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Technological innovations and business model innovations

An empirical case study

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ABSTRACT:

Globalization and technological innovations are changing the ways of businesses all around the world. Due to rapid technological developments and the expansion of global markets, consumers demand higher value from the products and services they acquire. As a result, companies must adjust to the market's needs and consistently deliver customer value. Otherwise, companies may lose their competitive advantage and become irrelevant in their industries.

The business model concept began to acquire traction and spark interest among academics and researchers after the emergence of the internet in the late 1990s and early 2000s. After the rise of the internet, it has become evident that many modern business models are arguably fundamentally linked with technological innovations. However, a common agenda regarding the research on this phenomenon is lacking among academics and researchers since there is no standard study framework on business models and the impact of technology on them.

Furthermore, there is limited research on the relationship between technology and business model innovation. Some academics believe that technology innovation is a precursor of business model innovation, while others claim that business model innovation provides a framework for technological innovations. Therefore, this study aimed to explore the link between technological innovation and business model innovation to understand the topic better and provide theoretical and empirical evidence for further research.

This thesis uses empirical research methods based on a qualitative case study. The primary research data was obtained through a structured questionnaire designed for the founders and board members of the case company. In addition, secondary data was obtained from the case company directly in the form of documents related to the company's business models and services. The questionnaire data were processed and analysed with the help of thematic analysis. Moreover, the empirical findings were compared to the literature review to gain further insights.

The study's findings demonstrate a direct connection between technology and the case studies' business models. It also illustrates how vital technology is to the case company and provides insights into how the case company's business models were created. The author also compares these findings to other companies, especially tech start-ups. However, the empirical findings cannot be directly compared to other organizations. Therefore, it was stated that further research on the topic is vital, especially emphasizing start-ups and large tech companies.

KEYWORDS: business model innovation, technological innovation, start-up, technology, innovation, business model

TIIVISTELMÄ:

Globalisaatio ja teknologiset innovaatiot muuttavat yritysten toimintatapoja maailmanlaajuisesti. Teknologian nopean kehityksen ja globaalien markkinoiden laajentumisen vuoksi kuluttajat vaativat korkeampaa arvoa hankkimistaan tuotteista ja palveluista. Tämän seurauksena yritysten on mukauduttava markkinoiden tarpeisiin ja tuotettava johdonmukaisesti asiakasarvoa. Muutoin yritykset voivat menettää kilpailuetunsa ja tulla merkityksettömiksi toimialoillaan.

Internetin yleistymisen jälkeen liiketoimintamalli-konsepti alkoi saada huomiota ja herättää kiinnostusta akateemikkojen ja tutkijoiden keskuudessa. Internetin yleistymisen jälkeen on käynyt selväksi, että monet nykyaikaiset liiketoimintamallit liittyvät oleellisesti teknologisiin innovaatioihin. Akateemikoilta ja tutkijoilta kuitenkin puuttuu yhteinen agenda tämän ilmiön tutkimiselle, sillä liiketoimintamalleista ja teknologian vaikutuksista ei ole olemassa yhtenäistä tutkimuskäytäntöä.

Teknologian ja liiketoimintamalli-innovaatioiden välistä suhdetta koskevaa tutkimusta on vähän. Jotkut tutkijat uskovat, että teknologinen innovaatio on liiketoimintamalli-innovaatioiden edeltäjä, kun taas toiset väittävät, että liiketoimintamalli-innovaatiot tarjoavat puitteet teknologisille innovaatioille. Siksi tämän tutkimuksen tavoitteena on selvittää teknologisen innovaation ja liiketoimintamalli-innovaatioiden välistä yhteyttä, jotta aihetta voitaisiin ymmärtää paremmin, ja tarjota teoreettista ja empiiristä näyttöä jatkotutkimukselle.

Tutkielma toteutettiin empiirisellä tutkimuksella, joka perustuu kvalitatiiviseen tapaustutkimukseen. Ensisijaiset tutkimustiedot saatiin strukturoidulla kyselylomakkeella, joka oli suunniteltu tapausyhtiön perustajille ja hallituksen jäsenille. Toissijaiset tiedot saatiin suoraan tapausyhtiön liiketoimintamalleihin ja palveluihin liittyvien asiakirjojen muodossa. Kyselyn tiedot käsiteltiin ja analysoitiin temaattisen analyysin avulla, jonka lisäksi empiirisiä tuloksia verrattiin kirjallisuuskatsaukseen lisänäkemysten saamiseksi.

Tutkimuksen tulokset osoittavat suoran yhteyden teknologian ja tapaustutkimuksen liiketoimintamallien välillä. Tulokset antavat näkemyksiä tapausyrityksen liiketoimintamallien luomisesta, sekä havainnollistavat teknologian tärkeyttä. Verraten havaintoja myös muihin yrityksiin, erityisesti teknologia-alan startup-yrityksiin, ei empiirisiä tuloksia voi suoraan verrata. Tästä syystä todettiin, että aiheen jatkotutkimus on tärkeää painottaen erityisesti startup-yrityksiä ja suuria teknologiayrityksiä.

AVAINSANAT: liiketoimintamalli innovaatiot, teknologiset innovaatiot, start-up, teknologia, innovaatiot, liiketoimintamalli

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1 Introduction

Over the past decade, it can be seen how many modern business models are arguably fundamentally linked with technological innovations (Baden-Fuller & Haeflinger, 2013). Taking Uber as an example, which has a two-sided marketplace that connects drivers and riders, broke the monopoly that the taxi industry had created over the years. Uber was able to generate a new entire business model in the field of transportation and mobility through technological innovation. Due to their innovative service and web application, Uber gained tremendous popularity in a short period of time and became a household name globally (Dudley et al., 2017).

Businesses today are significantly impacted by the current business environment and its accompanying effects. Globalization, technological advancements, the emergence of the Internet, and the development of information technology (IT), are putting companies under pressure to adapt and change how they conduct business (Turulja & Bajgoric, 2018). In such a setting, the business model idea is underlined as the key factor in contemporary organizations' attempts to achieve organizational success based on creating, capturing, and delivering value to end-users (Osterwalder & Pigneur, 2010). Therefore, the ability of companies to add value to their products and services and adjust to market demand is crucial to achieving a successful business (Anning-Dorson, 2017).

The degree of novelty, the broad impact of changes to the business, and the improvements/adjustments in the value proposition for both business owners and customers are according to many authors the main characteristics that distinguish business model innovation from conventional innovations like new products and technological advancements. According to researchers, these characteristics result from the nature and main goals of innovation in a business model, which includes the domino effect that occurs when one component is changed and the work of enhancing strong points, boosting value creation by inducing favourable changes to both the internal operating model and the external value proposition for customers. (BCG, 2009)

Some academics, such as (Tohãnean et al., 2020; Cautela et al., 2014; Wirtz, 2019), point out that technology can be leveraged to deliver BMI regarding a company's available resources. However, in this context, it should be mentioned that not all researchers believe technology plays a crucial role in creating BMI. Authors such as Chesbrough (2010) raise a problem regarding the interplay between business model innovation and technological innovation. Despite having substantial processes and investments for investigating novel concepts and technologies, businesses cannot frequently create and develop the business models used to implement these technological inputs because of a lack of prior knowledge or experience. Chesbrough (2007) also adds that technology no longer plays a crucial role in BMI, and that BMI is more related to management decisions.

Therefore, this thesis analyses the evolving view of the business model and sees where it leads in comprehending the different views of academics regarding the link between business model innovation and technological innovation. Furthermore, this thesis explores the dilemma regarding the underlying role in the relationship between technology innovation and business model innovation. Some studies (Souto, 2015) contend that technological innovation is a precursor of business model innovation. Meanwhile, other academics, such as (Wei et al., 2014) argue that innovation in the business model leads to technological innovations. Since there is no standard framework for the research of business model innovation and technological innovation, the literature review of this thesis combines both traditional literature (Osterwalder & Pigneur, 2010; Schön, 2012; Zott & Amit, 2008; Teece, 2010) and more modern views of the business model, such as digital business models (Wirtz, 2019) and technology entrepreneurship (Khefacha & Balacem, 2016). The aim of the study is to gain a deeper understanding of the relationship between technological innovation and business model innovation and develop current research with empirical findings from case study research.

1.1 Background of the study

The background of this study arose from the increasing need for research regarding the link between business model innovation and technological innovation. Technological innovation (digital technology) is developing rapidly. At the same time, new business models are being formed. Therefore, the importance to further research and revise older theories concerning business model innovation and how technological innovations drive business model innovation is necessary.

As mentioned above, business model innovation and technological innovation classification have advanced along several paths. First, some academics and observers consider technological innovation to be the precursor of business model innovations, while others argue that technological innovations are born through business model innovations. Furthermore, new classifications of business models and companies based on technology exist. These are called digital business models and technological entrepreneurship.

In order to understand the connection between business model innovation and technological innovation, it is essential to review traditional theory on the matter and combine it with newer literature to understand how business models work nowadays. In addition, combining an empirical case study with the literature review provides evidence of how a business model is created in the case company.

The idea of an empirical case study conducted on a modern start-up business was the logical step to explore this phenomenon. The start-up company (Lainappi Oy) was happy to support this study and provide the necessary data and support to conclude on the topic investigated. In addition, Lainappi Oy gains valuable information to develop its own business models further.

1.2 Research problem, aim, and questions

During the rise of the internet in the late 1990s and early 2000s, the concept of the business model has grown popular among academics. However, theoretically, there are still problems regarding business model research that continue to hinder the development of the theory (Fjeldstad & Snow, 2018). For example, the concept of a business model is not well-defined (Roome & Louche, 2016) and there is no clarity on its purposes, concept, or development (Cosenz & Noto, 2018).

Today, business model theory is still widely relevant, but due to the continuously changing business environment, the focus is directed more toward potential innovation applicable to current business models (BMI). This can be seen through the effect of which technological innovations are having on business models and how new start-ups are being created (Latifi et al., 2021).

In contrast, Nowiński and Kozma (2017) warn business leaders about the influences of new technology on business models and advise them to keep up with modern technological advancements to avoid possible disruptions. Some academics, for example, Souto (2015), state that technology comes before business model innovation and therefore has a significant impact on forming new business models. On the other hand, other academics mention that technological innovation comes after business models have been altered and developed.

Furthermore, some academic researchers such as (Wirtz, 2019) are developing the theory of digital business models to explain better and understand the emerging digital markets. In addition to digital business models, some authors, for example, (Khefacha & Belkacem, 2016), are talking about technology entrepreneurship which consists of starting businesses that are specifically based on new technology.

Even though there is plenty of research regarding business models, business model innovation, and technological innovation, there is still a lack of a common idea of what connection these concepts have, if any. In addition, little empirical research could also

be found on the link between business model innovation and technological innovation and how technological innovations drive and develop business model innovation. Therefore, this thesis aims to explore the research gap concerning the link between technological innovation and business model innovation with the help of a case study. The idea of the study is not to create a common standard on the topic but to understand the topic better and provide theoretical and empirical evidence for further research.

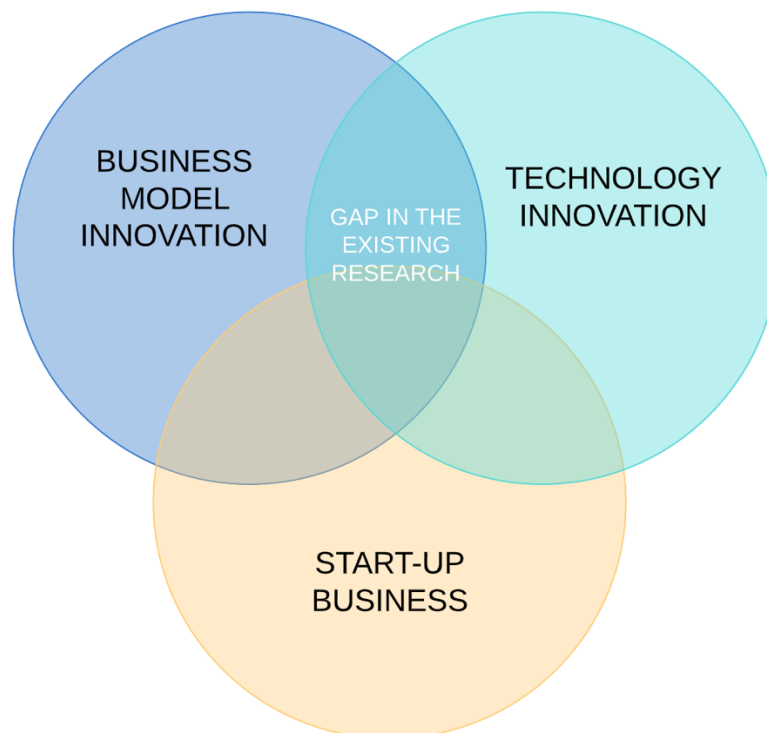


Figure 1. Demonstration of the gap in the existing research.

To explore the research problem, this thesis would like to nominate the following research question (RQ):

- How do technological innovations (emerging technologies) drive and develop business model innovation?

To understand the topic better, this thesis would like to nominate the following research sub-questions (RSQ):

- Is there a link between business model innovation and technology innovation?
- Are technological innovations influencing the construct of new business models?
- Has technology innovation influenced the case studies' business models?

The research gap demonstrated above points to the direction of the necessary investigations. Therefore, the research questions will be analysed with a combination of traditional business model theory, e.g. (Ostelwalder & Pigneur, 2010; Shön, 2012), and newer theories regarding business model innovation and technological innovation, e.g. (Wirtz, 2019; Khefacha & Belkacem, 2019). Furthermore, an empirical case study is applied to achieve the set objectives and aim of the study.

1.3 Research objectives

The research objectives of this thesis consist of three objectives that were designed to successfully achieve the aim of this research and answer the research questions stated above. This thesis proposes the following objectives:

- Identify and understand the characteristics of different kinds of business models.
- Identify and understand what technological innovation is and how it is impacting business models.
- Identify possible links between business model innovation and technological innovation.

This study intends to achieve the set objectives by conducting research, qualitative investigations, analysing findings, and providing a conclusion on the study results.

Furthermore, this study strives to be the foundation or body of literature for additional research.

1.4 Structure of the study

The structure of the thesis is based on six chapters, as seen in Figure 2 on page 12. The study begins with an introduction to the research topic and provides the reasoning behind the selected research topic. The introduction chapter also presents the research questions and objectives of the study.

After the introduction, the study follows with the literature review and theoretical framework. The main point of this chapter is to deepen the reader's understanding of the core concepts of the study. Furthermore, chapter three introduces the case company and provides background information on the company and its business models.

The fourth chapter presents the work's research methods and analyses the research's validity and reliability. In addition, this chapter explains how the data for the study was collected and analysed. Chapter five presents the study's findings which contains the results of data acquired from the qualitative research methods.

Chapter six contains a short discussion section where the author presents his opinions and findings on the research topic. Finally, chapter six contains the conclusion, reflection, and further research topics and limitations of the study. The concluding chapter summarizes the study, reflects on the results, and investigates possible future studies on the topic.

