



SUCCESS FACTORS FOR ACCELERATING THE INNOVATION PROCESS AND INCREASING THE USER ACCEPTANCE OF INNOVATIONS – A CASE STUDY ANALYSIS OF PAST IT INNOVATIONS

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Abstract: *This paper examines past IT innovations in order to derive success factors for the development of public charging infrastructure in the context of electric mobility. For this purpose, two case studies are conducted using the data collection method of a literature review. The successful innovation of the Apple iPhone and the failure of Nokia's mobile devices sector are used as objects of investigation. Both, the success of Apple's iPhone and the failure of Nokia's mobile devices sector are primarily due to the products themselves. In case of the iPhone, key factors have been its innovative characteristics, the combination of different functions in one product as well as its high quality and simplicity in use. In case of Nokia's mobile devices sector, their lack of innovation on the one hand and Symbian's lack of innovation on the other hand have been mainly responsible for their failure. Moreover, the device's outdated design as well as their lack of usability mainly have contributed to their downfall.*

Keywords: *IT Innovations, Apple, Nokia, User Acceptance, Success Factors, Failure Factors*

1. Introduction

The German mobility industry has been strongly characterized by change since the start of the energy transition. The transportation sector is responsible for a significant amount of CO₂ emissions which must be reduced in order to meet climate protection goals (cf. Geschäftsführende Vorstände der Fraktion im Deutschen Bundestag, 2016, p. 1).

Electric mobility has become a central element of transport policy, offering the potential for CO₂-neutral transportation when powered by renewable energy sources (cf. BMWi et al., 2011, p. 5). Taking into account the adoption of electric mobility and the associated charging infrastructure in Germany, we are now entering the third phase of Roger's adoption segments – the early majority (cf. Statista, 2022a).

However, according to Lucas (2020, p. 76), existing research on electric mobility has primarily focused on innovators and early adopters, neglecting the potential market of the more pragmatic early majority. To attract this segment of consumers, further technical developments and targeted market influence are necessary. This requires research to focus, among others things, on a market segmentation based on Roger's adoption segments.

To address this research gap, Lucas's recommendation is adjusted to the specific context of public charging infrastructure in the context of electric mobility. Currently, there is insufficient research on how to accelerate the innovation process and how to increase the user acceptance of public charging infrastructure within the early

majority. For electric mobility to succeed in the market in the future, it must be highly attractive to users (cf. Höfler/Neumann, 2016, p. 14). Attractiveness refers to the electric vehicle itself on the one hand and to the associated charging infrastructure on the other hand. Derived from the above-mentioned research gap, this paper provides an overview of how past successful innovations have managed to succeed in the early majority. For this purpose, past information technology (IT) innovations are examined using the methodology of case study analysis. The IT sector stands for a high level of innovation dynamics and therefore the smartphone industry is chosen as the object of study. Within a very short time, there was a paradigm shift from mobile phones to smartphones (cf. Baltes/Freyth, 2017, p. 7). Apple's iPhone is used as an example of success and Nokia's mobile devices sector as a negative example. The aim of this paper is to identify the respective success or failure factors.

In the further course of this research, the overall results of the case studies are used as a basis for deriving recommendations for the further development of public charging infrastructure.

2. Theoretical Background

In order to increase the probability of success in project management, “critical success factors [...] are used to support and evaluate the success of a strategic and tactical approach [...]“ (Asgari et al., 2018, p. 228). Critical success factors are a few key areas of activity where organisation performance is ensured by satisfactory results (cf. Bullen/Rockart, 1981, p. 3). These can be characteristics, conditions and variables that are mainly responsible for organisational success (cf. Leidecker/Bruno, 1984, pp. 27-29). Due to the paradigm shift that is taking place, electric mobility and the associated charging infrastructure can be seen as innovation project. In contrast to conventional vehicles, electric vehicles require completely new prerequisites (cf. Laurischkat/Viertelhausen, 2017, p. 115). Consequently, a new model has been devised to identify success factors for accelerating the innovation process and increasing the user acceptance of public charging infrastructure within the early majority of Rogers diffusion theory. The success factors are based on two fundamental aspects: The innovation process and the user acceptance. Figure 1 visualizes the newly developed model.

