4 Inventing the Ultimate Network Computer

Scott McNealy, the CEO of Sun Microsystems, had been praising his company, joking about competitors' products, and making fun of Bill Gates for fifteen minutes. In his unique and entertaining style he had warmed up the audience. Then he remembered why he was on the stage, facing more than a thousand people. He was giving a keynote speech at the second JavaOne Conference in San Francisco in 1997. Although Sun was known as a computer hardware company, the conference was about software, programming, and new ideas for the networked world.

McNealy pulled out a handheld device from his pocket, raised it in front of his eyes and opened the clamshell unit. He was talking about Java, a programming language Sun had developed to make it easier to run the same application on different types of computers. McNealy envisioned how Java applications could also be run on small portable devices like the Nokia 9000 Communicator he was holding. McNealy turned the Communicator towards the audience. In the large conference room, only the front row could see the computer-like keyboard and wide display of the unit. He introduced some features, like e-mail, Internet access, fax and mobile phone, all built into the device. But what he really wanted to point out was that it was

possible for any programmer to write applications for the new mobile device.

It was the early days of smartphones – so early that it was hard for the audience to digest McNealy’s vision of mobile phones as computers carried around in the pocket, allowing users to install useful applications and access the Internet wirelessly. GSM phones had just become mass-market products in Europe in the pioneering countries of mobile communications, but analogue networks and voice-only mobile phones were still the standard in many countries. At the time, sending text messages was a novelty many people had never even tried out and downloadable ringtones were yet to be invented.

The Nokia 9000 Communicator Scott McNealy was showing off at the conference had been created in the mid-1990s by a team of engineers in Tampere, Finland. The vision for the product went far beyond that day’s mobile phones or portable notebook computers. Its functionality was superior to any other handheld device. When the unit was closed, its front panel looked like an ordinary Nokia phone. A small display, menu keys and numeric keypad allowed anyone familiar with a mobile phone to make a phone call instantly. The unit, however, was bulky. When the clamshell-like unit was opened, the reason for its weight and size was revealed. Inside the unit, a small computer with a tiny keyboard and a wide black-and-white screen was awaiting for instructions.

After the original Communicator, Nokia has introduced a number of sleeker, smaller and more attractive models. Yet, the product concept, envisioned in 1994, has stayed the same until models like the Nokia E90 Communicator, which the company released in 2008.

## The Making of a Smartphone

At the JavaOne Conference of 1997, it was Mikko Terho's turn to take the stage. He was a keynote speaker of a conference track that focused on new technologies.

Terho started his speech by showing the Nokia 9000 Communicator to the audience. Boldly, he announced that the Communicator was the ultimate network computer. The device came with all the communication technologies a modern computer intended for Internet use required. Only File Transfer Protocol (FTP), a technology for copying files over the Internet, was missing, but not for long, he vowed.

Terho's claim about Nokia having created a portable and handheld network computer was preceded by years of research and development work executed at the Nokia Mobile Data Unit in Tampere, Finland.

Reijo Paaanen headed the new organization established at the beginning of 1993. It was his responsibility to set up the Mobile Data Unit, develop the products, and specify markets for them. As Vice President, he reported directly to Pekka Ala-Pietilä, President of Nokia Mobile Phones. Paaanen and Ala-Pietilä had agreed that the mission was to create a new category of mobile phones for Nokia. It wouldn't be just another range of phones solely targeted at mobile voice communication. Instead, the products would bring information such as e-mail messages and documents to personnel who needed to stay online in order to work also when out of the office.

Nokia was betting heavily on the GSM mobile network technology. The company had already been successful in analogue mobile phones, but it had made a strategic decision to invest in the digital GSM network that was expected to become a

global standard. In its wisdom, the committee that oversaw the GSM specification work included data transfer capability in the standard. A separate, but similarly visionary decision was to include text messaging in the GSM standard.