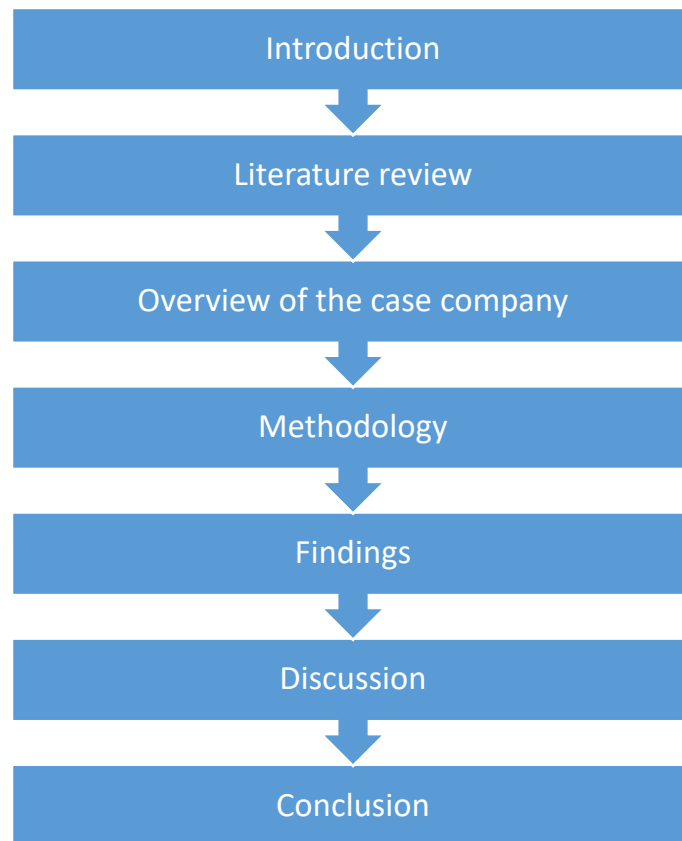


Figure 2. Demonstration of the structure of the study.

2 Literature review

The purpose of the following chapter is to deepen the reader's understanding of the topic and help them understand the key pillars of this thesis. The chapter introduces the theory of innovation, business model innovation, and technological innovation. Furthermore, it provides general definitions of the core concepts related to the study and establishes a theoretical framework for the research.

2.1 Theoretical framework

Research on the effects of technology on business models does not often distinguish between the consequences of technological and business model innovation (Zott & Amit, 2007; Casadesus-Masanell & Ricart, 2012). However, various authors have stated that the outcome and performance of a business model is influenced by technological advancement (Christensen & Bower, 1996; Zaheer & Bell, 2005; Evanschitzky et al., 2012; Hauser et al., 2006). Therefore, to improve the comprehension of the topic, a more detailed understanding of how new digital technologies affect business models and business model innovation is necessary.

Although there are various definitions for a business model, in this thesis, the term "business model" will be first explored in a slightly more traditional, precise, and condensed sense to refer to the reasoning of how a company develops, delivers, and captures value (Osterwalder & Pigneur, 2010). After that, a newer version of business model theory called "the digital business model" will be reviewed. Digital technologies have profoundly changed corporate strategies, operations, capacities, goods, and services by impacting vital inter-firm connections in wide-ranging business networks (Bharadwaj et al., 2013). Therefore, digital technologies have lately drawn much attention as drivers for developing new business models (Visnjic et al., 2016). In addition to digital business models, the theory regarding technological entrepreneurship (Khefacha & Balkacem,

2016) will also be reviewed to understand better how modern start-ups are entering their markets.

A business model is not only a demonstration of value creation; it is a description of a resource and activity system that exemplifies how to provide customers with relevant value while also generating revenue for the business (Stefan & Richard, 2014). According to Teece (2010), developing a successful business model is insufficient to ensure competitive advantage. In this sense, companies must constantly apply innovation to their business model. This innovation refers to the search for new business logic and ways of creating and capturing value for its stakeholders. It focuses on finding new ways to generate income and define value propositions for customers, suppliers, and partners.

A fundamental part of business model innovation nowadays regards technological innovation, and technology is seen as the natural and desirable reflection of the values of a technologically progressive society. Some academics mention that technological innovation must reconcile with business model innovation if companies want to adapt to the ever-changing market demand (Nieminen, 2020).

Technological advancements have provided the impetus for new and better ways of satisfying customer needs. For example, in transport, the horse was first used, then the railway, then the automobile, and finally the plane, the last three means of transportation have been technological solutions to the basic transportation needs of society. These solutions successively complemented and displaced each other and formed the basis of competing business models to get people from one place to another. Furthermore, the Internet and the computer and communication revolution have empowered businesses to provide further differentiation in product service offerings. Social networks are also outgrowing the age-old ability to use advertising to reach an audience (Teece, 2010).

2.2 Innovation

To explore the characteristics of technological and business model innovation, a clear understanding of the term innovation is needed. The concept of innovation has had various meanings over time. In business economics, Schumpeter (1934) was one of the first to mention that innovation occurs when a new product or service is created or improvements to an existing process are made. Furthermore, Schumpeter identified patterns related to business innovation and created the Mark 1 and Mark 2 models.

The Schumpeter models (Mark 1 & Mark 2) present patterns of innovation regarding each industry sector's industrial structure and technology. Schumpeter called the Mark 1 model "creative destruction" because the industries in that model are characterized by the ease of new innovative companies entering the market and making older companies incumbents. In this model, new companies enter the industry bring new ideas, products or processes that are integrated into the industry and disorganize production, distribution, and other commercial activity. However, these innovations quickly become obsolete in these market circumstances, preventing companies from obtaining a dominant position in the market (Schumpeter, 1934).

The Mark 2 pattern is characterized by what Schumpeter calls the "creative accumulation," which includes a more stable environment and high market entry barriers. The existence of barriers derives from competition in large-scale projects where only the most prominent companies can compete. In this model, innovations are mainly created by large established organizations.

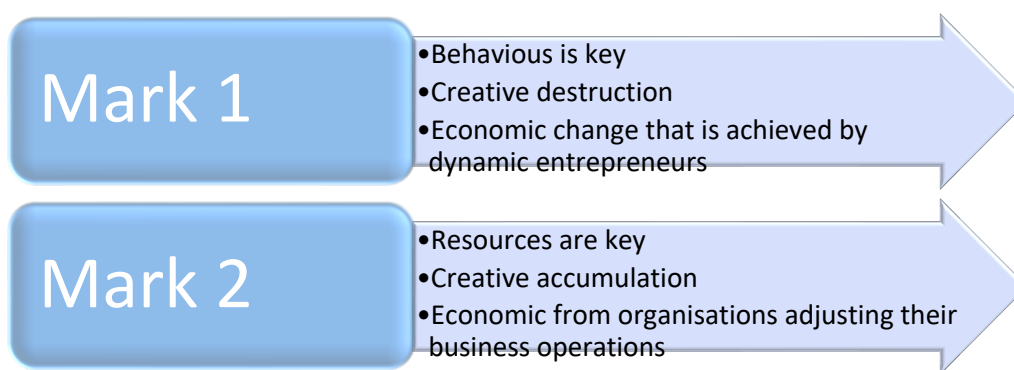


Figure 3. Mark1 & Mark2 innovation patters (Shumpeter, 1934).

Finding potential customers with unmet needs who are willing and able to pay for a good or service that can solve their problem is the first step for an innovative business. A successful business model offers a customer-friendly option at a price that will cover all expenses and still yield a respectable return for the company. Creating such a business model typically begins with thoroughly comprehending the client's situation (also known as user needs) and familiarising with the many existing business models in the market. In highly developed countries, it is somewhat harder to create entirely new business models but not impossible. (Doz & Kosonen, 2010)

Occasionally, technical advancements lead to the creation of entirely new business models. For example, online businesses put many industries out of business due to the Internet-driven great wave of innovation. Scale and scope were previously initiated and sustained by the telegraph and the railroads (Chandler, 1990). These days, the Internet has made it possible for new business models to flourish without the need for extensive amounts of resources. For example, Uber which was a start-up, developed the two-sided platform which connected drivers and riders. Furthermore, they created a new and more flexible way of employment and cheaper rides for customers. (Armstrong, 2006)

Undoubtedly, innovation is one of the fundamental drivers of an organization's economic sustainability, evolution, and growth. Michael Porter (1993) states that a nation's competitiveness depends on the ability to innovate and improve. Therefore, human capital combined with innovation activities effectively establishes advanced industrial

economies and competitive advantages. According to Porter, the only sustainable competitive advantage is permanent innovation. That is why it is essential to focus on how innovation processes are managed within an organization. Porter adds that these factors alone do not produce value since success will depend on how innovation activities are managed within organizations.

Organizations' innovation processes must respond to the unpredictability of the markets and the current opportunities. The world and economic landscape are constantly developing; therefore, organizations must adapt to changes and improve their business methods. According to a World Bank report (2012), nations that have invested a low proportion of their GDP in research and development (R&D), innovation and technology have remained stagnant in the past decade compared to the nations that have clearly invested a larger proportion of their GDP into R&D, innovation, and technology.

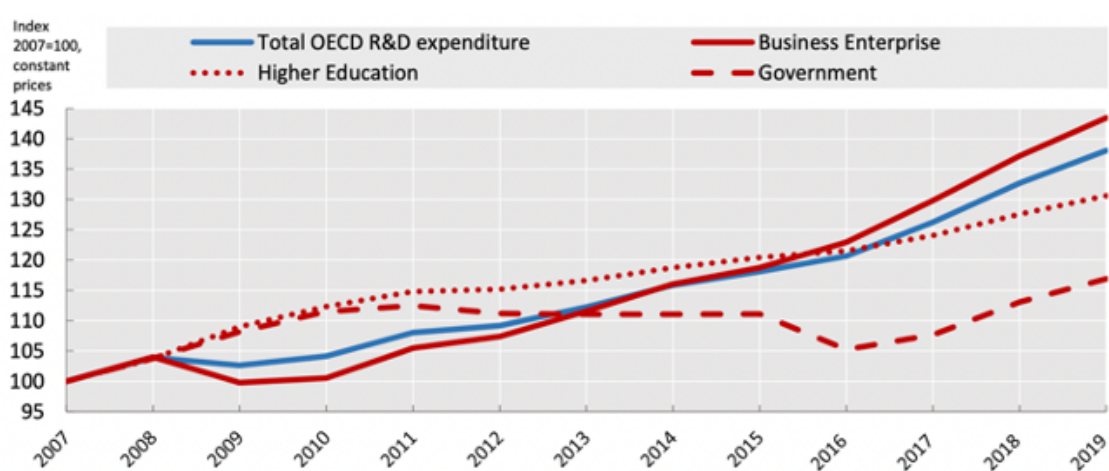


Figure 4. R&D expenditure in OECD countries (OECD, 2021).

According to OECD data, since 2007, the growth in expenditure on R&D in the OECD area was mainly driven by the business sector. This indicator provides an insight into the desire for businesses to drive innovation and improve their competitive advantage in the market. R&D has the potential to create and develop technologies, processes, and new ways of conducting business. Therefore, especially companies are investing large amounts of funds into R&D. (OECD, 2021)

However, the ease with which technology innovation has a beneficial impact on business performance has drawn focus away from concerns about how business models adapt to innovation. At the same time, management theory needs more specificity in terms of how business model changes encourage and facilitate innovation. (Amit & Zott, 2012)

2.3 Business models (BM)

The term business “business model” is commonly used to describe the key elements of a particular business. Thus, a company providing goods or services employs a particular business model, either explicitly or implicitly, that describes the design or architecture of the mechanisms used to create, capture, and deliver value. The essence of a business model is to define how the company delivers value to customers, how it entices customers to pay for that value, and how it turns those payments into profit. (Osterwalder & Pigneur, 2010)

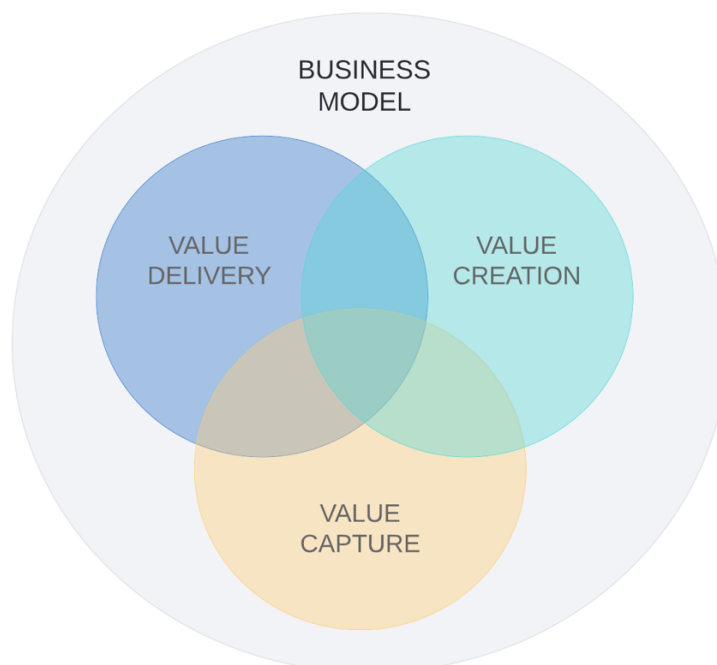


Figure 5. Business model theory (Osterwalder & Pigneur 2010).

Business model theory has been used in business studies for decades. Its origins can be found in the literature of Drucker (1956). Although only in the last decade has it achieved some relevance in the academic and professional world. The business model concept has become more attractive due to new modern Internet-based companies. Many of these new companies offer innovative services and products to end customers, meaning their business models must allow them to obtain value through innovative business synergies and not only from selling final products or services.

During the past decade, organizations have realized the importance of analysing their business models to understand where the competitive advantage lies. Thus, companies from various industries have changed the game's rules through drastic changes in traditional business models. Some examples of great success can be found in the textile sector, for example, the cases of Zara, Mango, and H&M with their fast-changing fashion trends and low-cost clothing shops worldwide. In the airline sector, good examples are low-cost airlines such as Ryanair and EasyJet, which have impacted the airline industry. The finance industry is also rapidly developing, with new fintech start-ups and blockchain technology disrupting the global financial sector. Many successful companies, including former start-ups, have radically modified the traditional business model in their industry for good.

According to Osterwalder and Pigneur's view (2010), a BM can be created by answering the following three fundamental questions:

- What tools does the corporation employ to run its operations? - To specify resources and model components.
- What connections do these resources have with one another? - To specify the relationships between model components that support efficient operation.

- How can value be produced, transferred, and gathered? - To explain the meaning and purpose of business.

All in all, the business model plays a crucial role in recognizing unmet consumer demands, designing the organization and technology that will meet them, and, finally, collecting value from the activities. The paradigm won't last very long, at least not by for-profit businesses, if creation, delivery, and capture are not appropriately balanced. The business model describes the industrial logic by which clients are satisfied, and profits are generated. (Teece, 2010)

2.3.1 Components of a business model

The business model construct is a widely studied topic in business literature. Academics have carefully identified the interrelated elements that make up a good business model (Osterwalder et al., 2009). Business partners, suppliers, clients, and the internal operational team are just a few variables that might affect how well a company operates (Hedman & Kalling 2003; Demil & Lecocq 2010). Before making any potential modifications or enhancements, choosing the suitable model to identify the essential elements can help to understand how the organization operates (Demil & Lecocq, 2010). Additionally, when too many variables need to be considered, this might provide a suitable business model innovation and lessen the complexity of the transformation process (Hedman & Kalling, 2003).

According to the Boston Consulting Group (2009), a business model can be formed of anything between two and four components. The Boston consulting group (BCG) has identified two essential elements in a BM. The value proposition and operating model. Each of these components has three dimensions, as shown below.