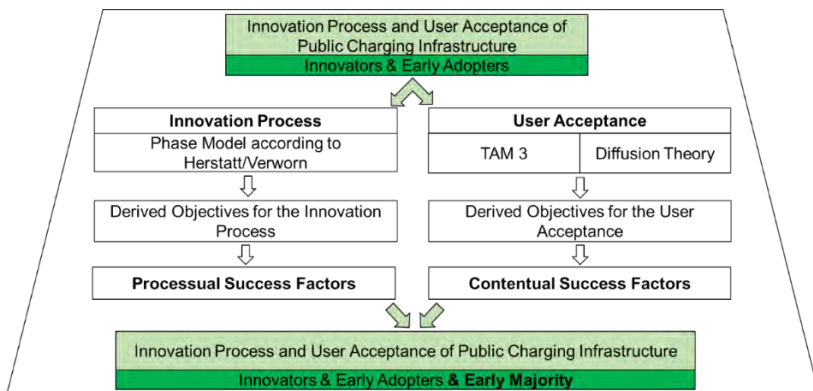


Figure 1: Model for deriving success factors for the innovation process and the user acceptance (proprietary development)

Using this model as a basis, the success factors shown in figure 2 have been identified (cf. Sucietto, 2022).

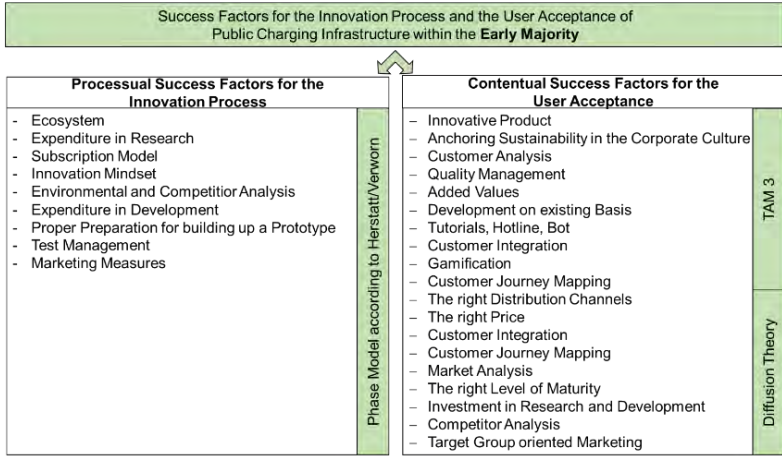


Figure 2: Success factors for the innovation process and the user acceptance (proprietary development)

The success factors are distinguished in processual ones for the innovation process and contentual ones for the user acceptance. A detailed derivation of the individual factors can be found in Sucietto (2022).

3. Methodological Approach

According to Bauer/Schimpf (2018, p. 23), it is worth taking a look into the past in the field of industrial innovation. It helps to better understand the present and to successfully shape the future. This approach is transferred to the field of IT innovations. Using the methodology of case study analysis, past innovations and their diffusion into the early majority are investigated. In addition to a successful innovation, a failed example is considered as well. This is suitable for deriving lessons learned and recommendations for future innovations.

According to Yin (1994, p. 23) "a case study is an empirical enquiry that:

- investigates a contemporary phenomenon within its real-life context; when
- the boundaries between phenomenon and context are not clearly evident; and in which
- multiple sources of evidence are used."

The here conducted case studies follow the research process according to Yin (1994) and Eisenhardt (1989).