Paajanen and his new team members began looking for technologies and products they could use. At the time, Mobitex was one of the few commercial wireless network technologies that allowed users to send and receive data. In fact, Mobitex was designed for data transmission alone, not for phone calls. The technology had been developed by the Swedish telecommunications company Ericsson with the objective of providing a highly reliable communication channel with fast response times for enterprise and government applications. Typical applications were two-way messaging and the broadcasting of urgent information to user devices. For instance, the UK Police service and the US Congress have implemented wireless communications systems based on Mobitex. Although Paajanen didn't consider using Mobitex as the wireless technology – GSM data had already been chosen – his team studied the wireless applications used in Mobitex networks.

Early on, Paajanen made two key decisions. First, the product had to be an all-in-one device that could be used for communication and computing without having to attach any external modules, wires, or other peripherals to it. Second, he decided to create working prototype products to test the vision. The problem was that no one knew how the new GSM data technology would work. The team had to find a way to master the technology – and fast. The solution was to create an intermediate product intended for wireless data communication. Another challenge was the business ecosystem. For the newly established team focused on engineering, service providers,

distribution channels and other business partners were not the strongest area of expertise. They decided to locate someone with expertise in the enterprise business.

One of Paajanen's new recruits, Mikko Terho, came up with an idea of creating a wireless modem for notebook PCs. Terho is an energetic man with strong visions about how to apply new technologies to commercial products. His idea was to build a modem into an adapter card that would fit into the PCMCIA slot of a notebook computer. The Personal Computer Memory Card International Association (PCMCIA) had an interface specification for attaching small, low-power peripherals to portable computers. Terho's product, eventually named the DTP-2, was a wireless modem that could connect a notebook PC to the GSM network, allowing the user to transmit information such as e-mail messages via a mobile network.

The wireless DTP-2 modem was one of the three initial components that led Paajanen's team on the right track in their quest for the ultimate network computer. The other two components were a GSM phone and the HP 200LX handheld organizer.

In 1994, Hewlett Packard (HP) introduced a small, battery-powered handheld PC, called the HP 200LX. It was slightly smaller than a paperback book, but it could run applications developed for Microsoft's MS-DOS operating system. The device was a powerful piece of hardware at the time – it could even run the Lotus 1-2-3 spreadsheet program. Entering information into spreadsheets and other documents was easy because the device featured a keyboard with dedicated keys for letters and numbers. The HP 200LX had an infrared transmitter that made it possible to copy data between a PC and other handheld devices. The unit only required two AA batteries. The HP 200LX also had

a PCMCIA card slot where the Nokia wireless modem could be installed. All and all, HP had built an amazing handheld PC before the days of Palm organizers, personal digital assistants (PDAs), or Pocket PCs. All it lacked was the ability to access e-mail or other resources via a network.

Most importantly, Paajanen now had the essential components for creating a concept device that could be tested in real life situations. The test system configuration consisted of the HP 200LX handheld device, a Nokia GSM data card inserted into the handheld's PCMCIA slot, a data cable whose one end was hooked to the card and the other end to a Nokia mobile phone. In those days, GSM phones didn't have built-in data modems.

Although the concept product consisted of three separate modules, it made it possible to simulate the user experience of having only one piece of hardware. The HP 200LX was held in the hand. The mobile phone was stashed away in a hip holster attached to a trouser belt. The data cable connected the handheld to the mobile phone, which was communicating with the mobile network. The cable, however, prevented free movement, constantly reminding the team of the final goal: a compact, all-in-one unit. However, the setup allowed the team to test mobile computing at airports, cafés and shopping centres, as well as on public transport, like trains.

The team learned valuable lessons from the tests. They were now convinced that the product had to be an all-in-one unit. Everything needed to type notes, send and receive messages and faxes or make phone calls had to be achieved without any extra gear. In addition, the team realized that the device would have to be so easy to use and optimized for communications that it would allow the user to read an e-mail message in less than two minutes – measured from the moment the device was whipped

out from a pocket or briefcase to the moment when the message was displayed on the screen.