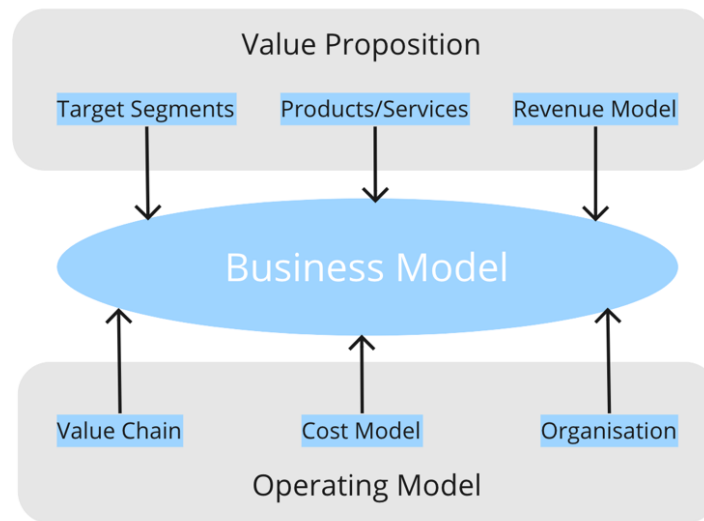


Figure 6. The Main Elements of a Business Model (Boston Consulting Group, 2009).

2.3.1.1 Value Proposition

A value proposition is the foundation of a business model, which describes how value creation is structured. Such a proposal addresses an issue or tries to meet customers' unmet needs (Jonker & Faber, 2021). As seen in the figure above (Figure 6) retrieved from BCG (2009), there are numerous varieties of value generation. Some of them are listed below:

- Target segment: Who are the customers and what are their needs?
- Product or service offering: Which products can solve the needs of the customers?
- Revenue model: How does the business make money?

2.3.1.2 Operating model

An operating model is an engine that visualizes how a business is conducted. It covers everything, from the company's product sourcing practices to the organization of its functional regions and departments. However, as seen in the figure above (Figure 6)

retrieved from BCG (2009), businesses also need to consider various operating model aspects. Some of them are listed below:

- Value chain: How is demand of the product/service met? What are the internal processes? What can be outsourced?
- Cost model: How to generate profitability? What are the costs?
- Organizing: How is the workforce trained and developed to enhance the organisations key competencies?

Furthermore, Schön (2012) offers a similar list to that of Osterwalder and Pigneur (2010) regarding the main components of a business model. However, the list made by Schön has been updated and divided into three primary categories. The list is as follows:

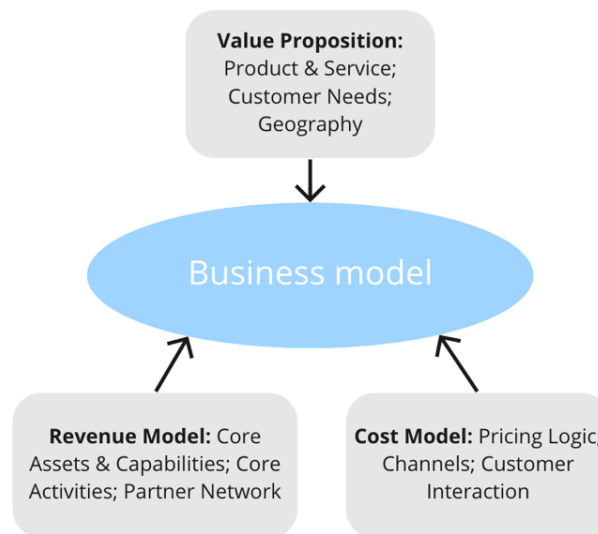


Figure 7. List of components of the business model (Schön, 2012)

The importance of the value proposition in the business model is also emphasized, along with other elements like resources, processes, and the profit model (Richardson 2008, Johnson 2008). Afuah (2003) also created a four-part business model that considers the effects of internal resources, positions, costs, and external industrial variables to provide

lucrative and unique operations. In Afua's model, the core element is compiled by the activities of the organisation which create and sustain profitability (see figure 7 below).

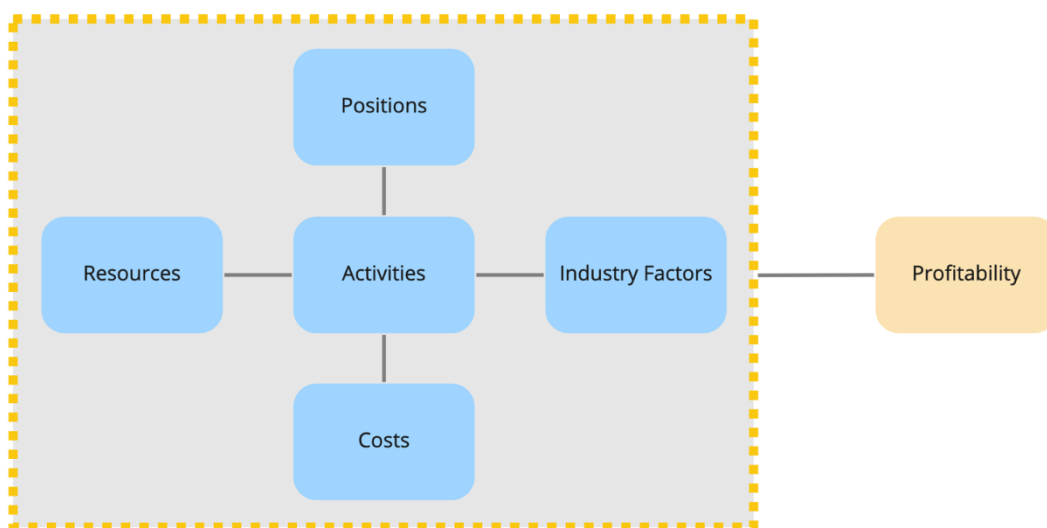


Figure 8. The four components of a business model (Afuah, 2003).

The structures of business models vary depending on the company and industry. Therefore, there is no single suitable model. Moreover, a proven model in a specific field may not work in other areas and copying a competitor's business model word for word may not turn out to be profitable. Instead, a list of general common characteristics of a good business model can be listed. They are, for example (Kutvonen 2012):

- Customer-centricity, where the customers are at the centre of operations and value is created directly for them.
- Core elements in a business model that other companies cannot do or copy easily.
- Clarity in the business model is the basis of the entire company's operations, and a confusing business model serves no one.

During the start-up phase, businesses often follow a particular business model. Then, when faced with market challenges, companies seek to improve their operations through initiatives like internal cost reduction, product upgrades, new products, new

processes, and so on (BCG, 2009). In this sense, start-ups are known for making drastic changes and testing out novel and disruptive strategies to gain a competitive advantage in the market (Peñarroya-Farell & Miralles, 2021).

From a business standpoint, the most fundamental improvement method is to innovate on the business model side while keeping the consumer in mind (BCG, 2009). A customer-driven innovation approach will succeed as a practical means of improving a business. Business model innovation is a process that is dynamic, cyclical, and characterized by open innovation dynamics rather than linear (Uttama, 2021).

A firm's success depends on the design and implementation of the business model just as much as it does on the choice of technologies and the operation of tangible assets and equipment, as is evident from the link to profitability. The business model offers a strategy for turning technological advancement, expertise, and tangible and intangible assets into revenue streams. (Teece, 2006)

2.3.2 Why business models are important?

Every firm requires at least one reliable business model, whether a start-up or an established veteran company, to thrive. A business model is a strategy for earning revenue. In addition, business models can assist in ensuring that an organization remains healthy and delivers value to customers. According to Teece (2010), a good business model allows for the following:

Long-term planning: The business model is the basis on which a company is created and expanded, so it is a step before developing the business plan. It projects the company into the future by determining the business objectives and the ways to achieve them. It allows for defining the organization's key activities and resources, the market segment it will focus on, how it will manage its relationship with customers, and what channels it will use.

Risk management: The business model involves designing small but thinking big in a way that helps anticipate potential roadblocks and minimizes the chance of expensive errors. In addition, it allows for planning the cost structure and sources of income, designing a business with the potential to continue growing.

Competitive advantage: A business model is an enterprise architecture that converts innovation into economic value. Finding an innovative and scalable business model, such as those implemented by technology start-ups such as Spotify, Cabify, or Netflix, allows you to have a significant advantage over the competition, attracting customers thanks to its differential value.



Figure 9. The importance of a business model (Teece, 2010).

2.4 Business model innovation (BMI)

Considering the various ways of conceptualizing a business model, it can be said that business model innovation describes how an organization adjusts its own business models. Typically, this innovation reflects a fundamental change in the way a company delivers value to customers, whether through the development of new revenue streams or distribution channels (Landry, 2020). Furthermore, Teece (2010) describes business model innovation as the conscious change of an existing business model or the creation of a new one. Skarzynski and Gibson (2008) add that, BMI fundamentally consists of creating new business models or increasing strategic variety over existing business models in a way that benefits customers and end users of products and services.

Business model innovation has the potential to increase an organization's success with existing products and technologies by crafting a compelling value proposition that can drive a new business model to scale a customer base and create a lasting competitive advantage (Teece 2010). According to Teece, the main driver of business model innovation is the need for improvement. Many new business models are born as a consequence of satisfying customer needs that have previously not been met.

Business model innovation does not necessarily have to do with the discovering of new technology or creating a new product or service. Instead, it can be related to how an existing product or service is delivered to the customer. It can also be related to how already existing services or products are combined to create extra value for the customer. In fact, among thriving companies, Fleisch (2012) identified four business model innovation strategies. Fleisch discovered that only roughly around 10% of BMI cases involve creating entirely new business models. The other 90% include adjusting, combining, and replicating existing business models to meet customer needs and achieve competitive advantage.

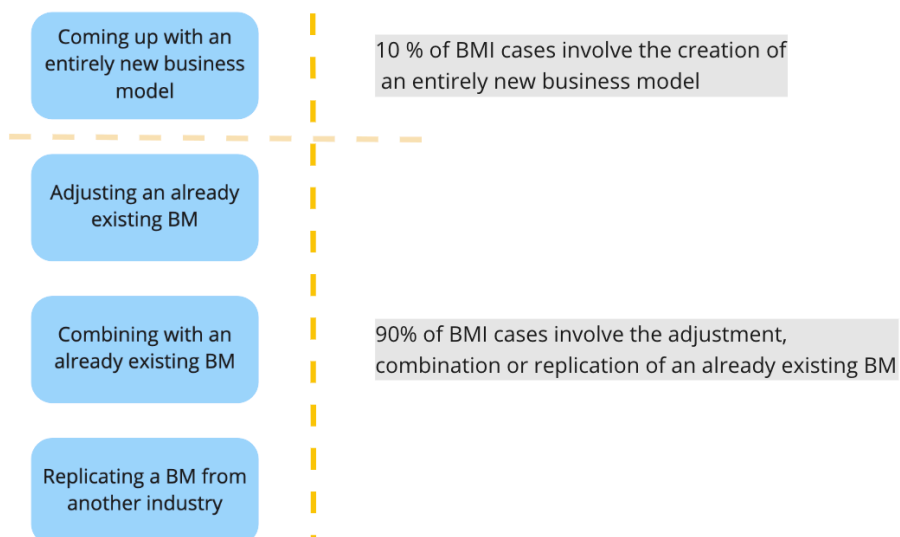


Figure 10. Business model innovation strategies (Fleisch, 2012).

Due to the emergence of new technologies and the invention of new products, business models must be improved and converted into more adaptable models. Thus, implementing innovation in the business model is crucial when a company wants to generate a long-term sustainable competitive advantage and explore new ways of organizing its business and balancing costs and revenues to develop a sustainable result (Behera, 2017).

Among the conceptual connections between technology and BMI, numerous authors link BMI to opportunity exploitation (Khefacha & Belkacem, 2016), value migration (Hacklin et al., 2018) dynamic capability (Ritter & Lettl, 2018; Teece, 2018), and networking (Ritter & Lettl, 2018; Snihur & Tarzijan, 2018). Furthermore, the adoption of new technologies is said to facilitate long-term economic progress through a dynamic process of creative destruction (Khefacha & Belkacem, 2016). As a result, a business model is used to create and capture value (Chesbrough & Rosenbloom, 2002; Teece, 2010) by developing (Fjeldstad & Snow, 2018), experimenting with (Bojovic et al., 2018), renewing (Foss & Saebi, 2017), and commercializing (DaSilva et al., 2013) them.

2.4.1 Why business model innovation is important?

The competitive business world demand that companies conduct intensive research, evaluations, and changes in their business models to not only survive but also to acquire greater participation in the market, deliver value to the client, and receive income in return (Beckmezi et al 2013). According to Hamel (2002), Innovation in business models has become one of the focus points of strategic renewal efforts for companies worldwide. Furthermore, an IBM report called the “Global CEO Study” by Chapman (2006), one of the major concerns of top management in various industries was said to be, the search for innovation in their business models.

Business model innovation allows a company to take advantage of changing customer demands and expectations. There are many examples of the success of this strategy,

such as Amazon, Netflix, Apple, Uber, and Ford Motors, to name a few, demonstrating that if organizations do not innovate and change business models, the probability of being displaced by newcomers with increased capacity to meet customer needs is very high (Landry, 2020). According to Landry most new companies listed in the Fortune 500 are born due to innovative business models within established sectors.

The successful implementation of business model innovation allows companies to adapt to changes in the market and survive against fierce competition from other companies. Furthermore, business model innovation enables the improvement of products and business strategies to create value for its stakeholders, which is the driving force for value creation. Therefore, from a simple point of view, it can be concluded that business model innovation is one of the most vital tools to build a business that creates maximum value for all stakeholders: customers, shareholders, employees, and the whole society in general. (Nieminen, 2020)

2.4.2 Benefits of business model innovation

Business model innovation is a flexible tool to build a great business independently of the industry, so most of the fastest growing and most disruptive companies' growth include business model innovation as a key part of their innovation mix (Nieminen, 2020). According to Nieminen, below are some of the key benefits of business model innovation:

Table 1. Advantages of business model innovation (Nieminen, 2020).

Growth	Performance
Helps organisations reach their market potential	Helps in reducing operational costs
Helps organisations discover new markets opportunities and expand its portfolio	Enhances organisational performance

Enhances the value perception from the customers perspective	Drives competitive advantage for an organisation
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A positive correlation has been established between the operating margin growth and the company's efforts to innovate in its business model. Studies that were carried out over a five-year examination period concluded that companies with higher-than-average success in the market invest over 30% of innovation resources into business models (Eschberger, 2021).

Furthermore, literature studies demonstrate that BMI benefits businesses. For example, Cucculelli and Bettinelli (2015) discovered that enterprises that adjusted and innovated their BMs over time experienced a beneficial effect on venture performance.

2.4.3 Business model innovation for start-ups

Various researchers have introduced different models for business model innovation over time. This section will help to understand current methods better and serve as an illustration of models that can be applied to start-ups. Many studies have focused on organizational issues and outlined potential resources, capacity restrictions, and success factors. Still, they do not offer a (generic) process model that supports BMI in practice, according to Steinhöfel et al. (2016). Steinhöfel et al. (2016) conducted a study that introduced three already existing models. The models were:

- The business model canvas by Osterwalder and Pigneur (2010)
- An integrated business model by Wirtz (2013)
- The business model navigator by Gassmann et al. (2013)

2.4.3.1 Business model canvas

Introduced by Swiss business theorist Alexander Osterwalder and a computer scientist called Yves Pigneur in 2010, the Business Model Canvas (BMC) is a tool that helps companies design new business models or develop existing ones.