With regards to the data collection of Apple's success factors and Nokia's failure factors, a structured literature review is conducted. The subsequent data analysis is carried out using the summarizing content analysis according to Mayring (2010). The summarizing content analysis is an analysis method for comparing material containing meaning that systematically reduces data. The analysis of the material is carried out inductively by forming categories from the material containing meaning and assigning individual parts of the material to the categories (cf. Hunziker/Blankenagel, 2021, p. 241; Mayring, 2010, p. 83).

*The data collection and analysis is done case by case. Once all data is analyzed, it is merged to reveal similarities and differences between the two cases. In doing so, the analysis technique of pattern matching is used where relationship patterns are

constructed. Afterwards, a comparison of the patterns with the previously defined theoretical model takes place. The patterns can both, support and refute the previously defined theoretical model (cf. Yin, 2003, pp. 116-120).

Case Study Analysis

In the following, success factors of the Apple iPhone and failure factors of Nokia’s mobile devices sector are examined using the methodology of case study analysis.

Case 1: Apple iPhone

First, Apple Inc. and the iPhone are briefly introduced. Then the iPhone’s success factors are presented.

Apple Inc. and the iPhone

Apple Inc. is an IT company that “designs, manufactures and markets smartphones, personal computers, tablets, wearables and accessories, and sells a variety of related services” (Apple Inc., 2021, p. 1).

In recent years, Apple has achieved remarkable revenue growth. Revenues have increased from around eight billion U.S. dollars in 2004 to around 365.8 billion U.S. dollars in 2021. The iPhone in particular has been responsible for this growth (cf. Statista, 2022c).

The iPhone is Apple’s “line of smartphones based on its iOS operating system” (Apple Inc., 2021, p. 1). In 2007, the first one appeared on the market (cf. Mickalowski et al., 2008, p. 1), whereas today (08/29/2022) there are 33 different models (cf. Meischer, 2022).

Success factors of the Apple iPhone

When conducting the literature review, super categories are formed first using the summarizing content analysis. Based on them, further subcategories are formed to represent the respective success factors. In summary, the success factors shown in table 1 have been identified.

Table 1: Success factors of the Apple iPhone derived from the literature review (own illustration)

Super Category	Success Factor
Product	<ul style="list-style-type: none"> • Innovative characteristics • Combination of different functions in one product/ using existing product basis • High quality • Simplicity in use
Price	<ul style="list-style-type: none"> • Skimming strategy • Geographic product pricing
Brand	<ul style="list-style-type: none"> • Developing a brand image/ creating brand identification • Focusing on emotion • Focusing on lifestyle
Distribution strategy	<ul style="list-style-type: none"> • Own retail stores/ in store service • Partnership with AT&T • Online shopping • Similar distribution strategy in different countries
Marketing	<ul style="list-style-type: none"> • Identify a target group • Narrative marketing



	<ul style="list-style-type: none"> • Creating emotions • Simplicity in advertising
Regulatory issues	<ul style="list-style-type: none"> • Working with regulatory factors
Environmental	<ul style="list-style-type: none"> • Using existing infrastructure
Customer orientation	<ul style="list-style-type: none"> • Customer analysis • Target group specific content and applications • Interacting with customers • Taking lessons learned
Service	<ul style="list-style-type: none"> • Offering purchasable warranty • In store service: repairs, tutorials, workshops
R&D	<ul style="list-style-type: none"> • Continual investment in R&D • Innovation Mindset
Business model	<ul style="list-style-type: none"> • Device-centric business model • Partnership with AT&T
Partnership with AT&T	<ul style="list-style-type: none"> • Building an ecosystem • Barrier to change

The identified success factors can be clustered into 12 super categories: product, price, brand, distribution strategy, marketing, regulatory issues, environmental, customer orientation, service, research & development (R&D), business model and ecosystem.

The most mentioned success factors are located in the super category ‘product’. Therefore, this paper focuses on the super category ‘product’.

Looking from a product perspective, the iPhone’s innovative characteristics and its differentiation from the competition have been key factors for its success (cf. Khan et al., 2015, p. 960).

