Comparative Analysis of the Technology Strategy in the High-tech Industry: A Case Study of Apple and Nokia

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Abstract. In today's world, as technology iterates and technology companies become more competitive, the technology strategies employed by companies will undoubtedly have a huge impact on the competition for market share. This paper presents a comparative case study of the rise and fall of Nokia and Apple technology companies in the mobile device industry, focusing on their different approaches to technology strategy. A good technology strategy can give a technology company a huge competitive advantage in the market. This paper examines the embodiment of these technological strategies in products and their impact on the marketplace. This paper finds that the technological advantages applied to the products positively impact the company's growth. It also finds that companies will receive rewards in terms of market share if they maintain their innovation ability and focus on consumer needs. As two giants in the history and present of mobile device companies, a study of their technology strategies is informative for contemporary technology companies.

Keywords: Technology strategy; innovation; high-tech industry.

1. Introduction

The competition for technology companies in today's society is particularly fierce, with new products being launched, new companies being formed and old ones going out of business every year. How to remain competitive in this environment is particularly important. Apple, a well-known success case and market leader among technology companies in the last decade, has expanded rapidly in recent years. In January 2022 Apple's share price exceeded $3 trillion in market value for the first time in its history, making it the world's fifth-largest economy after Germany [1]. By contrast, despite receiving the same compliments over a decade ago, Nokia eventually suffered a sustained decline until it could not compete in the smartphone market. Marketing is one of the key factors in the success of these companies [2]. Besides that, Apple's product development strategy and technical innovation are also integral parts of its success. In today's world, with the increasing pace of technological iteration, it is a matter of concern how business executives can deploy the right technologies and strategies to gain an advantage in the competition for market dominance [3].

This paper compares Apple and Nokia's technology strategies related to innovative products over the last decade. Through this paper, technology companies can learn from the different performances of Apple and Nokia in their technology strategies. At the same time, Apple should also take action to address its current problems to avoid repeating the same mistakes. This paper uses multiple data sources to analyze how Apple uses the right technology strategy to maintain its market dominance compared to Nokia. The information collected includes published academic studies, journals, and official annual company reports for the past few years. This paper explores how business leaders gain an edge in the struggle for market dominance through technology strategy. And study the impact of technological innovations and product lines on market share.

Specifically, this paper examines the technology strategies used by companies in the mobile device industry, led by Apple and Nokia, and gains a broader understanding of how Apple companies currently maintain the ability to innovate to secure a competitive advantage from a technological perspective. Firstly, the two companies are introduced. Secondly, a comparative analysis is made in terms of innovation capacity, product line, and market size respectively. Ultimately, the study's significance to academia and practitioners, its limits, and future research objectives are all discussed in the conclusion.

2. Case Description

Steve Jobs and three partners established Apple on April 1, 1976, to create and commercialize Wozniak's Apple I personal computer. It began as a company selling personal computers, from which emerged one of the first mass-produced microcomputers. It was the fourth-biggest provider of personal computers in terms of volume, the second-largest producer of mobile phones, and the largest corporation in the world in terms of market valuation by June 2022. The most notable changes occurred between 1985 and 1997. Jobs departed at this point due to issues with the company's expensive products and executive power battles. After Jobs returned to the company in 1997, Apple adopted a series of strategies to steer the near-bankruptcy company back to profitability. The iPhone 4, which debuted in San Francisco in 2010, was positively received worldwide, with over 600,000 pre-orders in 24 hours, and despite some issues regarding its new antenna design, it was an important step toward Apple's global fame. Apple's market capitalization reached a record $624 billion in 2012 thanks to the increase in share price, which broke Microsoft's previous record for market capitalization not adjusted for inflation. At the same time, Apple launched products such as the Apple Watch and iPad, the MacBook, and in 2016 announced that there were one billion Apple devices in use worldwide. After this, Apple becomes one of the most successful companies in history. Meanwhile, Nokia is surprisingly similar to Apple in the respects above.