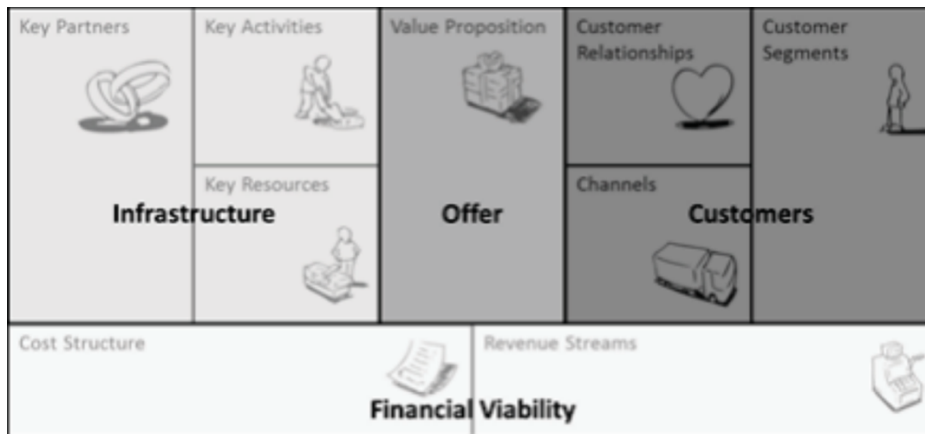


Figure 11. The BM canvas (Osterwalder and Pigneur 2010).

The business model canvas allows a company to visualize business models, spot weaknesses, and test new features. A visual model is preferred by researchers to comprehend cause-and-effect linkage, the interactions between various components, and commitment to the final strategic decisions in the business plan. Because of its careful and thorough assessments of many businesses model facets, matching with all the above efficiency and value framework, it has been the first detailed business model design accepted by many enterprises and academics in the academic world. The business model canvas is a visual map divided into nine parts, each describing one of the elements that make up a company. The nine parts are as following:

Table 2. The nine parts of the business model canvas (Osterwalder & Pigneur 2010).

Customers & partners	Partnerships, value & activities	Finances & key resources
Customer segments are the target groups of people that a company wants	Key partnerships are business alliances that support a company's operations. These can be suppliers of	Cost structure defines the expenses incurred from operations to deliver value to customers

to reach and sell their products to	raw materials or companies providing different types of services.	
Customer relationship defines how a company establishes its relationships with the different customer segments.	Key activities define what services a company will perform to fulfil the value proposition.	Revenue streams define how a company earns money from various sources of income. What value are customers paying for?
Channels is the process of communicating with the customers and conveying the promised value	Value proposition is how a company defines the value they bring to the market and what will create value for their customers.	Key resources refer to the resources needed to perform the key activities. Key resources are, for example, human, intellectual, and financial resources, among others.

2.4.3.2 The Integrated business models

According to Wirtz (2013), a business model (BM) is a highly simplified and compiled picture of a company's essential activities that illustrates how marketable information, goods, and services are developed through a value creation component.

To accomplish the main objective of creating and preserving competitive advantage, a strategy component and customer and market components are taken into account. Based on this knowledge, Wirtz describes BMI as the design process for developing a brand-new business model (BM) that strives to create or maintain a sustainable competitive advantage and is supported by an adaption of the value proposition and value constellation. Steinhöfel and colleagues (2016).

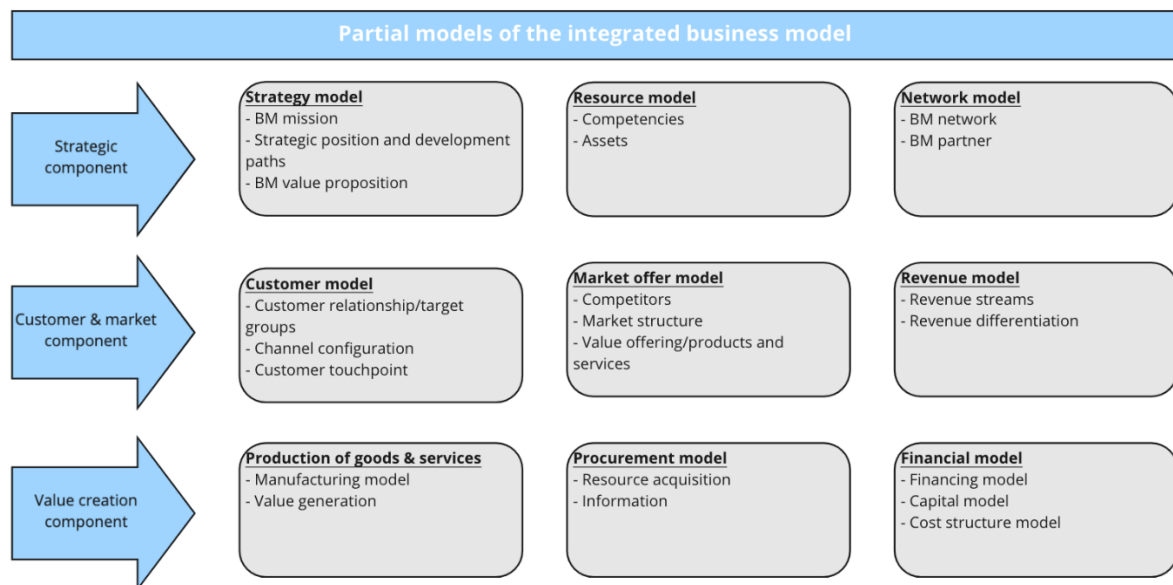


Figure 12. Partial models of the integrated business model (Wirtz, 2013).

Wirtz (2013) mentions that a BM's composition depends on the organization of its individual "partial models." Therefore, he distinguishes between strategic partial models, partial models related to customers and the market, and partial models related to value creation (see figure 12). As a result, a network of interconnected structural components is created. Therefore, the individual elements and their corresponding components, cannot be considered independently. Instead, their causes and effects must be applied to the complete range of partial models (Wirtz, 2013).

2.4.3.3 The business model navigator

According to the founders of the integrated business model, a business model is characterized by who the customers are, what is offered to them, how a value proposition is created and how revenue is generated (Gassmann, Frankenberger, and Csik's (2013).

Furthermore, the founders mention that when two of these four so-called dimensions are altered, business model innovation occurs. Their magic triangle (see Figure 6) illustrates their philosophy, which consists of the client segment, value proposition, value chain, and revenue model. Improving one of the corner points requires adopting the

other two. A BM is understandable and provides the foundation for innovation thanks to the four questions presented in the image below and the detailing of the four dimensions.

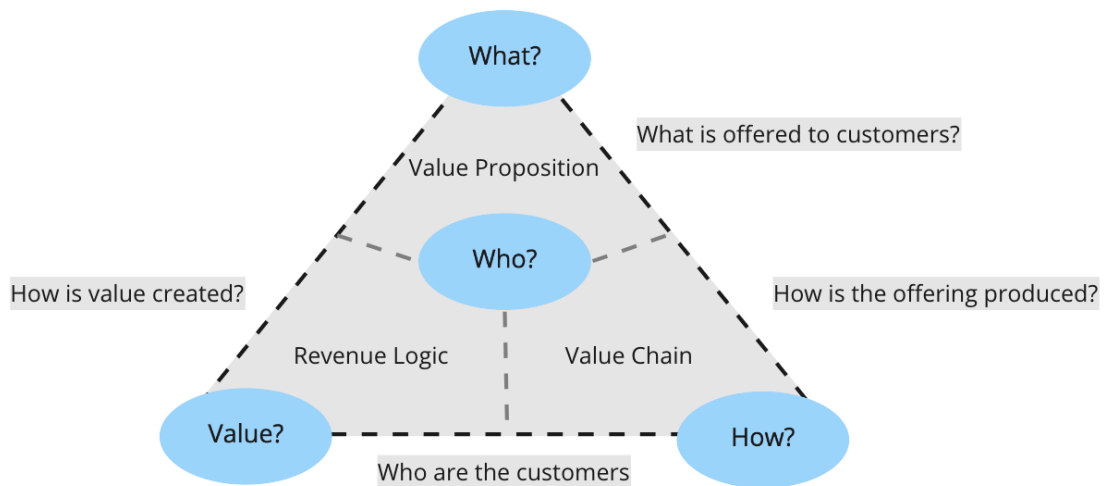


Figure 13. Magic triangle and four dimensions of a BM (Gassmann et al., 2013).

2.5 Technological innovation (TI)

According to Diaconu (2011), advances in technological innovation have rapidly grown in past decades. As a result, technology has revolutionised the daily lives of all humans. From the creation of the internet to the automation of daily tasks and industrial processes, life on earth has quickly developed into a more technologically dependent world for both businesses and regular people.

As shown by the connection to earnings, a company's ability to succeed depends just as much on the development and application of its business model as it does on the choice of technologies and the operation of its physical assets and machinery. The business model provides a pathway by which technological innovation and know-how combined with the utilization of tangible and intangible assets are converted into a stream of profits. (Teece, 2006)

Technological innovation consists of the implementation of new ideas. This novelty involves businesses and organisations presenting new products or services in the market with new or enhanced technical characteristics. In addition to new products and services, technological transformations can also be seen in an organisation's internal processes. Thus, the changes introduced in the likes of production, financing, or marketing of a product or service are also considered technological innovation. (Allen, 2000).

Realized technological innovations are new products brought to the market (product innovations) or new production methods introduced (process innovations). A new product or process is an innovation that fulfils the mentioned conditions from the company's point of view, they need not be new to other companies or markets. This being said, technological innovation is based on new technological developments, combinations of existing technologies, or the use of other knowledge acquired by the developer (Allen, 2000).

The technological innovations implemented by an organization usually originate from research and development (R&D). This term refers to investments in scientific and technical knowledge to achieve new products, materials, or processes. Research and development activities are characterized by creativity and novelty that strive to improve an organization's results. However, not all companies adopt an innovation model based on research and development. Therefore, technological innovations can be both random and planned. Diaconu (2011) reveals that R&D is more relevant for companies close to or on the technological frontier.

Furthermore, technological innovation can nowadays be seen as the natural and desirable reflection of the values of a technologically progressive society (Wardynski, 2019). Therefore, it is important for technological innovation to reconcile with business model innovation if companies desire to efficiently capture and create value for their customers.

2.5.1 Why technological innovation is necessary?

In recent years, technological innovations have been identified as critical elements of economic growth. As a result, technological innovation is considered the cornerstone of almost every organizational development project. Worldwide, the importance of technological innovation has been growing due to advanced investments in technology policies and improvements in research and development funding structures. (Ruuskanen, 2014)

United Nations Technology and Innovation Report (2021) "Catching technological waves" urges all developing nations, and their businesses, to prepare for a period of profound and rapid technological change. Furthermore, the United Nations states that new technologies drive the most significant innovations directly or indirectly. The report by the United Nations also mentions that frontier technologies such as artificial intelligence, robotics, and biotechnology show tremendous potential for sustainable development.

The confluence of technological advancement has made it challenging for managers to predict the future business environment and how best to allocate the resources required to establish desirable business models (El Sawy et al., 2016). Big data analysis offers one potential remedy, allowing managers to respond to current technology development trends and predict how they will change in the future (Sebastian et al., 2017). However, due to the unpredictability of technological advancement, incumbent businesses must plan resources that will allow them to foresee the confluence of technical advances to keep their position as digital leaders (El Sawy et al., 2016).

2.5.2 Types of technological innovations

According to GIS Innovation Center (2015), there are generally three different types of innovations: disruptive, incremental, and radical. They may change depending on the market, niche, brand essence, services, and items provided.

- **Disruptive:** The technology is entirely new and allows companies to enter new markets with advanced products, services, or processes. In addition, disruptive innovation is capable of creating entirely new markets. Implementing an alternative set of user values establishes may establish a new market that eventually surpasses the current markets (Christensen & Bower, 1995). For example, the Internet was something that had never been seen before and is considered a disruptive technology that established various new markets and industries.
- **Incremental:** These technologies improve the currently offered products, services, or processes. In addition, they can improve price/performance rate through adjustments to current technology (Gatignon et al., 2002). In other words, it is an innovation based on something already existing. For example, a web bank that uses the Internet.
- **Semi-radical:** Radical innovations use new technology to alter a company's course and give customers more advantages than previously available in the market (Gatignon et al., 2002). It refers to a change in the perception of technology. For example, social media can be seen as an advertising channel instead of being considered something irrelevant in the business world.

2.5.3 Benefits of technological innovation for businesses

Technological innovation has the capability of providing better products and services and delivering higher business sales and revenue. In addition, access to the most recent technology can empower employees and raise organisational satisfaction levels. Businesses can use innovative technologies to operate effectively and efficiently at the

forefront of technology. According to (Joseph, 2018), the four key benefits of technological innovation are:

Table 3. Benefits of technological innovations (Joseph, 2018)

1	Efficiency	Technological innovation delivers new products, services, and processes that can improve an organization's efficiency with enhanced technical solutions. For example, cloud computing allows fast access to data and flexibility inside an organisation, meanwhile reducing downtime and increasing the efficiency of employees and business operations.
2	Market growth	Technological innovation allows companies to expand globally. For example, using websites, applications and e-Commerce will enable business owners to offer their products and services to customers worldwide. The same happens with social networks, allowing businesses instant consumer feedback.
3	Productivity	Technology innovation has automated the company's financial, commercial, and human resources processes, reduced manual work and man hours, and increased worker productivity. In addition, technological options such as ERP Software allow increased real-time control of an organization's operations.

4	Communication	Technological innovation ensures better communication between businesses and customers. For example, technological innovation has provided new business communication and work methods during the Covid pandemic with Zoom and Microsoft teams and similar services.
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2.6 Start-ups

A start-up is an emerging company dominated by an innovative business philosophy that stands out for being scalable and dynamic. This doesn't mean that all newly founded businesses are start-ups. However, all start-ups are newly formed businesses with a potential for significant business opportunity and impact.