The two-minute rule proved to be a crucial finding. It eventually guided product development and helped designers to focus on the all-important user experience. For instance, the concept testers had realized that business travellers wanted to check their e-mail quickly just before boarding on a flight. Often, travellers had to stand in line for a long time at the gate. In that situation, pulling a laptop out of a briefcase wasn't a tempting option, because it would mean waiting for the notebook PC to start, launching a communication program, dialling up to a network service number, logging in, and waiting for messages to download. This took so long it was practically impossible without a table or a chair.

HP saw the potential of the new concept. Paajanen's Mobile Data Unit and HP's handheld division in Singapore started cooperating. They aimed at creating a product for businesspeople who needed access to corporate IT systems while out of the office. The outcome was very much like the concept Paajanen's team had envisioned. HP commercialized a product that consisted of the HP 200LX handheld PC, Nokia's GSM modem, and the Nokia 2110 mobile phone. Since the GSM modem was a PCMCIA card, it could be installed inside the HP 200LX unit. But getting the Nokia 2110 mobile phone into the same unit was a tougher challenge.

Someone realized that the whole top side of the HP handheld was vacant space. The mobile phone could be attached onto the cover without preventing access to the keyboard and screen. A custom case was built to keep the handheld and the phone together. The result was like a thick and heavy sandwich with hinges – the handheld device was at the bottom and the mobile

phone at the top.

In February 1996, HP and Nokia announced the new jointly developed product, HP OmniGo 700LX Communicator Plus. It was made available in Europe and Asia. Kheng Joo Khaw, General Manager of HP's Asia-Pacific Personal Computer Division was excited: "It's a simple idea, but a tremendous breakthrough. [The] enabling joint technology defines a new category of handheld devices: the personal mobile business centre." How right he was. HP and Nokia were pioneering a new generation of mobile devices that would later materialize in products such as the RIM Blackberry. The product allowed a travelling professional to access e-mail, send and receive text messages and faxes, browse and copy files from the Internet, update the calendar and contacts, and run MS-DOS applications. The integration between the two units wasn't tight. For instance, the palmtop PC and the phone had their own batteries.

The glory of the new product was short-lived. Only a month after the launch of the HP OmniGo 700LX, Nokia announced its own breakthrough product, the Nokia 9000 Communicator – the ultimate network computer.

The timing of the two product announcements was a coincidence. Nokia's joint project with HP had taken much longer than Paajanen had anticipated, but his own team had been able to keep its schedule and was ready to announce the product as planned. The product specification and launch plans for the Nokia 9000 Communicator had made been made two years earlier.

In 1994, Paajanen had decided to build the Communicator on three cornerstones: the Internet, the two-minute rule, and hardware keyboard.

At the time, it was a bold attempt to create a handheld mobile

device capable of accessing the Internet. After all, this was before Netscape made history by launching off the dot-com era, before Windows PCs even had built-in software for Internet access, and before mobile phones were connected to data networks at all. Not to mention the design requirements regarding unit size, battery life, durability and network coverage. Inevitably, cost was an important factor, but since the Communicator was targeted at business professionals, it wasn't a top priority.

When Nokia was making its fundamental design decisions concerning the Communicator, the software primarily used to access information on the Internet was Gopher. This software allowed users equipped with text-based computer terminals to search and retrieve documents from other computers connected to the Internet. The documents and folders were displayed as lines of text. Users could proceed from a folder to a document in hierarchical manner. Gopher was the most user-friendly tool available for navigating the Internet at the time, and it greatly affected the Communicator's design. The design team favoured having a few long lines of text on the display rather than many short lines of text. The resolution of the wide display, 640 horizontal and 200 vertical pixels, was higher than the display of many smartphones available today.

The original GSM specification assumed that data communication between a mobile phone and a network was based on a dial-up connection. The maximum speed was 9,600 bits per second (bps). Anyone who has used a dial-up Internet connection knows that it can be tedious to establish a connection and wait for the information to drip down to the computer at that speed. It was, however, sufficient for text-only e-mail messages. For example, when Communicator users wanted to access their e-mail, they would dial the service provider's phone

number. Once the line was open, e-mail, Internet and other services were available. Because the Communicator was an all-in-one integrated product, the process was made easier for the user by automatically connecting the device to the network whenever new e-mail messages were requested.