Compared to competing products, the iPhone’s design has been simple (cf. Richardson, 2020, p. 22). Besides its innovative characteristics, the first iPhone had many more characteristics a smartphone did not have back then. Its 3.5-inch touchscreen, the gravity sensor, its electronic compass with GPS as well as its camera were completely new characteristics of a smartphone (cf. Johnson et al., 2012, p. 3; Mickalowski et al., 2008, p. 2).

Moreover, by enabling mobile browsing with relatively very high quality, the iPhone has offered a completely new experience related to the mobile internet (cf. West/Mace, 2009, p. 16; Laugesen/Yuan, 2010, p. 4).

With regards to services, Apple has focused on entertainment applications and services based on their own operating system (OS) (cf. Laugesen/Yuan, 2010, p. 6; Fitriani/Achmad, 2021, p. 421).

A further success factor in relation to the product has been the combination of different functions in one product. In case of the iPhone, Apple used its already existing product basis. Initially, Jobs introduced three different devices: “a new cell phone, an internet communicator and a widescreen iPod (Barrett, 2012)” (Johnson et al., 2012, p. 15). After briefly introducing the functions of each device, he announced that all of these functions are bundled into a single product (cf. Johnson et al., 2012, p. 15). The iPhone has combined the features of a computer with the mobile internet (cf. Laugesen/Yuan, 2010, p. 3). The effective ability to replicate much of a computer has been one of the iPhone’s decisive success factors (cf. Laugesen/Yuan, 2010, p. 3).

In terms of the iPhone’s development, Apple built on the iPod and the iTunes experience from previous developments (Căpătină/Drăghescu, 2015, p. 65).

The high quality of the iPhone has been another success factor in terms of the product. High quality refers on the one hand to the high-quality materials and on the other hand to the comfortable design of Apple products (cf. Johnson et al., 2012, p. 15). Furthermore, the simplicity in use has been another key factor for the iPhone’s success. Customers do not want complicated products and services they do not understand. The simple arrangement of buttons on the iPhone appeals to customers and symbolizes simplicity in use at the same time (cf. Laugesen/Yuan, 2010, pp. 3-4).

Conclusion of the Apple iPhone’s success factors

In the course of the case study, the iPhone’s success factors have been identified based on a structured literature review. In total, 31 success factors clustered into 12 super categories have been identified.

Looking at the super categories, it can be seen that it mainly has been the product itself that has been decisive for the iPhone’s success. It’s innovative characteristics, the combination of different functions into only one product as well as its high quality and simplicity in use have been crucial for the iPhone’s success (cf. chapter 4.1.2).

Case 2: Nokia’s Mobile Devices Sector

First, Nokia and its mobile devices sector are briefly introduced. Then the failure factors of Nokia’s mobile devices sector are presented.

Nokia and its Mobile Devices Sector

Since Nokia’s foundation in 1865 as a single paper mill operation, the company has been active in numerous “industrial sectors including cable, paper products, rubber boots, tires, televisions and mobile phones” (Nokia, 2022).

From 1998 – 2011, Nokia held the position of the leading mobile phone manufacturer in the world (cf. Kleine Zeitung, 2013). However, their market share gradually declined and they lost their technology-leading position to rivals like Samsung and Apple. As a consequence, their mobile devices sector began to experience financial losses (Statista, 2022b).

To combat the growing competition from Apple’s and Samsung’s operating systems, Nokia and Microsoft entered into a strategic partnership in 2011. Ultimately, in 2014, Nokia sold its mobile devices sector to Microsoft (cf. Nokia, 2022).

Failure factors of Nokia’s Mobile Devices Sector

When conducting the literature review, super categories are formed first using the summarizing content analysis. Based on them, further sub categories are formed to represent the respective failure factors. In summary, the failure factors shown in table 2 have been identified.