During the past decade, a lot of business schools have developed their academic definitions of what a start-up is. Steve Blank (2012), who is a successful businessman and lecturer at business schools like Stanford, Berkeley, and Imperial College, came up with the description of a start-up that is most commonly used today. The following is the definition: *"A start-up is a transitory organization created to find a repeatable and scalable business strategy."* While a company is *"a permanent entity created to carry out a repeatable and scalable business strategy."*

The critical distinction between a start-up and an established business is that while established businesses already have an appealing business model and are focused on effectively implementing it, start-ups are still looking for one. The needs and characteristics of both types of organizations are impacted by this distinction (Blank, 2012). According to Blank (2012) the classification for analysing how small businesses change and develop into large corporations looks like this:

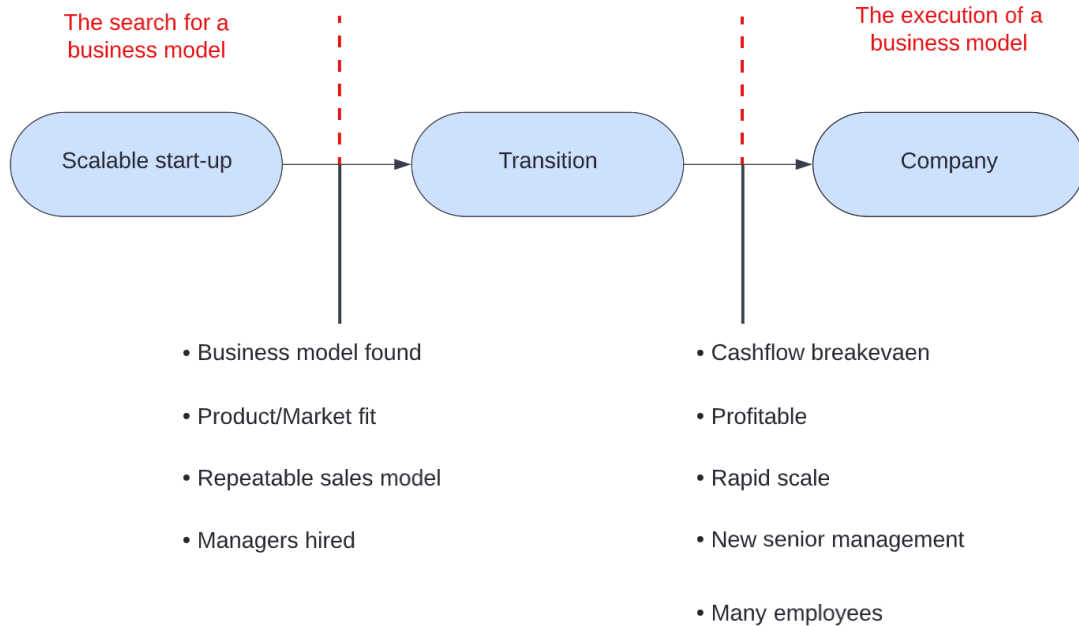


Figure 14. The transition of a start-up into a regular company (Blank, 2012).

The globalization of information and communication technology and the process transformation of production organizations, where businesses increasingly operate in networks, has fuelled growth in the start-up industry. By assisting in introducing novel products and knowledge-intensive services, start-ups contribute to the economy's structural transformation. They also support innovation, stimulate the economy's productivity, and create chances for strong economic growth (OECD, 2018).

Technology start-ups are regular start-ups that are employed to create innovative services or goods to challenge the status quo of the market. Due to the current demand for technology, tech firms are increasingly emphasizing innovation, scalability, and growth.

2.6.1 Star-ups and technology

According to data from Statista (2021), the fintech sector employs 7.1% of the world's start-ups. Following closely behind are the industries of life sciences and healthcare (6.8%), artificial intelligence (5.0%), gaming (4.7%), adtech (3.3%), and edtech (2.8%). Based on this knowledge, it is evident that current start-ups are drawn to the internet and digital technology.

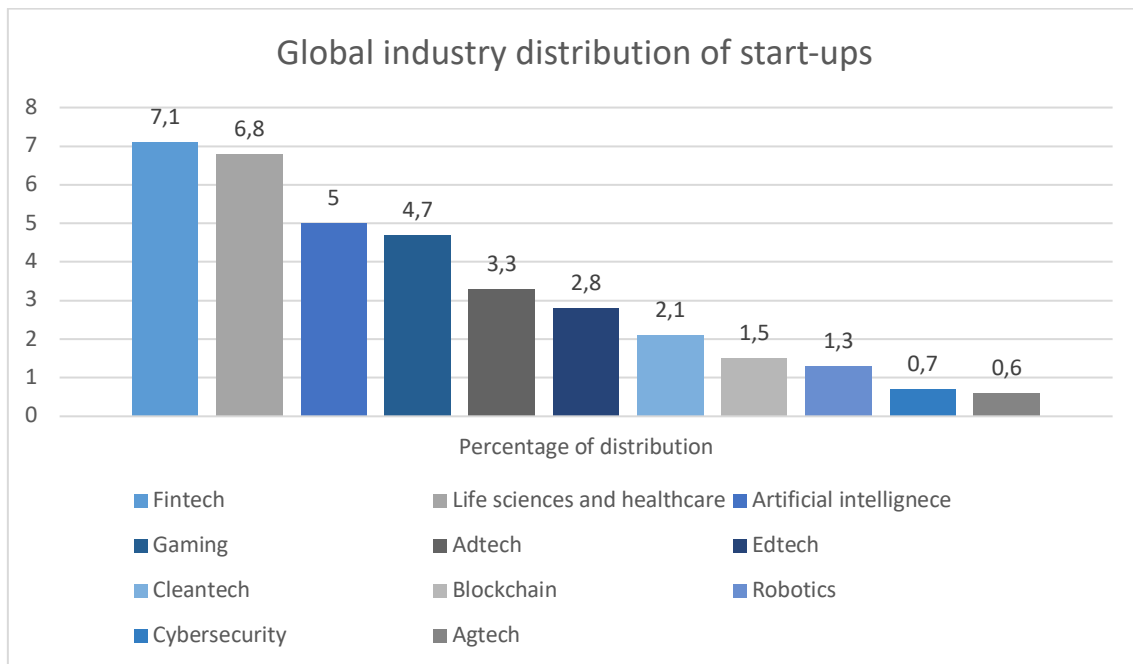


Figure 15. The global industry distribution of start-ups (Statista, 2021).

As seen in the figure above, in terms of industries, Fintech, Internet Software & Services, Artificial Intelligence, and Healthcare are the top sectors that the start-ups are focusing on. Although, of course, Artificial Intelligence and Healthcare have grown even further in the post-pandemic period, this distribution may shift in the future. However, all these industries will have one thing in common: they will all be driven by technology-based advances. (Statista, 2021)

The identification and capitalization of technologically associated human resources and business possibilities are practices that fall under technology entrepreneurship (Dorf & Byers, 2005). As a result, entrepreneurial resources, such as financial and human

resources, aid business owners in identifying, assessing, and exploiting opportunities (Kosa & Mohammad, 2017). Therefore, these resources are essential for enhancing current business models or developing entirely new ones (Fjeldstad & Snow, 2018).

According to Khefacha and Belkacem (2016), technological entrepreneurship involves developing technologies and applications, recognizing, and matching technologies, and starting a business based on technology. As a result, the combination of technology entrepreneurship and business models is recognized through value creation and capturing (Muegge, 2012). Furthermore, by considering this combination, business model innovation is defined by value networking (Roome & Louche, 2016), generating entrepreneurial chances (Markides, 2006), and employing technological entrepreneurship through technology integration.

To commercialize technological innovation, Roome and Lounche (2016), state that the four fundamental aspects of business models that emerge from traditional literature, such as (Ostewalder & Pigneur, 2010), need to be significantly improved. These are value proposition, value network, value capture, and value creation and delivery. In addition, the alignment of a proposed value, segmentation goals, revenue mechanisms, value chains, and internal structures are required, according to a recent study by Foss and Saebi (2017). Therefore, BMI creates inventive alterations of these imposed complementary relationships to identify the innovation (Cosenz & Noto, 2018). Because of this, business models need to be modified and enhanced as technology advances.

2.7 The impact of technological innovations on businesses and business models

The information, processing, communication, and connection components of digital technologies are fundamentally reshaping company strategies, business processes, firm capabilities, products and services, and crucial inter-firm linkages in extended business networks (Bharadwaj et al., 2013). As catalysts for new business model development,

digital technologies have gained a lot of attention (Visnjic et al., 2016). A company can convert its traditional business into a digital business by utilizing modern technological innovations. In addition, technological innovations have made it easier for businesses to break down functional and process silos and remove organizational boundaries, which is one of the dimensions of organizational agility (Bharadwaj et al., 2013). (Doz and Kosonen, 2010).

Business model innovations have resulted from the numerous options that digital technology has given businesses to communicate with their clients (Khanagha et al., 2014). For instance, Martia Abraham, Chief Marketing Officer of ZILINGO, noted that the fashion business has grown more dependent on digital technology and that every week it appears fashion is changing, and it's all occurring through social media platforms.

Furthermore, digital innovations like social media, online marketplaces, and electronic payments have allowed small businesses to expand quickly and affordably, supporting internationalization (Huang et al., 2017). At the same time, new technologies have made it possible for incumbent firms in danger to alter their industry positioning (Kaulio et al., 2017). With the aid of digital technologies, the competence gap between large established organizations and small businesses that have just joined the market or industry narrows, resulting in more competitive markets (Teece and Linden, 2017). Digitalization can weaken the competitive position of even large-sized incumbent enterprises as an entrepreneurial process that makes it easier for businesses to reassess their current business models (Huang et al., 2017)

Numerous innovative business models that serve as the cornerstone of organizations like Amazon, Google, Facebook, and eBay have been made possible by the emergence of online markets and digital business models. Today's large start-up and innovation pace, which depends on new business models, demonstrates the applicability of the business model concept in the context of digital technology. (Wirtz, 2019)

Businesses face many challenges in incorporating technological innovations into their daily operations because of various organizational and resource problems (Leih et al., 2015). For example, some years ago, less than a third of managers in traditional businesses were actually prepared to use new digital technologies (Berger, 2015). However, if companies successfully integrate digital technology into their daily operations, businesses can reach several advantages. Such as improved resource utilization expanded business models (Kiel et al., 2017), improved innovation capability (Bouwman et al., 2018), improved performance (Bouwman et al., 2018), and the potential to implement multiple business models (Li, 2018).

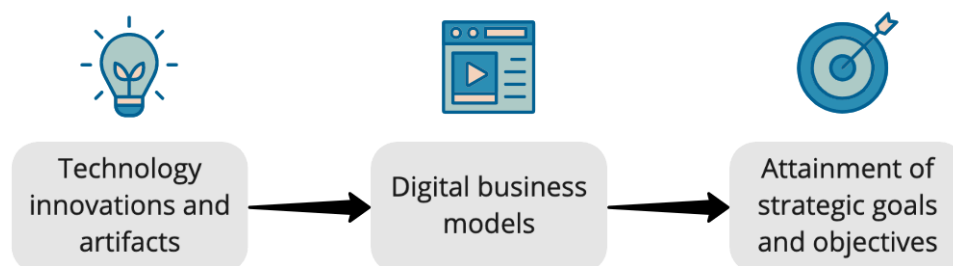


Figure 16. The connection between technological potential and monetary value (Chesbrough and Rosenbloom, 2002).

As shown in Figure 14, the BM denotes a mediating construct between technological objects and the accomplishment of strategic aims and objectives, including the development of fundamental economic value. According to Chesbrough and Rosenbloom (2002), an effective business model creates a heuristic logic that connects technical potential with the realization of monetary value. A similar claim is made by Kamoun (2008), who claims that the business model becomes the blueprint of the way a corporation develops and extracts value through new services, products, or innovations. According to this perspective, Yuan and Zhang (2003) contend that the BM that underlies technical products is what determines their success and what makes hi-tech possible.

As businesses create new methods for delivering, capturing, and creating value, digital business models are beginning to emerge. The resources of established businesses and new entrants and the firm's location in the supply chain have a significant role in the implementation and applicability of digital business models. The major factors influencing the adoption of digital business models usually surround the maximizing of profits through client interaction and the reduction of costs. (Chesbrough and Rosen-bloom, 2002)

Modern digital technologies allow unattended customer access to information and services, enhance B2C and B2B interaction, foster efficiency, and effectiveness, and serve as the technological foundation for e-markets. As a result, digital business has quickly emerged as a solution innovation that can offer a variety of advantages (Schneider, 2017). Additionally, the nature of its digital platform for B2B and B2C interaction encourages uniformity and reflects customers' desire for greater accountability and transparency.

According to the literature review, digital business models are vital to the global economy because they are highly relevant in addressing modern customers' needs and desires. Furthermore, digital business models seem to provide a competitive advantage for businesses dealing with customers through digital platforms. However, traditional theory regarding business models and business model innovation can also be applied to more modern business models as well.

The core idea of value creation, delivery, and capture is still relevant in modern technological business models. However, a deeper focus on the technological aspects of a business model is vital. Whether business model innovation is born through managerial decisions and experiments, as Chesbrough (2007) mentions, or directly through immersive technological innovations, as commonly seen in the start-up industry, requires further

empirical examination. However, several views of business model innovation likely are applicable in different industries and organizations.

That being said, a digital business model can be, for example, constructed by combining traditional business model concepts and combining them with a technology aspect to the business model. For example, a digital business model could have the following four main components: The value model, the technological model, the distribution model, and the financial model, as proposed by Gennaro Cuofano (2022).

3 Research methodology

This chapter introduces the case company. Furthermore, it demonstrates the research hypotheses, strategy, and method used in this thesis to explore the link between technological innovation and business model innovation. Moreover, this chapter presents the data collection method and provides insights into the data's validity and reliability.

3.1 Introduction to the case company

Lainappi Oy is a Finnish tech start-up company that was founded in 2020. The company's core business operations consist of an innovative household item rental service offered to consumers and business customers. The innovative service works through a mobile application and a rental box. On the mobile application, users can rent items between each other or use the rental box services if necessary. Everyday items such as tools, sports equipment, clothing, and much more can be rented through their application.

Lainappi Oy has developed an easy and sustainable way to make renting achievable and affordable so that many people can enjoy the unique experience. One of the start-up's main ideas is to promote the sharing economy and green economy by delivering a service where consumers can rent items instead of making unnecessary purchases, negatively affecting the environment.

In addition to the environmental solution of sharing and decreasing the need to buy unnecessary items, Lainappi offers its users a chance to save money by renting items from other users on the app instead of buying new items from the store. Furthermore, Lainappi offers its users a chance to make money by providing things to rent on the app.

3.2 Research methods and strategy

To understand and explore the characteristics of business model innovation and technological innovation, this thesis uses qualitative research methods combined with an empirical case study. Furthermore, literature in the form of books and articles is used to support the theoretical framework of the study.

Considering that the subject or research is more exploratory in nature, a qualitative technique seems suited to address the suggested research questions (Yin, 2009). Additionally, qualitative research is advantageous for analysing new linkages, abstract concepts, and operational definitions and exploring implicit assumptions as opposed to conventional quantitative empirical instruments (Bettis, 1991; Weick, 1996).

Furthermore, the inductive case study approach is a suitable tool for building theory when there is little previous theorizing about a subject (Eisenhardt, 1989). In the viewpoint of Yin (2009), case studies are particularly well suited to comprehending modern complex social phenomena in their actual settings. In addition, Yin (2009) mentions that case study research can be used for explanatory and exploratory purposes.

The qualitative research is conducted as a structured questionnaire with only open-ended questions to gain in-depth knowledge of the phenomena being researched. Lainappi Oy employees, founders, and board members were targeted with this questionnaire (Google forms) to give their opinions and convey their perceptions on the research topic.

3.3 Data collection

In this thesis, the primary data was obtained through a questionnaire directed toward the management team and founders of Lainappi. Lainappi also submitted a few documents about its business models and canvas, but those weren't enough to comprehend

them completely, so they were added as secondary data. This approach fits the needs of this study since this thesis aims to explore the link between technological innovation and business model innovation to gain a better understanding of the topic and provide theoretical and empirical evidence for further research on the topic.

Questionnaires are a standard research tool used by researchers to get feedback from consumers, customers, or any other targeted audience relevant to the research. For a questionnaire to obtain relevant, accurate, and valuable results, it must be designed to allow for honest feedback and responses that are easy to measure and interpret. It is also necessary to avoid guiding respondents to a specific reply. Therefore, questionnaires should also be neutral from all points of view. (Silverman, 2001)

The primary data regarding Lainappi's business models and technology choices were gathered with a Google forms questionnaire designed for the founders and board members of the case company. A Google form questionnaire removes the need for transcription, it provides good visualization of data, and the method was requested by the case company because of its flexibility. This allowed the respondents to answer the questionnaire whenever they had time to do so. The language used in the questionnaire was English and was conducted via Google forms. The questionnaire contains 13 questions regarding the case company's business models, technology, opinions about the topic, and future sentiments.