As in other electronic products, even the best hardware cannot perform anything without a piece of software that makes the whole thing tick. Paajanen's development team chose the GEOS operating system developed by Geoworks to manage the Communicator's inner life. GEOS was a multitasking operating system developed for resource-limited PCs and portable devices. For instance, HP and other manufacturers of handheld devices used GEOS in their battery-powered products. Geoworks also tried to break into the PC market, challenging Microsoft, but without success. Nokia invested USD 7.5 million in Geoworks in 1995, which bought it a seat on the company's Board.

GEOS didn't provide touch screen functionality at the time when many companies were planning to introduce a handheld organizer featuring touch screen and handwriting recognition technology.

For example, Apple had introduced a handheld organizer, the Newton, with touch-sensitive display back in 1993. Apple had high ambitions of creating a new market for portable devices, and it invested heavily in the development of the Newton. The highly hyped and anticipated product was a fl op. Apple had promised to provide handwriting recognition in the Newton, but failed to deliver satisfactory technology. The fairly large and bulky handheld organizer wasn't acclaimed by reviewers or users.

Eventually in 1996 a subsidiary of the modem manufacturer USRobotics managed to create a handheld product that could

interpret handwriting and was a pleasure to use. The product was called Palm Pilot. It had taken years from Palm's small development team to design a reliable handwriting technology. The downside was that users had to learn a new writing technique because Palm Pilot recognized handwriting only when a character was drawn as one consistent line in a pattern specified by Palm.

Although touch-sensitive screens and handwriting recognition were the hot technologies of the day, the Communicator development team decided to design the product around a keyboard. Paajanen knew they were betting against a major trend, but two reasons convinced him to go for the keyboard. First, the product was targeted at professionals who were used to typing on a computer keyboard. Second, as he hired more talent into the development team, most recruits regarded keyboard as the best method of text input. Many of the new employees were graduates of the University of Tampere and had grown up with computers, displays and keyboards.

The hardware inside the Nokia 9000 Communicator revealed that it truly was a miniature computer. It was powered by the Intel 386 microprocessor, familiar from PC hardware that had revolutionized computing a decade earlier. Intel continued to manufacture the 386 processor exceptionally long, until 2006. One processor, however, wasn't enough for the Communicator. A second processor dedicated to communication with cellular networks was ticking inside the unit as well. The Communicator had 8 megabytes (MB) of memory space for applications and data.

The clamshell structure of the unit required new materials. For instance, the hinge that kept the keyboard and display modules together was subject to heavy wear and tear over time.

The design team even approached the Finnish Air Force for advice on materials designed for heavy duty use.

In addition to the keyboard located inside the unit and the numeric keypad on the cover, a third keypad had been designed to the product as well. Programmable keys around the display had originally been reserved for gaming. On the left side of the display, up and down navigation keys made it easier to scroll through information on the screen. On the right side, application-specific keys were available for menu navigation.

Three years after Paajanen had established the new organization, and two years after the Communicator specifications had been frozen, the product was launched. The big moment for the Mobile Data Unit was in March 1996. Over 100 R&D people who were still feverishly working on the project were anxious to see how the Communicator would be received by the public. The world's biggest information technology show, CeBIT, held annually in Hannover, Germany, had been chosen as the venue of the announcement. Publicity campaigns had been prepared. Expectations were high among Nokia's management.

The product made such an impact at the show that even a last minute leak couldn't spoil the party. Accidentally, someone had attached campaign posters on the sides of Hannover buses a day before the official announcement. The Nokia 9000 Communicator was the talk of the CeBIT 1996 show. It won Byte magazine's Best of Show award as the most important and innovative product at CeBIT.