Finnish multinational firm Nokia is involved in consumer electronics, information technology, and telecommunications. It was founded in 1865 by Fredrik Idestam and started as a pulp mill that had long been connected to rubber and computers before changing its business model. For ten years from 1998, Nokia was the world's biggest supplier of mobile phones. Nevertheless, in the late 2000s, Nokia suffered several mismanagement choices that resulted in a sharp decrease in its market share for mobile phones. Following the announcement in 2013 that its launch and devices division would be sold to Microsoft, Nokia concentrated on networked devices that utilized the Nokia network. In 2016, Microsoft gave HMD the rights to manufacture feature phones under the Nokia brand, and subsequently, in 2017 the company launched three Nokia smartphones, although this was not a Nokia investment and they did contribute to the creation of the new devices. A 2019 research showed that, in some respects, Nokia phones are superior to those of its rivals, such as the latest version of Android. Despite Nokia's good progress in these areas, there is no doubt that it is no longer a match for Apple in mobile phones and other related markets.

Nokia's collapse from smartphone supremacy stems largely from its poor technological capabilities compared to its competitors (Apple) and the failure of its leadership to see the coming disruptive innovation, especially the iPhone from Apple [4]. At the same time, Nokia's blind confidence and ignorance of the market and consumer demands were the main reasons for its downfall [5]. This paper will try to analyze how Apple can use the right technology strategy to stay ahead of the competition and avoid the same failure as Nokia.

3. Case Study of Apple and Nokia's Technology Strategies

To define the different technology strategies of Apple and Nokia, the following section will compare them in terms of innovative capabilities, product line, market size, and share. And tried to use the case of the decline of Nokia's mobile device industry to advise Apple on its future development.

3.1 Innovative Capabilities

Innovation is the process of turning technology advancements into marketable products or processes in a cutthroat industry [6]. The design of the fourth-generation Apple mobile phones gives Apple an innovative brand image. The quality of Apple's products is superior in both appearance and substance. Evidence from questionnaires in Jakarta and Indonesia shows that product development, namely innovation, and policies to maintain reputation are essential for all businesses, which is closely related to consumer satisfaction [7]. As product innovation is one of Apple's fundamental

skills [8], some of the key technologies resulting from the innovative capacity will be presented. It will also be compared with Nokia in these areas.

Firstly, the iPhone's condensed menu of buttons saves users from cluttering menus and icons. The clean and intuitive iOS interface satisfies consumers' preference for mobile Internet devices that are relatively easy to use. Secondly, although the iPhone was not the first device to support multi-touch technology, Apple was a pioneer in the popularization of this technology, which was a major gamble in user interface design [9]. However, Nokia was not very impressed with it and believed it would be difficult for such a phone to gain popularity [10]. It was this mistake in decision-making that led to Nokia's downfall in the market, while the iPhone redefined the mobile phone and became a huge success.

After the release of Apple's exclusive operating system iOS, the other traditional companies rushed to develop software features that were completely new to them. But Nokia only improved its proprietary operating system Symbian to maintain sustainable profits. Both internal and external developers believed Symbian was difficult to use. But as Nokia tried to use Linux in its mobile devices, Nokia's senior executives felt it still had a competitive edge [11]. But consumers' reaction to Nokia's phones has been increasingly negative, with a severe lack of innovation compared to other companies products such as Apple.

Nokia is driven by the business case, and it uses numbers to prove what is good. Whereas Apple is driven by engineers and is pure technology. As a result, Nokia's technical capabilities are lower compared to Apple. Many executives did not have a technical background. The Symbian OS user interface was a very antiquated system and Nokia couldn't get away from this. Technicians had to keep tinkering with it but failed to address the core issues [11]. From a technological innovation perspective, Apple's success and Nokia's demise seem inevitable.