For the secondary data, Lainappi provided documents regarding their business models and business model canvas. These documents were used to understand better the case companies' current business models and background.

What is your position in the company?

5 responses

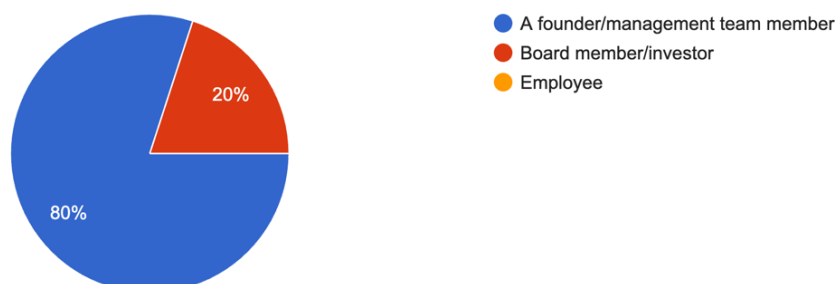


Figure 17. Background of the responders to the questionnaire.

As seen from the figure above (Figure 17), five responses to the survey were received. Each respondent to the questionnaire has been with the company since its foundation (2020). Furthermore, each respondent has prior experience in the business industry and belongs to the management team that leads the development of the company.

3.4 Data analysis

The qualitative data received from the questionnaire conducted has been analysed with the help of thematic analysis. This method of gathering qualitative data focuses on identifying, evaluating, and interpreting meaning patterns. This is one of the most well-known and used qualitative analysis methods (Braun & Clarke, 2006). The thematic analysis provides flexibility in data interpretation, which also helps authors find connections between concepts (Alhojailan, 2012).

The steps in the data analysis process were as follows: evaluation, transcription, coding of the data and identification of patterns and key themes. Data familiarization, coding, theme finding, theme reviewing, theme defining, and reporting are the six stages of the thematic analysis process that Braun & Clarke (2006) developed.

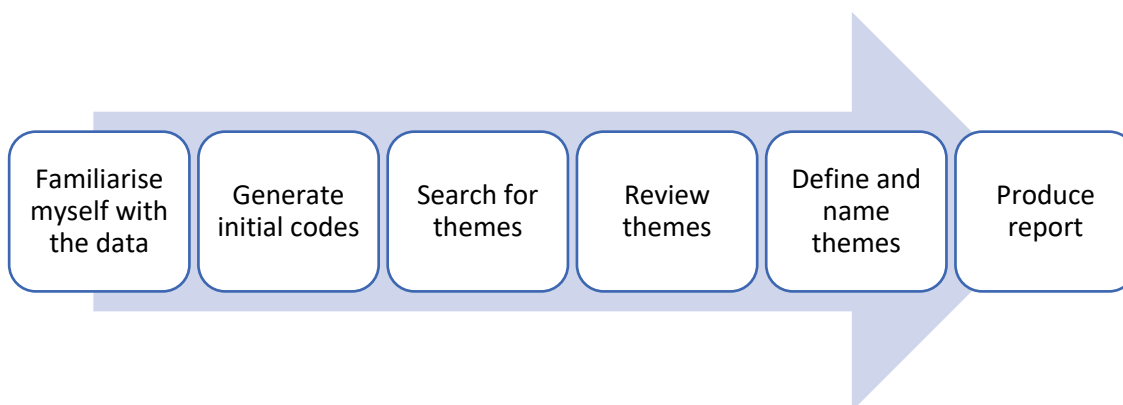


Figure 18. The six stages of thematic analysis (Braun & Clarke, 2006).

3.5 Validity and reliability

The validity and reliability aspects of the study are considered. The validity of research guarantees that it assesses what it sets out to evaluate and that the results obtained from the study can be applied to other pertinent contexts or groups. Furthermore, it requires that the research method is open and transparent for other researchers to understand and replicate. Replicating the results and conclusions of a reputable study should be doable using the same research techniques. (Saunders et al., 2012)

According to Yin's (2009) framework of creating and designing case study research, several rounds of data analysis were carried out before coming to a conclusion with a series of evidence derived from the case study methodology. On the other hand, a thorough case study selection and context-based description ensured external validity. This one-case research, which sought to achieve empirical evidence as described by Siggelkow (2007), produced findings that can be replicated with the case company.

Furthermore, regarding the qualitative research method. The case study questionnaire was reviewed with the majority of respondents before giving their responses. This was done so that all respondents knew the research topic and understood the questions. The responders were not guided in any direction or instructed to answer in any way. This points to the accuracy of information mentioned by (Creswell & Poth, 2018).

According to the validity of this thesis, all research methods and techniques are visible and transparent. Therefore, the study's conclusion and results should be replicated by another researcher. The reliability of this thesis is that all the data obtained during the study are documented and visible. The results of the questionnaire are saved and recorded in google forms. Furthermore, the targeted respondents of the questionnaire are all members of the case study company and well versed and knowledgeable in the topic of the questions.

4 Empirical findings

This chapter presents the empirical findings of the research. First, it introduces the case company's current business models and its business model canvas. Secondly, it explores the different components of Lainappi's business models and presents the technology they currently use. Towards the end of the chapter, the results from the research questionnaire are demonstrated. The information in this chapter is based on the secondary data received from the case company and the questionnaire that was designed for the case company founders and board members.

4.1 Lainappi Oy business models

A company providing goods or services employs a particular business model, either explicitly or implicitly, that describes the design or architecture of the mechanisms used to create, capture, and deliver value. The essence of a business model is to define how the company delivers value to customers, how it entices customers to pay for that value, and how it turns those payments into profit. (Osterwalder & Pigneur, 2010)

Lainappi Oy currently has three active business models. Their core and primary business model consist of a multi-sided platform business model (P2P), which connects household item owners and renters. The company's second business model consists of rental boxes (B2C). Lainappi boxes are self-service rental boxes where consumers can rent household items easily. Lainappi Oy's third and newest business model consists of advertising (B2B) which is conducted through the company's app and rental boxes.

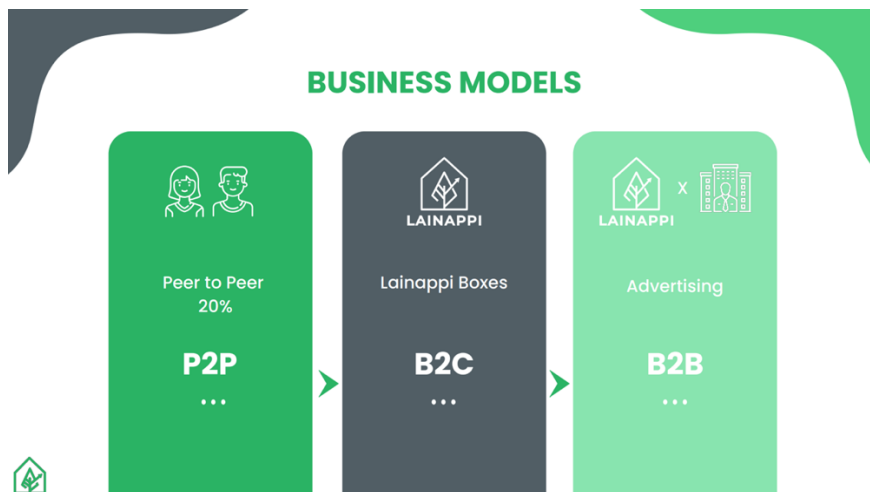


Figure 19. Lainappi Oy business models (Internal material received from Lainappi Oy, 2022).

The main component of technological innovation in the case company's business models lies in using platform technology for the P2P household item rental industry. The household item rental service has previously mainly happened through companies directly or third-party web pages. Lainappi has created a service for users of the platform to rent items between themselves and therefore set their own prices and return policies.

4.2 Peer to Peer (P2P)

Lainappi Oy's peer-to-peer business model is an innovative household item rental service. The peer-to-peer rental service is a sharing platform that connects both owners and renters on the app. As a result, app users can either be renters, owners, or both. This allows app users to rent an item instead of buying it. In addition, renters can make some money from renting out an item they do not need at that instant. Therefore, Lainappi is also providing revenue streams for its users.

Lainappi's value-creation and delivery lie in the two-sided marketplace they provide for their customers on the platform. Furthermore, the value capture (revenue model) in the peer-to-peer rental marketplace business model is run based on the commission model. This means that Lainappi receives a commission for every rental conducted on the platform.

Before the rental industry was controlled mainly by business models based on inventory, but the innovative P2P is a fast-expanding substitute that offers several benefits for its users and business owners.

- Save money from renting and not buying
- Make money from renting
- Reduce waste from over production
- Try before you buy experience
- Experience flexibility and convenience
- Safety, since each rental includes insurance

4.3 Lainappi boxes (B2C)

The Lainappi rental boxes are a new business model concept for Lainappi. The rental box service consists of physical boxes that are available to Lainappi users and business customers. Through Lainappi boxes, businesses can rent their items to regular Lainappi users without having to deal with the renter in person. This provides a quick and efficient rental service for both the user and businesses. Lainappi has a combination of five rental boxes in the hearts of Helsinki and Tampere, with many more to be rolled out in the near future.

This business model delivers and creates value for businesses and regular Lainappi users through the box rental service. Companies can rent their items through rental boxes to Lainappi users quickly and efficiently. On the other hand, Lainappi users can rent these products without needing to pay a hefty price for their purchase. Moreover, the rental box service allows Lainappi users to test a company's products before purchasing them. The value capture on Lainappi's side consists of a service fee acquired from each rental deal. However, businesses will also capture value through this business model with the

rental price obtained from the renters. In addition, businesses gain brand awareness and visibility.

4.4 Advertising

The third and newest business model by Lainappi is a B2B model, which consists of advertising. This business model includes cooperation with other companies, where Lainappi promotes other businesses with ads and promotional material on the Lainappi boxes. For example, Lainappi is currently in collaboration with Fiskars. Fiskars benefits by gaining visibility and product awareness through the cooperation with Lainappi.

In this business model, the value creation and delivery consist of the advertising collaboration between businesses. A company looking for an advertising place and product awareness benefits from Lainappi's advertising service, while Lainappi takes an advertising fee from the service. Furthermore, both parties capture value through cooperation with revenues from advertising and rental fees. Moreover, both parties acquire data from rental behaviour from the customers.

4.5 Lainappi business model canvas

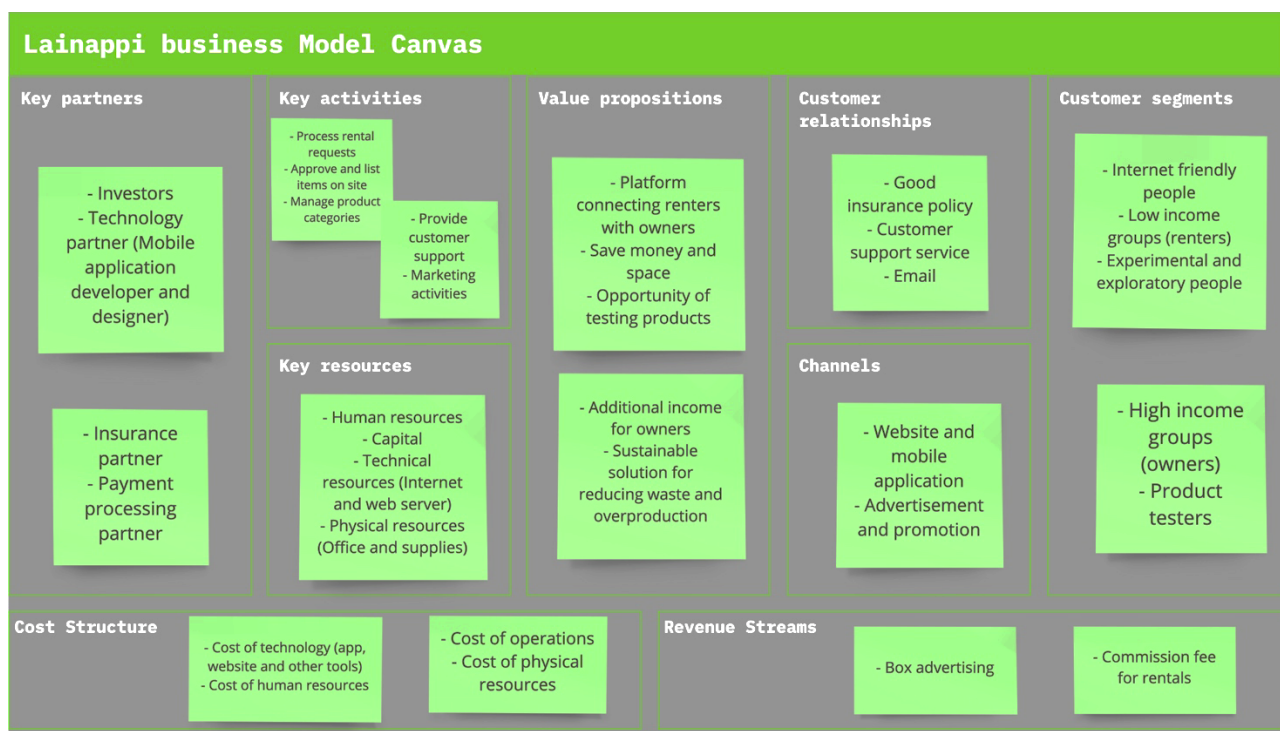


Figure 20. Lainappi Oy business model canvas (Internal material received from Lainappi Oy, (2022).

The business model canvas is a business tool created by researchers Alexander Osterwalder and Yves Pigneur in 2010. Lainappi uses the tool regularly to develop and monitor its business models. The figure above presents the nine core elements of Lainappi's business.

4.5.1.1 Key partners

Every company needs business partners to survive. Lainappi's key partners include investors, technology, insurance, and payment processing partners. Each partner has supported Lainappi in the development of their business models.

Investors have provided capital for the growth of the business. Technology partners have aided in the help of the creation of the start-up's application and website.

Furthermore, the insurance and payment processor partnerships have helped Lainappi to create a more valuable service for its customers.

4.5.1.2 Key activities

The key activities define the company's critical operations that drive the business. For example, Lainappi's key activities consist of the daily operations of its app and website. These operations include processing rental requests, approving and listing items, managing categories, providing customer support, and marketing their services.

4.5.1.3 Value proposition

The value proposition is one of the main elements of a business model. The value proposition describes the value that a company's service or product is creating for the customer. Lainappi's value proposition lies in its innovative business models.

Lainappi's main value proposition consists of a two-sided platform connecting renters and household items owners. Their platform allows users to save money from renting instead of buying or testing products before purchasing them. Furthermore, it enables the generation of additional income for owners and reduces the need for unnecessary purchasing and overproduction.

4.5.1.4 Customer relationship

The customer relationship describes the type of relationship that a business has with its stakeholders. Lainappi provides customer support services and a good insurance policy for their rental service. Furthermore, they have a website with their office location and phone numbers.

4.5.1.5 Customer segments

Customer segments describe the type of customers a business is targeting. Lainappi's main target is to focus on internet-friendly people willing to experiment and explore new services. In addition, they are focusing on product testers and searching for product owners and possible renters.