Table 2: Failure factors of Nokia’s mobile devices sector derived from the literature review (own illustration)

Super Category	Failure Factor
Product	<ul style="list-style-type: none"> • Operating system • Missing applications & user interface (UI) • Lack of innovation • Outdated design • Decreasing quality • No ease of use



	<ul style="list-style-type: none"> • Missing features
Price	<ul style="list-style-type: none"> • High price
Brand	<ul style="list-style-type: none"> • Overestimation • Missing product name • Old Brand • No buzz • Complacency
Marketing	<ul style="list-style-type: none"> • No marketing in innovative context
Environmental	<ul style="list-style-type: none"> • Changing market
Customer orientation	<ul style="list-style-type: none"> • Changing customer needs
R&D	<ul style="list-style-type: none"> • Lack of innovation • R&D activities only on own systems
Business model	<ul style="list-style-type: none"> • Focus von hardware • Focus on Symbian OS • Missing ecosystem
Strategy	<ul style="list-style-type: none"> • No focused device strategy • Wrong time to market • Moved too slowly • Market segmentation
Organizational Design	<ul style="list-style-type: none"> • Lack of knowledge in management • Slow decision-making • Restructuring
Company Culture	<ul style="list-style-type: none"> • Culture of fear • Over confidence

The identified failure factors can be clustered into 11 super categories: product, price, brand, marketing, environmental, customer orientation, research & development (R&D), business model, strategy, organizational design and company culture.

The most mentioned failure factors are located in the super category ‘product’. Therefore, this paper focuses on the super category ‘product’.

With regards to Nokia’s failure, their products themselves represent a crucial factor. Nokia held on to its outdated operating system ‘Symbian’ for a long time. (cf. Joshi/Panigrahi, 2020, p. 158; Kotaniemi, 2017, p. 240; Sofiah/Aslami, 2022, p. 32). Compared to the new ‘iOS’ and ‘Android’ software from Apple and Samsung, ‘Symbian’ was not convenient enough. Ignoring the new software, Nokia decided to continue investing in its own software (cf. Wang, 2022, p. 1868).

Symbian’s main problem was its outdated user interface as well as the lack of applications (cf. Joshi/Panigrahi, 2020, p. 156; Bhalodiya/Sagotia, 2018, p. 16). ‘iOS’ and ‘Android’ on the other hand have offered exciting interfaces with many different applications. Nokia did not understand that basic features were no longer enough to keep up with the competition.

In terms of technology features, Nokia phones were inferior to their competition. Even Nokia’s Windows phone ‘Lumia’ from 2011 lacked essential technology features (cf. Laamanen et al., 2019, p. 14).

Moreover, there were recurring software problems (cf. Alibage/Weber, 2018, pp. 7-8) and the software was not very user-friendly (cf. Joshi/Panigrahi, 2020, p. 157).

However, Nokia’s lack of innovation also played a significant role in their failure (cf. Joshi/Panigrahi, 2020, p. 155). Instead of doing innovating things, the company mostly followed the competition. As a result, they were not able to create something unique (cf. Bhalodiya/Sagotia, 2018, pp. 15-16).

Furthermore, the design of Nokia’s mobile phones was outdated. Nokia did not prioritize mobile phone fashion and lacked the trendy and attractive designs of Apple and Samsung (cf. Wang, 2022, p. 1869; Abdou/Hussein, 2020, p. 47).

Additionally, the quality of the hardware significantly declined. Customer complaints included issues such as overheating and blurry captured images (cf. Joshi/Panigrahi, 2020, p. 157; Alibage/Weber, 2018, p. 7).

Conclusion of Nokia’s failure factors

In the course of the case study, the failure factors of Nokia’s mobile devices sector have been identified based on a structured literature review. In total, 30 failure factors clustered into 11 super categories have been identified.

Looking at the super categories, it can be seen that the failure factors are mainly related to their products themselves. From a product perspective, Nokia’s lack of innovation on the one hand and Symbian’s on the other hand have been mainly responsible for their failure. Moreover, the device’s outdated design as well as their lack of usability mainly have contributed to their downfall (cf. chapter 4.2.2).