First units were available in retail stores before the end of 1996. In January 1997, PC World magazine reviewed three pocket-sized mobile devices designed for messaging. In addition to the Communicator, two other products available in the US, the AT&T PocketNet and Mitsubishi MobileAccess smartphones

were evaluated. PC World found the Communicator superior to the AT&T and Mitsubishi phones in e-mail features. Especially, the reviewers appreciated the Communicator's large screen and keyboard. The capability to send, receive, and view faxes was a unique feature. The initial price of the product, about USD 1,800,



raised some eyebrows. In addition, the Communicator had a feature that still can't be found in all mobile phones – a Web browser that allowed users to view Web pages, even ones that contained graphics.

## Silent Electronic Revolution at the Parliament

When the Nokia 9000 Communicator arrived in retail stores in late 1996, Olli Mustajärvi, Head of Information and Communications Technology (ICT) at the Parliament of Finland decided to pick up two units. The Nokia 2110 mobile phone was already widely used by the Members of Parliament (MPs), but Mustajärvi wanted to find out if the Communicator was suitable for mobile computing, as Nokia had claimed.

The 200 Finnish MPs are busy people. They spend little time in their offices at the Parliament building located at the centre of Helsinki. MPs spend most of their waking hours attending committee meetings where they prepare reports and proposals on new laws, attending plenary meetings or meeting citizens

and interest groups. As mobile phones became mass-market products, MPs quickly adopted the technology. Especially, they were drawn to the non-intrusive text messaging capability of GSM phones.

The Parliament's central IT department provided an enterprise e-mail, calendar and document management system called Teamware Office for MPs. They could access the system from in-house PCs and also from home PCs via a dial-up modem connection. Since the Nokia 9000 Communicator was designed for network access via dial-up connections, the Parliament's data centre had the main infrastructure components in place for providing services to mobile devices.

However, MPs considered the first Communicator model somewhat bulky and heavy, and preferred to keep their Nokia 2110 phones. Even loyal Communicator users admitted that the unit could have been smaller, but they turned it into a joke, affectionately calling the device a "brick". The unit weighed 397 grams with a battery. Its dimensions were 173 × 64 × 38 mm.

Meanwhile the Communicator's father, Reijo Paajanen, had taken on other duties at Nokia. His former team had analyzed feedback on the original model and was developing the successor to the ultimate network computer. In late 1998, the Nokia 9110 Communicator arrived in retail stores. The new product closely followed the original concept, but offered plenty of improvements in hardware and software. Updated, enhanced applications running on GEOS were familiar to Communicator users. The best news was the reduced size and weight of the unit, which still accommodated a highly user-friendly keyboard and wide screen. Two totally new features – at least in the mobile phone industry – had been implemented. A digital camera module could be attached to the unit. Pictures taken with the

camera were saved on a removable memory card. The images could be transmitted right away via e-mail. The digital imaging features were so much ahead of their time that they went practically unnoticed by the public, but taught Nokia a lot about camera phone technology and related user needs.

In early 2001, when the financial situation in the Internet and telecommunications sectors had just fallen from euphoric heights to graveyard lows, Nokia introduced the first Communicator with a colour display, the Nokia 9210 Communicator. Its size, form, and overall hardware design were similar to its predecessor, the Nokia 9110 Communicator. The looks were deceiving, because the new model had gone through a total redesign. The 9210 was built on the Symbian operating system (OS), which was known as EPOC at the time. In addition to the colour display, the Nokia 9210 Communicator offered two important new features. It allowed users to view documents created using Microsoft Word, Excel and PowerPoint, and made it easier for independent software developers to design applications for the device. The new Communicator could run Java applications, and programmers familiar with Symbian OS could write business, messaging, entertainment and other applications for the device.

Now, all the pieces fell into place for Olli Mustajärvi at the Parliament. He had the back-office technology ready at the Parliament data centre. The Teamware e-mail, calendar and document management system could be accessed using the Nokia 9210 Communicator thanks to a piece of software that integrated the back-office system with mobile devices. Also, data transmission was faster with the 9210 model than with its predecessors. A new technology called High Speed Circuit Switched Data (HSCSD) enabled data rates of up to 43 kbps,

which was five times faster than that of the original Communicator.