3.2 Product Line

In terms of product lines, Apple has created a new market space where Nokia is clearly at a disadvantage. Apple seamlessly combines the mobile phone with the portable music and internet communication sectors [12]. In 2010 Apple launched the iPad, a line of tablet computers positioned between the iPhone and the MacBook. Apple's ambition was to replace paper in the office, education, and reading with the iPad. At first, the iPad's ARM architecture made it incompatible with regular MacBook programs. But later on, with Apple's M1 chip, a solution seemed to be born. iPads are now widely used in the field of education. Some primary schools even use it as a learning tool for their students [13]. The iPad has demonstrated its power in many areas, not only in education but also as a terminal that can control interactive devices and has changed the world of work [14].

Meanwhile, Apple launched the Apple Watch in 2015 and it has quickly become the best-selling wearable device. By 2020, it is estimated that more than 100,000,000 people will be using the Apple Watch [15]. From the first generation to the eighth generation in 2022, the Apple Watch keeps enriching its functions with each iteration. The Apple Watch is more than just an ordinary electronic watch. It is a wearable device that's impacting multiple fields. For example, recent studies have shown that the health features of wearable devices, particularly smart watches such as the Apple Watch, are effective in monitoring patients' health issues such as atrial fibrillation [16]. Apple Watch's detection of coronary ischemia during episodes of chest pain may prevent myocardial infarction [17]. The iPod was released in 2001 as a portable and versatile digital media player. Although Apple announced in 2022 that the iPod line would be officially discontinued, the iPod has remained an option for many people to listen to music. In addition, Apple's line of MacBook computers already accounted for 56% of all ultrabooks sold in the US in 2013 [18].

Nokia's product lines spread across mobile phones, tablets, operating systems, Wi-Fi routers, and smart TVs. From 1982 to 1999, Nokia produced a variety of 1G mobile phones, the earliest version of Nokia, which almost dominated the global mobile phone market during this period. Nokia targeted the fashion-conscious and young consumer markets with its vibrant designs and removable back coverings. In 1998, Nokia surpassed Motorola as the highest-selling mobile phone in the world. Later,

Nokia made various ranges of advanced phones. However, they did not receive much attention. Moreover, in 1997, Nokia first provide a digital satellite receiver to the UK as a business. For many years, the Symbian operating system from Nokia has been the most popular smartphone platform in Europe and Asia. In 2010, Nokia took control of the operating system. But with the simultaneous emergence of iOS and Android, Nokia's operating system became obsolete, making it difficult for developers.

It is worth mentioning that the interaction between Apple's different products greatly enhances the user experience. For example, Apple's iPad series can be used as another screen for the MacBook. Apple features like Airdrop makes the experience of seamlessly connecting individual Apple devices very comfortable. In contrast, Neither Nokia's early alphabet series nor the new mobile phone offerings launched later, had features that could compete with it.

3.3 Market Size and Share:

After Apple was founded in 1976, revenues grew exponentially in the first five years of operation, with annual sales increasing from $775,000 to $118 million from 1977 to 1980. After Jobs' resigned from Apple in 1985, the misguided policies of Apple's leaders at the time caused Apple's share price to fall by 20% in 1989.

Jobs returned in 1997, and by the end of the year, Apple achieved US$309 million in profits by launching the App Store. From early 2003 to 2006, Apple's share price rose more than tenfold because of its numerous successful products and the right strategy. In 2012, Apple's share price rose to $624 billion after Cook took over. In January 2016, with the acquisition of Beats Electronics and the launch of the apple watch, Apple announced that there were one billion Apple devices in use worldwide [19]. Apple achieved a market value of $1 trillion in 2018 and became the first publicly traded US firm to do so. Then Apple became the first US corporation with a market valuation of $3 trillion in January 2022 [20].