4.5.1.6 Channels

The channels section describes how a business communicates its value proposition to its customers. For this, Lainappi mainly uses its website and mobile application. In addition, they advertise and promote their service on various social media channels.

4.5.1.7 Key resources

The key resources of a business describe the company's main assets that are used for value creation. Key resources can be physical, human, intellectual, or financial resources. Lainappi uses all four types of key resources in its business models.

Lainappi has employees in the form of human resources. Furthermore, they have financial resources from investors and intellectual resources from their customer base and business operations. In addition, Lainappi has physical resources from office supplies and office space.

4.5.1.8 Cost structure

The cost structure section is composed of all the essential costs that are necessary for running the business. For Lainappi, the primary investments and expenses were made from building and maintaining their app. Furthermore, they have human resources (employees) expenses and daily business operations (marketing, promotion). In addition,

Lainappi also has expenses from their physical resources, such as their office and work equipment.

4.5.1.9 Revenue streams

Revenue streams describe the cash flow from different business operations and models. Lainappi's primary form of income is generated from its innovative rental service. Lainappi takes a commission from each rental conducted on their platform. Furthermore, Lainappi generated revenue from its rental box advertisements.

4.5.2 Lainappi technology and business model innovation

According to Lainappi's internal documents, platforms for peer-to-peer rental marketplaces must have cutting-edge user interfaces and flawless user experiences (UX). Furthermore, the administrator must be at ease when running the business operations. Thus, the most important technological aspects of Lainappi's business are its mobile application.

Apart from the technological aspect of the business, Lainappi also employs an innovative business model that currently has little competition (similar service) in the Nordic region. The innovative household item rental marketplace is one of its kind in Finland and one of the forerunners in the industry (Lainappi internal documents).

4.5.2.1 Technology

Mobile applications have enabled e-commerce enterprises to reach a wider audience while improving consumer happiness and the buying/renting experience. One of the best methods to engage and communicate with online users across many platforms is through mobile applications. Because of the increasing demand for online markets, organizations in the e-commerce industry must be able to create mobile applications in

order to be competitive in the industry and deliver value to the customers. This is especially crucial in the rental service/P2P industry.

The creation of a mobile application consists of various elements. Programming languages, platforms, frameworks, tools, UX/UI software, and other technologies necessary to create a functional mobile app are collectively called the "mobile development stack" or "mobile stack."

The following elements make up the mobile stack:

- Frontend: Technologies used to construct the interface that interacts with end-users.
- Back-end: The hardware and software required to build the server's underlying processing.
- Development: A consolidated platform that offers the libraries and interfaces required to create the application
- Support: The integration of other tools and technologies raise the app's performance, flexibility, and security.

Other than the mobile application, Lainappi uses Stripe's payment processing services as one of their main support tools. Stripe's payment service allows customers to make credit card payments on the rental service platform. Stripe's services also include compliance and security processes for payments. In addition, Lainappi offers an insurance for all rentals on their app through a partnership with an insurance company.

4.5.2.2 Business model innovation

The main drivers and trends for the creation of Lainappi's innovative business models arose from the demand for a sharing economy and a circular economy. Overproduction and ownership of goods and products have gotten out of hand in recent decades.

Therefore, the founders behind Lainappi wanted to contribute to a better future with an innovative solution.

The P2P household rental marketplace is an innovative business model that can challenge the existing retail marketplaces in the Nordic region. As a result, customers no longer need to pay for everyday household items they do not necessarily need. In the long run, this can lead to more efficient spending and decrease the production of unnecessary goods. Furthermore, this business model presents the opportunity for businesses and regular users to generate income on items they do not use regularly.

Lainappi's business models are not entirely new but have been adjusted and combined with models from other industries (as seen in figure 10, page 29). For example, Airbnb and P2P car rental services offer similar services in different sectors. However, Lainappi is one of the first organizations to provide a P2P household items rental service. Lainappi is among the first companies to offer a P2P platform solution for the sharing economy. The platform (mobile application) can be considered a technological innovation in the household item rental industry. The platform has also allowed the case company to develop its business models further and create entirely new ones, which supports the concept of business model innovation.

4.6 Results of the questionnaire

The questionnaire for this research was designed for the people behind the creation of Lainappi Oy. Therefore, it contains a summary of the answers from five founding team members. In addition, four respondents are categorized as founders, and one is a board member of the company. Moreover, each responder has prior business industry experience and a business-related degree (see table 3, page 40-41). The questionnaire is qualitative, with open-ended questions. Therefore, the following results are strictly based on the answers given by the questionnaire respondents. Finally, the respondents' data have been analyzed using a thematic analysis approach.

Table 4. Position and experience of respondents of the questionnaire.

Respondent	Position in the company	Experience in the business industry (years)
1	Founder	5
2	Founder	4
3	Founder	4
4	Founder	3
5	Board member/Investor	4

4.6.1 Primary business model

According to the respondents, the start-up's primary business model is a P2P (peer-to-peer) household item rental service. Furthermore, its main idea is to develop the sharing economy with its service and deliver a solution for unnecessary purchasing and over-production.

Lainappi is a sharing economy platform, where users can easily and safely rent items from each other. (Respondent 2, 2022)

Lainappi's primary business model was formed based on a platform method that combines supply and demand for rental items. The platform works on a mobile application that connects renters and owners of household items. From each rental transaction on the application, Lainappi collects a commission fee.

We thought of different monetization methods. We decided on a typical platform business model, where the platform deducts a fee for a purchase/transaction made on the platform. (Respondent 3, 2022)

The main components of the start-up's primary business model revolve around their mobile application and the way they create, deliver and capture value. Lainappi's application creates value by offering a platform for renters and owners of household items. Furthermore, it delivers value by providing safe rentals (insurance), securing customer data, and building customer reviews to help choose rental items. Finally, Lainappi captures value through a commission fee from each application rental.

Creates value by offering a platform that brings together supply and demand. Delivers value by offering safe rentals, secured user profiles and building customer reviews. Captures value by seeking the mass's attention and charging a low fee from each rental. (Respondent 4, 2022)

The primary business model is a commission fee of 20%, which Lainappi takes out of every transaction made inside the app. It was formed when we thought it would be an okay form that consumers are willing to pay when we provide them a platform where supply and demand comes together + we offer an insurance for renting. (Respondent 2, 2022)

The business model is formed from a mobile application which connects people together to rent items from one another. (Respondent 1, 2022)

Based on the responses to the questionnaire, it is safe to say that the core concept behind Lainappi's business model is their platform (mobile application). The mobile application has been developed to provide an efficient service for users to rent items and support the sharing economy.

4.6.2 Other business models

Lainappi primarily started with one business model: the P2P rental model. Further on, they developed two more business models: physical Lainappi rental boxes and an advertising model.

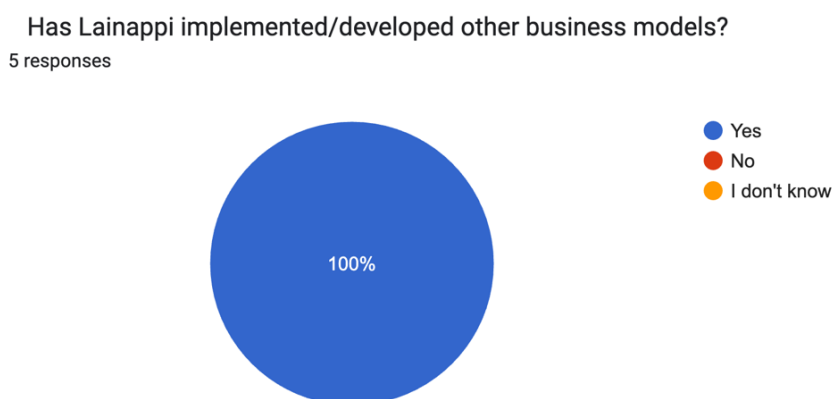


Figure 21. Questionnaire data results.

According to the respondents, both the Lainappi boxes and advertising business models came spontaneously after developing their service and analysing new sales methods. Furthermore, the new business models received public funding that further advanced the creation of the models. Moreover, the technology used for the new business models is mainly related to their existing technology (application), but some new coding and programming were necessary.

The Lainappi boxes and advertising came in as additional business models after the primary business model. These were created to create value for businesses as well as regular customers. Lainappi boxes were easy to connect to the mobile app and advertising mainly works through the visual branding of companies on the boxes. (Respondent 5, 2022)

The idea of B2C renting was implemented by receiving public funding to create a B2C renting solution. Technology for it was developed by various programming software and languages. The existing technology was also developed further to suit the new B2C needs. (Respondent 3, 2022)

This business models were created some what spontaneously. Lainappi took part in a sharing economy piloting project which made us create a new business model: The Lainappi box. While having already an existing mobile application, it was easy to connect the existing app into the Lainappi box. Lainappi box: A box where people can pickup items for rent. (Respondent 1, 2022)

4.6.3 Impact of technology

One hundred percent of the respondents agreed that technology had impacted their primary business model (P2P). Furthermore, each respondent stated that their most crucial technology was their mobile application. Moreover, the respondents mentioned that Stripe's payment processing services are essential since it would take too long to create their own payment processing system.

Did technology have an impact on the creation of the primary business model?

5 responses

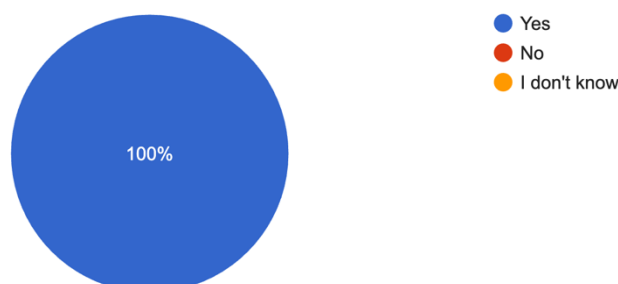


Figure 22. Questionnaire data results.

A mobile application functions as the core technology behind the service. Furthermore a payment process partnership and an insurance partnership were created. (Respondent 5, 2022)

Technology was used in create the the platform itself. React Native was the main software in creation. Its affect was creating a easy, simple to use application. (Respondent 1, 2022)

The selection process of the technology used to create and develop their business models consisted of previous knowledge of the technology and the easiness of its deployment. Therefore, React Native was used to build the company's mobile application.

We selected React Native in creating the platform due to its possibility in offering the platform to both stores: Google play and appstore (iOS) in a single instant. Less time consuming and more efficient creation. (Respondent 1, 2022)

Our selection criteria was based on cost, simplicity and customization options. (Respondent 3, 2022)

This technology is known in the Nordics and in Finland. It is trustworthy. (Respondent 2, 2022)

Later, the application was further developed and modified to connect the Lainappi boxes to the mobile application and provide additional value for regular users, especially business customers. The mobile application then became the core element of the business, which connects users on the app, allows users to rent items safely, and

it handles their payments through the platform with the support of Stripe. In addition, the app provides the opportunity to contact support and message internally with other app users.

4.6.4 Current and future outlook

The current outlook of the company's business model does share opinions, as seen in the image below (Figure 23). Two respondents believe that their business model is innovative, and one respondent replied with "I don't know." The remaining two respondents partly believe that Lainappi has an innovative business model but also think it is generic and could be easy to replicate.

In your opinion, does Lainappi have an innovative business model?
5 responses

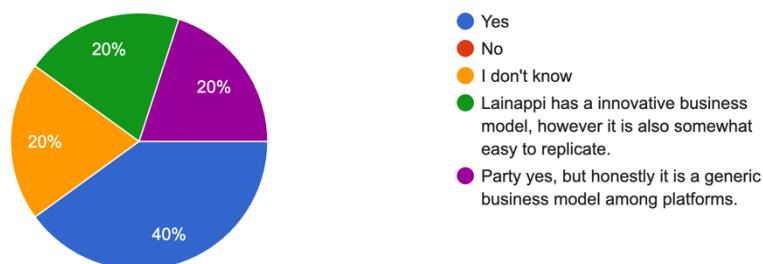


Figure 23. Questionnaire data results.

According to all respondents, the company's current business models could not have been created without modern technology. This is evident from the figure below (Figure 24).

In your opinion, could your business models have been created without modern technology?

5 responses

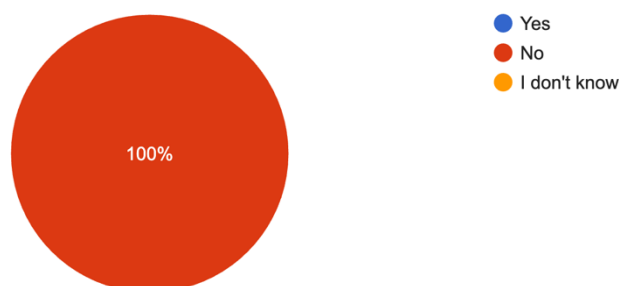


Figure 24. Questionnaire data results.

The respondents have shared their opinion on the possible impact of future technological advancements on their business models. According to the responses, two respondents believe that future technological advancements will not impact their business models, and two are unsure by responding, "I don't know." One considers that future technological advancements can make their current business models irrelevant. (Figure 25)

In your opinion, could your business models become irrelevant due to future technological advancement?

5 responses

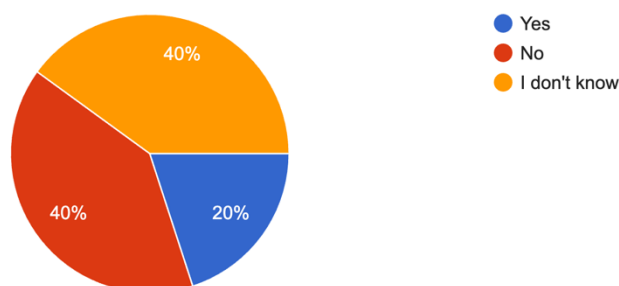


Figure 25. Questionnaire data results.

According to the questionnaire data, all respondents believe digital innovations can develop/improve today's business models. This is evident from the figure below (Figure 26).

Do you believe digital innovations can develop/improve today's business models?

5 responses

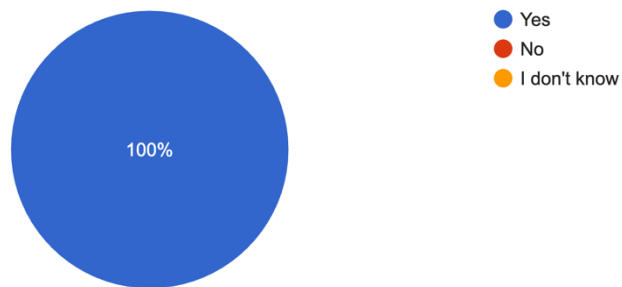


Figure 26. Questionnaire data results.

5 Discussion

Chapter two (literature review) provides the reader with an understanding of the key pillars of the study. Furthermore, it introduces different theories regarding the research topic and provides definitions of the core concepts. This chapter is dedicated to reviewing the empirical research findings and comparing them with the literature in chapter two.

The study's main objective was to explore the link between technological innovation and business model innovation and provide theoretical and empirical evidence for further research on the topic. Moreover, this chapter will seek to answer the research questions proposed in the introduction chapter and define the limitations of the study and future research possibilities.

5.1 Summary of the findings

The findings of this thesis are based on an empirical case study. The author gathered both primary and secondary data from the case company. The primary data consists of a qualitative structured questionnaire with a set of 13 questions that were designed for the founders and board members of the case company (Figure 17, page 52). Secondary information consists of internal documents received from the case company.