MPs had realized that they were modern knowledge workers, who were constantly attending meetings or on the move. Mustajärvi was convinced they could benefit from the new mobile technologies. Things started rolling when Yrjö Neuvo, Nokia's CTO, met Riitta Uosukainen, Speaker of the Parliament, on a flight. Neuvo managed to convince Uosukainen about how the Communicator would ease the hectic work of MPs, allowing them to communicate with colleagues, the media and other interest groups on the go. An always-on portable communication device could keep MPs and their personal assistants constantly up-to-date on urgent issues.

In late 2001, Mustajärvi started a pilot project with a group of MPs. The purpose was to find out which mobile computing services MPs needed. With consultants invited to help out in the project, Mustajärvi conducted a survey among MPs. Real-time access to e-mail and calendar were regarded as the top priorities, along with text messaging and real-time news. The pilot project team created three alternative configurations for the participating MPs. The first alternative was a Compaq iPAQ PDA, a handheld organizer popular among corporate executives. The second alternative was a Fujitsu or Compaq Evo mini-notebook PC, complemented with a GSM phone. The phone was hooked up to the notebook via an infrared connection. The setup allowed using the phone as a wireless modem via the notebook. The third alternative was the new Nokia 9210 Communicator.

The Communicator was the all-round favourite among pilot users. Although those MPs who had a mini-laptop favoured the larger keyboard, even they appreciated the Communicator

concept where everything was packed into a single, easily portable unit. There were no wires or external modules that had to be carried around, because the pocket-sized device already had everything in it. There was, however, a small additional item everyone had to carry. The SecureID card, a gadget the size of a credit card used for authenticating users logging into the Parliament network from remote locations.

Once the pilot group of about 20 MPs had used the mobile services for three months, they were so used to the new solution that many had given up traditional pen-and-paper calendars. E-mail, instant communication via text messages, fax and a shared calendar between MPs and their personal assistants were considered the most valuable services. Some MPs had even written speeches and memos during a flight, while others had developed so deep an affection for text messaging and shared calendar access that they were shocked when the first telephone bills from service providers arrived.

The Parliament's IT department had developed an application that made it possible for MPs to monitor remotely the proceedings of a plenary session. Web pages tailored for the Communicator allowed MPs to follow the session at the Parliament café without missing a vote or a speaking opportunity. One of the first users of the Communicator at the Parliament was the young MP Jyrki Katainen. Particularly after the 2007 elections, when he was appointed Minister of Finance, he has been spotted frequently in front of TV cameras with his Communicator in hand.

Minister Katainen was also the Leader of the National Coalition Party when a high-level text messaging scandal broke in Finland in early 2008. Foreign Minister Ilkka Kanerva, a member of the party that Katainen led, had a reputation of

flirting with women via text messages. This time, Kanerva had stepped into a trap. A striptease dancer and sex movie actress, Johanna Tukiainen, had managed to contact the Foreign Minister via a text message. Immediately after she had successfully established a text message relationship with the Foreign Minister, she sold the story to the yellow press. Eventually, the messages were published. The juicy topic raised so much interest in Finland and abroad that Katainen had to take a stand. He promptly fired Kanerva from the minister's post. When the incident was over, a number of worried citizens wanted to know if the Foreign Minister had used his mobile phone subscription paid by the state for his private affairs. Another group of citizens worried about an individual's privacy if personal text messages could be published in the press.

Nokia has continuously designed new models for the Communicator product line. The Nokia 9500 Communicator was the first product featuring support for wireless local area network (WLAN). The Nokia 9300 Communicator was considerably smaller than the earlier Communicator models. The Nokia E90 was a redesign of the inside, because the operating system powering the unit was changed to Nokia's S60 software platform.

When the Parliament's pilot project ended in 2002, Communicators were issued to each MP who wanted one. As Nokia introduced new models, the Parliament's IT department tested them to find out if they were compatible with the software that integrated the office system with mobile devices. Now, MPs on the go were able to access e-mail, get the latest schedule updates from the personal assistant, immediately read breaking news and use custom applications, for instance, to see what was going on in a plenary session. By 2006, 88 per cent of all MPs

were using Communicators.