Pattern Matching

With regards to the identified success and failure factors related to super category ‘product’, relationship patterns are constructed. These patterns are constructed by utilizing the failure factors identified in the Nokia case to underpin the success factors identified in the Apple case. In cases where no corresponding success factor is found in the Apple case, the failure factors of Nokia are used as a foundation to derive new success factors. This derivation is essential to make the comparison with the predefined theoretical model of success factors afterwards (cf. chapter 2).

Table 3 shows the patterns of the corresponding factors related to the product. The italic rows represent the newly derived success factors from the failure factors of the Nokia case.

Table 3: Pattern matching of Apple’s success and Nokia’s failure factors related to the product (proprietary development)

Super Category	Apple: Success Factor	Nokia: Failure Factor
Product	• Innovative characteristics	• Lack of innovation
	• Combination of different functions in one product	
	• High quality	• Decreasing quality
	• Simplicity in use	• No ease of use
	• <i>Compatible operating system</i>	• <i>Operating system</i>
	• <i>Lots of features</i>	• <i>Missing features</i>
	• <i>Lots of applications & intuitive UI</i>	• <i>Missing Applications & UI</i>
	• <i>Innovative design</i>	• <i>Outdated design</i>



Apple has been very good in developing innovative characteristics while Nokia lacked innovation. Their high degree of innovation together with the iPhone's ease of use and high quality have been the most important success factors from a product perspective. In contrast to Apple, Nokia's mobile devices were not easy to use and quality significantly declined (cf. chapter 4.1.2; 4.2.2).

Besides the success factors directly identified in the literature review related to the Apple iPhone, four additional success factors have been identified, derived from the failure factors of the Nokia case.

As far as the product is concerned, Nokia's biggest failure was the operating system with its lack of applications and functions as well as its uncomfortable user interface. In addition, the outdated design of the mobile devices has been crucial (cf. chapter 4.2.2). It can be concluded that a compatible operating system with an intuitive user interface and a wide range of applications and functions have been further success factors of the Apple iPhone. In addition, the innovative design of the iPhone can also be considered a success factor.

Discussion

With regards to the success factors related to the product, eight factors have been identified (cf. chapter 5). A comparison of the factors with the previously defined theoretical model (cf. chapter 2) shows a partial agreement. Three of eight factors are already part of the theoretical model. Consequently, five additional success factors have been identified in this research paper. However, they do not represent an advancement of knowledge as the factors can be found in previously published literature sources related to Apple and Nokia.

Table 4 shows the comparison of the success factors identified in the literature review with the success factors of the predefined theory.

Table 4: Comparison of the identified success factors related to the product with the previously defined theoretical model (proprietary development)

Super Category	Super Category	Literature Review	Theory
Product	Innovative characteristics	X	X
	Combination of different functions in one product	X	X
	High quality	X	X
	Simplicity in use	X	
	<i>compatible operating system</i>	X	
	<i>Lots of features</i>	X	
	<i>Lots of applications & intuitive UI</i>	X	
	<i>Innovative design</i>	X	

7. Conclusion and Outlook

This paper identifies success factors of the Apple iPhone and failure factors of Nokia's mobile devices sector. Both, the success of Apple's iPhone and the failure of Nokia's mobile devices sector are primarily due to the products themselves. Focusing on diversification and simplicity, Apple has set new standards while Nokia's technological orientation and their focus on hardware rather than software have mainly contributed to their downfall.

With regards to the data collection method, the factors identified in this paper are based on a literature review. In order to gain further insights and deep dives, additional expert interviews need to be conducted.

Furthermore, a closer examination of the other super categories is needed. Only when the relationship patterns of all super categories are constructed, a comparison can be fully made with the previous defined theoretical model in chapter 2.

In the further course of this research, the overall results of the case studies are used as a basis for deriving recommendations for the further development of public charging infrastructure in the context of electric mobility. In this way, the innovation process can be accelerated and the user acceptance can be increased.

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