Based on the questionnaire results and secondary data findings, it can be said that the case company is dependent on technology. According to the questionnaire data, 100 % of responders stated that technology did impact the creation of their primary business model (Figure 22, page 68). In addition, all responders to the questionnaire indicated that Lainappi could not have created its business models without modern technology (Figure 24, page 70).

The primary and secondary data provide proof of the importance of technology in the company's business models. Lainappi's core service is its mobile application which works as a platform that connects household item owners and renters. In addition, it connects businesses and regular users. According to the responses to the questionnaire, it is understood that the core focus in creating the primary business model was the platform and the ability to connect users through the mobile application. Furthermore, secondary data supports this idea with evidence pointing to the importance of technology in the case of companies' business model canvas and business model creation. Thus, the mobile application is one of the core elements and value propositions of the case study company. Furthermore, these aspects of the company's business model are then combined with other business model concepts, such as the ability to create, deliver and capture value.

In addition to the importance of the mobile application and the platform business model, the data from the respondents of the survey also points out that 100% of the respondents believe that digital innovations can develop/improve today's business models (Figure 26, page 71). However, the irrelevance of their business model due to future technological advancements has split the respondents' opinions. 2/5 of respondents answered that future technological advances would not make their business model irrelevant, another 2/5 were unsure by responding "I don't know," and one respondent answered yes. This was one of the more complex questions of the questionnaire and was challenging to answer and interpret (Figure 25, page 70).

In addition to the mobile application, the case study company used different technologies and coding languages to create the application. Furthermore, they leveraged technical partnerships that allowed them to scale their business models. These partnerships were mainly regarding an insurance partnership and a payment processor partnership.

The case companies' business models and business model innovation were stated to have been generated somewhat spontaneously. This is evident from the responses to

the questionnaire and findings from the secondary data. It seems like a demand for a B2C model arose after the initial P2P business model was created. Furthermore, the advertising model was created once the P2P and B2C business models were up and running.

5.2 Linking theory with the findings

The study's literature review and theoretical framework focus on understanding the different types of business models and their components. Furthermore, it explores the link between technological innovation and business model innovation. As stated in the literature review chapter, there are various definitions and concepts regarding the core elements of this thesis. However, the most popular concepts were used in the literature review section and will be further used to examine the findings of the empirical case study.

To start with the linking of theory and empirical findings, it is evident that the case study company is a tech start-up with a high technology dependency. Furthermore, the case studies business model can be described as a digital business model since it operates based on a platform. Therefore, the most common literature regarding business models and business model innovation used in this study's literature review does not necessarily describe or interpret the case study companies' business models and the method they were created. However, there is clear evidence that even though the case company possesses all the aspects of a digital business model, it still has layers of traditional business model components, such as the likes of Osterwalder & Pigneur (2010).

One of the most widely used business model theories is the theory developed by Osterwalder & Pigneur (2010). The main idea lies in the rationale of how an organization creates, delivers, and captures value. Furthermore, other popular business model theories include researchers such as Schön (2012), Afuah (2003), and the Boston Consulting Group. Each approach has, in a way, focused on how a company operates and how they

generate revenue. It can be argued that the technological aspects of any business can be adapted into these models. Still, a more digital business model approach seems necessary for a full purebred tech start-up company.

Since the case company is a tech start-up whose business revolves around technology, the traditional business model theory does not seem 100 % applicable. Therefore, a more modern approach to business models and innovation is necessary. This is where a more digitally focused business model steps in. According to Kamoun (2008), in digital business models, the business model becomes a blueprint of how a business develops and extracts value through new services, products, or innovations. In addition, Yuan and Zhang (2003) state that business models that underlie technical features are what determine their success and make them hi-tech organisations.

Figure 16 on page 46 illustrates how some modern-day digital business models are created. As seen in the figure, the construct of a digital business model has technology as its foundation. This seems to be the case with Lainappi, where an idea of a sharing economy platform arose from the founders. This idea was then tackled by creating a mobile application and applying a commission fee for all rentals conducted on the application. After the primary business model was created, other revenue opportunities arose, so new business models were developed.

Furthermore, from figure 15 on page 43, the global industry distribution of start-ups can be seen. This table demonstrates the growing supply of tech start-ups. Most of these start-ups have evolved around new digital innovations. However, it is also safe to say that a large proportion of these start-ups have been developed solely around digital business models where the core function of the model is technology. For example, the blockchain industry uses technology as its core function to create and distribute a digital ledger for a peer-to-peer network mechanism (Juszczak & Shahzad, 2022).

Some authors associate BMI with exploiting opportunities as one of the conceptual linkages between technology and BMI (Khefacha & Belkacem, 2016). The case company's founders have exploited the opportunity in the sharing economy industry with mobile application technology and a platform connecting different customer types. The company's innovative P2P business model allows customers to interact on the platform, rent items from each other and set their prices. Furthermore, the case companies' other business models were born spontaneously as additional business models that could be easily integrated with the primary business models. In this sense, technology and the components of the primary business model had a big role in business model innovation.

According to Cosenz & Neto (2018), BMI creates inventive alterations of imposed complementary relationships to identify innovation. Based on this knowledge, it is evident that business models must be enhanced as technology advances. The empirical findings of the case company demonstrate that technology was a big part of business model innovation in many ways. Mobile application technology combined with other technologies, partnerships, and knowledge from other industries were used to develop the core service of the case company. Furthermore, the newly formed business model allowed the creation of new revenue streams and, therefore, generated new business model innovations for the case company. As Teece (2010) mentions, a business model offers a strategy for turning technological advancement, expertise, and tangible and intangible assets into revenue streams.

5.3 Analysis of research questions based on theory and findings

1. How technological innovations (emerging technologies) drive and develop business model innovation in a start-up company?

Based on the empirical case study and theory regarding the topic of business model innovation and technological innovation, it can be said that emerging technologies have a significant impact on start-ups. Many start-ups (Lainappi included) use technology as the

core function of their business models. As seen in the case of Lainappi, mobile application technology has molded Lainappi's business model into a platform model where all operations function on top of or through the mobile application. In addition, it can be seen in other industries, such as the blockchain industry, where new immersive technologies are creating entirely new business models that are also being adapted in many traditional companies worldwide (Shahzad, 2020). Therefore, technological innovations are connected to business model innovation in start-ups and traditional companies.

Furthermore, a customer-driven innovation strategy like Lainappi's will be effective as a realistic way to enhance a company's competitive abilities. Instead of being a linear process, business model innovation is a dynamic, cyclical process that is driven by open innovation dynamics (Uttama, 2021). Therefore, it seems evident that many start-ups most likely have an open innovation approach that focuses heavily on the technology and customers of their business in the beginning phase and then, later, start planning their revenue and operating models around their core service/product. This phenomenon describes the "how" of how emerging technologies are developing business models and contributing to business model innovation.

2. Is there a link between business model innovation and technology innovation?

According to the empirical study and theory on the topic, there is a clear link between business model innovation and technological innovation. Lainappi and other tech start-ups use immersive technologies to develop and create either entirely new business models or new business models in a specific industry. For example, it can be seen how the case study company has taken a P2P business model that has already thrived in other industries and implemented it into the household item rental industry. By doing so, the case company has utilized platform technology that is also highly popular in other businesses. Furthermore, when these new technologies arise and are used in creating new business models, other companies must also follow the trend and innovate in their own business models to stay relevant in the industry. Therefore, there is a link between

business model innovation and technological innovation. In addition, the case company provides empirical evidence that technology was, in this case, a precursor of business model innovation or business model creation.

3. Are technological innovations influencing the construct of new business models?

This may be one of the most straightforward research questions in this thesis to argue for. It is evident from how the case company developed its business models that technology is at the forefront of creating, delivering, and capturing value. From this point of view, it seems like the company has more of a digital business model than a traditional business model.

As seen from the case company study and theory regarding the impact of technology on businesses, it is safe to say that technological innovations have influenced the construct of many new business models. It seems like many new companies are increasingly focusing on technology, which is impacting how new business models are being created.

4. Has technology innovation influenced the case studies' business models?

According to the empirical findings, technological innovations have impacted the case companies' business models. This is evident from the case studies business model canvas and questionnaire findings. In addition, the case company's core service has evolved around platform technology to deliver value to its customers and user base. Therefore, it is evident that technology has influenced the case companies' business models.

5.4 Contribution to existing theory

The study aimed to gain a deeper understanding of the relationship between technological innovation and business model innovation and develop current research with empirical findings from case study research. In addition, the study also combines more

traditional and newer theories to understand the evolving view of business models and business model innovation.

As an exploratory study with a one-case study approach, this thesis provides empirical evidence of how a start-up business has created its business models by taking advantage of modern technology. Furthermore, the case study provides insights into the different technologies used by the case company and how they developed new business models (BMI) with the help of technology and already existing business models.

The study provides evidence of a possible larger link between technological innovation and business model innovation. Therefore, this study should motivate business managers and academics to apply further research on the topic with more extensive and diverse case studies.

5.5 Managerial implications

Based on the empirical findings, it is challenging to provide standard managerial implications since it was a one-case approach. In addition, the study focuses mainly on tech start-ups and the theory applicable to examining the case study findings. Therefore, this chapter's managerial implications mainly concern start-ups or small businesses developing or innovating their business models with technology.

The study finds that technological innovations play a big part in constructing modern business models and developing business model innovation. Therefore, managers looking to innovate their businesses or start an entirely new business must focus on current and upcoming technology. These technologies can already be used in the industry, copied from other industries, or be entirely new. For example, the case study company has used a P2P business model combined with a platform solution that has existed for many years in other industries. Implementing this model into the case companies' business

industry has allowed the creation of new revenue models and has developed the company's BMI.

The globalization and expansion of markets is generating a lot of competition between companies. Therefore, it is vital for companies and organizations to actively seek to develop their business and generate further value for their customers. This can be done by actively evaluating the current business models and focusing on business model innovation and technological innovation. It is also important to understand the customer's needs and tackle a clear problem. As for the case study, the company was seeking to tackle the problem of overproduction with a sharing economy. Furthermore, they were able to create additional revenue streams for their customers and allow them several other benefits from renting household items instead of owning them.

For a more digital business model that is heavily influenced by immersive technologies, an organisation's dynamic capabilities and resources are in a big role. Under these constantly shifting environments, defining, and implementing a digital business plan can guarantee a company's long-term success. For example, according to Wirtz (2019), such a plan specifically calls for four dynamic skills: digital innovation, organizational and strategic flexibility, networking and integration ability, and usability.

5.6 Limitations of the study

This thesis was conducted as case study research, meaning that the study's findings cannot be directly applied to other companies. Furthermore, the qualitative data collected for this thesis consists of five respondents which is quite a small sample population considering the topic of research which is a very broad topic.

However, single case studies typically do not seek to find a common answer for a larger area of research. Instead of attempting to generalize, single case studies aim to provide

a more in-depth understanding. Therefore, additional research, a more focused investigation, and more time would be needed for a more in-depth examination.

5.7 Suggestions for future research

Technological disruptions are clearly impacting how businesses generate income, but their full impact on organizational structures, operational procedures, and innovativeness is not entirely understood. The absence of a widely acknowledged definition of business models to provide systematic assessments is a significant factor in what appears to be such a large topic. Currently, numerous business model definitions and different models make it challenging to comprehend the key elements.

The possibility of combining the two research fields of technology innovation and business model innovation has already been acknowledged. It is necessary to further explore the link between emerging technologies and how business models are formed and developed. Since this thesis focused on a single case study, future research could focus on a multi-case study or focus on a much larger company.

It is important to focus on start-ups or large technological companies since they are the ones developing new technologies, so it is important to pay attention to how their business models are changing. Furthermore, common barriers of business model innovation should be further researched. This could point out to reasons for not innovating business models or adapting new technologies at already existing companies.

Finally, the performance of companies with new digital innovations could be researched and compared to other companies since this thesis did not consider the performance aspect because the case company is a start-up still in its initial phase.

6 Conclusion

This research explored the link between business model innovation and technological innovation. The study aims to explore this phenomenon to understand the topic better and provide theoretical and empirical evidence for further research. In addition, the study was conducted to address the existing gap in the literature concerning the impact of technology on an organization's business models.

The study's research questions were designed to explore the existing gap in the literature and gain a deeper understanding of the subject. By contrast, the study's objectives were set to achieve the study's aims. Moreover, the study's research questions and objectives were designed to fit the needs of empirical case study research.

The research begins with an introductory chapter explaining the research problem and providing the research's purpose and background. After the introduction, the study provides the theoretical framework and key literature regarding the subject. Furthermore, the research presents the methodology of the study and empirical findings. Lastly, a discussion and analysis of the results is provided, and a conclusion.

The literature review revealed different general ideas and concepts about business models and how new technologies impact them. In particular, some studies contend that technological innovation is a precursor of business model innovation (Souto, 2015). Meanwhile, other academics argue that innovation in the business model leads to technological innovations (Wei et al., 2014).

Since previous research concerning the link between business model innovation and technological innovation is limited, this research provides empirical knowledge on the topic. The research results demonstrate how, in this case, study, there is a clear link with technology in creating the start-up's business models. This is evident from the qualitative data from the case study questionnaire, where the respondents state that mobile

application (platform) technology is the core of their service and based on this service/technology they were able to further develop their business. In addition, the empirical findings prove that, in this case, technology was a precursor of business model innovation because the case company utilized already existing technology to create and develop its value propositions.

The study's empirical findings and literature demonstrate that technology plays a significant role in the modern start-up industry. For example, the case study companies' business model uses technology to deliver value to their customers on their platform. Therefore, modern technologies and new technological innovations are changing the business environment. Because of that, business managers must be open to these changes and ready for sudden adjustments regarding their business models and technological innovation.

On the contrary, the study's empirical findings cannot be directly linked to other organizations. However, the author has speculated that similar approaches to developing new business models are highly likely by other tech start-ups. The author also assumes that the importance of technology in the business model will grow over time. Therefore, further research on the implications of new technologies on business models is essential and focuses primarily on start-ups or large tech companies that use immersive technologies.

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Appendices

Appendix 1. Interview questions in English

1. What is your position in the company?
○ A founder member/management team member
○ Board member/investor
○ Employee
○ Other
2. Can you describe what Lainappi's primary product or service is?
3. How was the primary business model formed, and what are the business models main components?
4. Did technology have an impact on the creation of the primary business model?
○ Yes
○ No
○ I don't know
○ Other
5. (If yes) What technology was used, and what effect did it have on the business model and it's core components?
6. How did you select the technology for the primary business model, and why?
7. Has Lainappi implemented/developed other business models?
○ Yes
○ No
○ I don't know
○ Other
8. (If yes) How were these business models created? Were different kind of technology solutions considered during the creation phase?
9. What effect did technology have on these business models?
10. In your opinion, does Lainappi have an innovative business model?
○ Yes
○ No
○ I don't know
○ Other
11. In your opinion, could your business models have been created without technology?
○ Yes
○ No
○ I don't know
○ Other
12. In your opinion, could your business models become irrelevant due to future technological advancement?

<input type="radio"/> Yes
<input type="radio"/> No
<input type="radio"/> I don't know
13. Do you believe digital innovations can develop/improve today's business models?
<input type="radio"/> Yes
<input type="radio"/> No
<input type="radio"/> I don't know