Just as mobile communications have changed the way corporate employees work and spend their time in meetings, MPs quickly adopted the new tools. Jyrki Kasvi, an MP and Doctor of Technology, once had 1,500 messages in his Communicator's inbox. "I don't understand how we coped without the Communicator. It is creating needs you didn't have before," Kasvi said. At a Parliament plenary session, he had witnessed how an MP wrote his speech on the Communicator, stepped onto the podium and delivered his speech while reading it from the screen of the handheld device.

Still, in the old Parliament building, traditional phone booths are in active use. When MPs want to have a private conversation, they can step into a phone booth and close the door. The phone call, however, is dialled using a Communicator.

## After 9/11, Blackberry Conquered Capitol Hill

The terrorist attacks into the United States on 11 September 2001 were the final sign for the Congress Administration. It was time to implement a new communications system that could deliver messages to key people regardless of where they happened to be.

A centralized mobile e-mail system, Blackberry Enterprise Server, had been tried out already earlier in a large-scale pilot project at the Congress Administration. During 2001 and 2002, the system was put into use. RIM Blackberry handheld devices were issued to each member of the Congress. Even though many of them already had pagers or mobile phones, the new devices introduced a communication method that had previously been available only on computers. The new system delivered new e-

mail messages to the pocket-sized devices automatically.

When Barack Obama was elected as President of the United States, he was asked to give up the device for security reasons. His response was that the security officials would have to “pry it out of my hands. It’s just one tool among a number of tools that I’m trying to use, to break out of the bubble, to make sure that people can still reach me,” Barack Obama told CNN. He kept his Blackberry, even though he had to accept security-restricted settings that allowed him to e-mail a limited group of people only.

Headquartered in Waterloo, Ontario, the Canadian company Research In Motion (RIM) has been creating wireless solutions for large organizations for decades. The Blackberry messaging solution consists of two main components, a handheld device and messaging software running on a server computer. Although the mobile device is the concrete object that users see, feel and hold, the real power of the system lies in the server computers running the software. The server software monitors user mailboxes, and whenever it detects a new message, it transmits the message directly to the mailbox owner’s Blackberry device. Blackberry users enjoy the experience because they don’t have to do anything to receive new messages to the handheld device. Wherever the users go, the system will find their Blackberry devices, as long as the devices are connected to a mobile network.

In the mid-1990s, when Nokia’s Reijo Paajanen had already decided to base the Communicator on GSM technology instead of the wireless Mobitex network, RIM was working with the telecommunications company Ericsson on the manufacture of two-way pagers for the Mobitex network. Launched in 1999, the first Blackberry handheld device was designed for e-mail use

alone. It looked like a large pager, with a small black-and-white screen and an alphabetic keyboard. It allowed users to send and receive e-mail, but offered no mobile phone communication capability at all.

Whereas Nokia built the all-in-one Communicator product, RIM built a product that was designed for only one thing: e-mail. Later, RIM integrated mobile phone hardware and software into the product, effectively turning Blackberry into a smartphone. With its large colour screen, QWERTY keyboard, automatic e-mail delivery, Web browser, downloadable Java applications and mobile phone functionality, the Blackberry became a success among business professionals.

The Nokia Communicator had found its customer base in Europe, while Blackberry has primarily been a success in the US. In 2008, the market research company Canalys estimated that 10 per cent of Nokia's unit sales consisted of smartphones. Considering Nokia's sales volumes, this meant tens of millions of smartphones every year. Although Communicator sales don't equal the sales of Nokia's best-selling smartphones, like the N95 or E71, it does have its loyal business customer base.