Nokia sold its computer business to the British business International Computers in 1991. Investors considered this a financial problem. Nokia's share price began to fall. But when Nokia executive Vuorilehto resigned in 1992, the new leader of the mobile phone business decided to transform Nokia into a telecoms-focused business. This successful strategy increased the operating income for Nokia increased from nothing in 1991 to nearly $4 billion in 1999. Motorola was surpassed by Nokia as the best-selling mobile phone brand in 1998. Sales for the corporation totaled $20 billion, and profits came in at $2.6 billion. Nokia held a 30% market share for mobile phones in 2000, which was nearly twice Motorola's share. Nokia's revenue climbed five times between 1996 and 2001, from six billion euros to 31 billion euros. The company's market share reached 40.4% in 2007 and in the quarter, Nokia's market share for smartphones increased to 51%, making it the top supplier worldwide, excluding North America [21]. In the second quarter of 2011, Nokia reported a significant loss. Midway through 2012, the company's stock price dropped to under $2. A large part of the reason is the continued low sales of Nokia phones. Nokia's market share declined dramatically. The acquisition of Nokia's mobile device division by Microsoft was announced in September 2013. Microsoft eventually had to write off the assets it had acquired from Nokia in 2015. Since then, Nokia keeps focusing on networking devices.

4. Results and Discussions

Apple and Nokia are very similar in operating mobile device businesses and making big profits. But success is no accident, and neither is a failure. Nokia was not always static. It was also a very innovative company in the beginning. In the early 1990s, when the mobile phone industry first emerged, Nokia anticipated that everyone would purchase mobile phones, not just business users. In reality, Nokia made the first investment in digital telephony and was the first to introduce a user-friendly phone that was smaller and lighter. In 1998, Nokia overtook Motorola and continued to dominate the global market for almost 15 years thanks to multiple partnerships with top designers

and creative ideas [12]. Nokia started by catering to the needs of consumers and won the market. But in later years, the wrong technology strategy, overconfidence of the management, and the old system caused Nokia to be uncompetitive and abandoned by the market. An analysis of the factors that contributed to the rise and fall of Nokia and Apple yielded lessons that can be learned by international technology companies when developing and launching mobile device products. According to research, products that are more innovative iteratively are more likely to be admired by consumers in terms of their ability to innovate, as evidenced by the popularity of the iPhone 4 and apple watch around the world. Apple should ensure that each generation of product iteration has an innovative approach that appeals to consumers. By leading the industry in innovation and development, it has sufficient competitiveness in the market. In terms of product lines, the interaction between products in different product lines will greatly enhance the consumer experience. The interaction between Apple's phones, computers, watches, and other devices will drive consumers to prioritize Apple products when they have an immediate need. The improved user experience often results in immediate feedback in the marketplace. This is evidenced by Apple's revenue growth after implementing various interactive products. Apple management needs to focus on the benefits of the current interactive features and maintain and improve them. As well as maintaining the stability of the device's interaction ecosystem as new products are introduced in the future. Moreover, through the failure of Nokia, Apple should realize that new products need to meet the needs of consumers. It needs to develop an appropriate technology strategy through extensive market research to determine the direction of innovation for new products to avoid deviations from consumer demand points.

5. Conclusion

This paper finds that mobile device products with the ability to innovate give technology companies a competitive advantage in the market. Therefore, technology companies should not only invest their money in marketing tools such as advertising but also invest in research and development of new technologies. Iterative products that lack innovation will be eliminated from the market. As mobile devices from all major companies converge in functionality, the ability to consistently innovate and comfortably interact with the device ecosystem will undoubtedly provide consumers with a better experience. As consumers become accustomed to the device ecosystem created by the company, new and innovative products become increasingly attractive to them. This virtuous circle has led to Apple's current success. Other tech companies need to learn from the technology ecosystem created by Apple and adapt their strategies to gain advantages in the competitive market. They should also understand the needs of consumers and tailor new products to their expectations to avoid the same mistakes as Nokia.

This study firstly scientifically evaluates the objective impact of innovation capabilities on the market share of technology companies. This helps technology companies adjust their technology strategies in time to avoid missing the market. However, due to limited data sources, there is no quantitative data source to specifically analyze the impact of the innovative approach of the product on the market after the launch of each product. Therefore, further research is needed. Consequently, future studies should specifically examine the effects of technology strategies on changes in market share, as this information may be extremely valuable to Apple and other potential mobile device producers.

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