Blackberry, however, crossed the chasm from the business e-mail market to the consumer smartphone market. Some Blackberry users became so addicted to the always-on e-mail system that they called their devices "crackberries". Canalys reported that Blackberry devices had become the third biggest brand in the worldwide smartphone market. In October 2008, Blackberry's share of the smartphone market was 15.2 per cent against Nokia's 38.9 per cent and Apple iPhone's 17.3 per cent. In the US, Blackberry had become the third popular mobile phone, after Apple iPhone and Motorola RAZR.

Although Blackberry made a strong impact with its e-mail

feature, the Nokia Communicator was a superior product until the mid-2000s. For more than five years, Nokia had a window of opportunity to enter the enterprise market and become a major supplier of mobile devices and solutions for large organizations. It already had the brand as a device manufacturer and its telecommunications network division was building infrastructure solutions for operators on all continents, but apart from a few mobile phones designed for business use, Nokia didn't offer products or services to enterprise customers. Nokia Ventures Organization (NVO) had a division manufacturing and marketing Internet security appliances for enterprises, but it was a relatively small business.

As the Finnish Parliament had discovered, they had to find a system integrator who could make the Communicator and the Parliament's information system work together. Olli Mustajärvi had discovered a small software company that created the required piece of software connecting Communicators to the Parliament's e-mail system and other information resources.

Finally in 2004, Nokia decided to seize the opportunity. It established a dedicated business unit to serve enterprise customers. Jorma Ollila hired Mary McDowell from Hewlett-Packard to lead the new business division that would invest in enterprise products, services and solutions. Senior Vice President McDowell started at Nokia at the beginning of 2004. She had about 2,000 employees designing Communicator smartphones and a range of Internet security appliances.

Although McDowell had to start with a very limited selection of marketable products or services, she was optimistic. She realized that Nokia had the opportunity and resources to capture a vast new market. She expected the new Enterprise Solutions to produce five per cent of Nokia's revenues by the end

of 2004. She was planning to break even in 2005. While the potential for growth was enormous, so were the challenges. Even for a global brand, entering a new market wasn't easy. In 2007, Enterprise Solutions was losing more and more money, slipping further away from ever breaking even.

Nokia Enterprise Solutions managed to produce a number of successful smartphones, such as the E61 and the E65, but it struggled with solutions that would connect the devices to corporate IT systems. In 2005, the division licensed RIM's Blackberry e-mail software and customized it to run on the Nokia 9300 Communicator. Nokia managed to sign up AT&T Wireless to market the Nokia 9300 Communicator in the US. In addition to the Blackberry software, e-mail solutions developed by Visto, Seven Networks and Good Technology had been customized for Nokia's E-series smartphones.

Four alternative e-mail solutions wasn't enough. McDowell's team had been preparing its own e-mail solution as well. Enterprise Solutions introduced Nokia Business Centre, an e-mail solution for the corporate market, in September 2005. There was more to come. Only five months later, McDowell acquired one of the established companies in mobile e-mail business, Intellisync. Nokia paid USD 430 million in cash for the company. Customer deals were signed, new systems were installed, but by the end of 2008, Nokia decided to discontinue the Intellisync product line for enterprise customers. Instead, it integrated Intellisync as an e-mail solution in the Ovi service, which was targeted at consumers.

McDowell's time to start up a new business, however, had run out already in 2007. Kallasvuo decided to put an end to the loss-making Enterprise Solutions as he reorganized the corporation into fewer business divisions. The Eseries product

line would continue, but system-level solutions would be left to business partners like Microsoft and IBM. Nokia's venture into the enterprise market as a solutions provider had ended.

Former MP and Minister Osmo Soininvaara hadn't even heard of Blackberry or Intellisync when he packed his gear for a bicycle tour that started from Tallinn, Estonia, and ended in Nice, France. He carried everything he needed on the trip on his bicycle and in his backpack. He had found the Nokia Communicator so handy that he decided to rely on the device for all his communications during the trip. During his one month journey in May–June 2008, Soininvaara wrote a daily blog to the Finnish newspaper *Helsingin Sanomat*. Soininvaara used the Communicator as his laptop PC, digital camera, and GPS navigator. Also his blog, later published as a book, was written using the Communicator.

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