Blockchain and Business Model Innovation: An analysis of opportunities and the innovation process

Master Thesis
to obtain the academic degree of

Master of Science
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Management and Applied Economics
STATUTORY DECLARATION

I hereby declare that the thesis submitted is my own unaided work, that I have not used other than the sources indicated, and that all direct and indirect sources are acknowledged as references. This printed thesis is identical with the electronic version submitted.

Linz, 23.08.2019
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1. Executive Summary

Blockchain has received a lot of attention over the last decade, as it has the potential to severely disrupt many industries. The vast majority of literature about blockchain is without any connection to business applications and originates from cryptocurrencies and computer science. Furthermore, not only the fact that literature is sparsely available, also real-life data may not exist as blockchain is in its early phase of development and there are few firms which already use blockchain in their day-to-day business. Taking the United States as an example, the rate of firms which currently deploy blockchain is at only 14% (Deloitte, 2018, p. 31).

How does blockchain affect business models and how the business model innovation process looks like when blockchain is implemented are the fundamental questions this thesis will deal with, especially in the real estate and financial industry. The real estate industry as well as the financial industry is afflicted by several problems. While Kejriwal & Mahajan (2017, p. 19) for example highlight settlement times as a massive obstacle when it comes to trading real estate assets, Mishra (2018) and Quarshie et al. (2018, pp. 8, 11) claim that illiquidity is the result of these long-lasting transaction processes. Kejriwal & Mahajan (2017, p. 19) further mention that commercial real estate transactions are characterized by being solely paper-based, time-consuming, complex in managing cash-flow and lack of real-time data. Regardless of whether real estate is solely traded, or a development is being financed, in almost any process there are middlemen involved, and so they are when it comes to originating loans. Furthermore, although there exist several methods of how to innovate a business model, there is hardly any for when blockchain is the trigger for the change. However, Morkuna et al (2019) firstly tried to show how the elements of Osterwalder and Pigneur’s framework are effected by blockchain, whereas this thesis focuses on Frankenberger et al’s. (2013) framework, as it comes along with major advantages when it comes to implementing new innovations, because it is basically based on trial and error.
Blockchain is eventually the most hyped term in the history of technology (Lakhani, 2017). Walker (2017, p. 5) even states that the blockchain is “poised to create the most transformative and dramatic impact in the next five to ten years”. Blockchain can indeed be a trigger for business model innovation as it is, according to Chen et al. (2018, p. 1), part of the fourth industrial revolution, which will have a substantial impact on the society (Chung & Kim, 2016, p. 1311).

The origin of the blockchain technology stems from the cryptocurrency Bitcoin, which was introduced in 2008 by Satoshi Nakamoto (2008). The original purpose was to prevent cryptocurrencies from being spent twice – also known as the double spending problem (Nakamoto, 2008, p. 1). A blockchain is a specific type of a distributed ledger that maintains a growing list of transactions arranged in blocks with numerous protection measures against manipulation and revision (Samman & Seibold, 2016, p. 2). This technology is still in its early phase, but its potential and the sheer endless possibilities of using the blockchain has already been recognized and enables just as many ways to innovate the business model. Blockchain has the potential to be applicable in many areas, such as in the financial or in the real estate industry (Kejriwal & Mahajan, 2017; Peters & Panayi, 2016).

The popularity of the term “business model” has significantly grown during the dot-com era. From then on, scientific research has been constantly paying attention to business model research (Wirtz et al., 2016, p. 7). Magretta (2002, p. 92) claims that this term is “among the most sloppily used terms in business” and that “they are often stretched to mean everything – and end up meaning nothing”. Wirtz et al. (2016, p. 15) identified that the varying perception of the term business model has gradually converged to a more unitary one. The underlying concept of a business model can be commonly described as a way the firm functions, what activities lead to profits as well as the way it captures and creates value (Afuah & Tucci, 2003, p. 3; Chesbrough & Rosenbloom, 2002, p. 533f; Magretta, 2002, p. 87; Osterwalder et al., 2005, p. 3; Santos et al., 2009, p. 11; Adrian J. Slywotzky, 1996, p. 4; Timmers et al., 2008, p. 294; Wirtz et al., 2010, p. 274). The business model itself can be seen as a static description of how a company functions, whereas Business Model Innovation represents the dynamic part, as it is driven by creativity.
The origins of business model innovation may eventually stem from Schumpeter (1950, p. 83), who once argued that “the opening up of new markets [...] and the organizational development [...] illustrate the same process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one”. Schumpeter (1950, p. 83) calls this process “creative destruction”. Business Model Innovation can be defined as a reconfiguration of the existing model (Girotra & Netessine, 2014; Lindgardt et al., 2009, p. 1; Santos et al., 2009, p. 14) as well as a conceptualization of an entirely new approach to commercialize value (Gambardella & McGahan, 2010, p. 263; Wirtz, 2016, p. 191). There exist several frameworks, which should assist by innovating business models. Frankenberger et al’s (2013) business model innovation process for example is a proper basis for creating a new business model in the area of high-tech innovations, as it is characterized by a continuous innovation process with iteration phases (Tesch, 2019, p. 7). This framework comprises four stages, initiation, ideation, integration and implementation, whereby each of these stages should be processed sequentially. It basically describes the process of how to find opportunities by scanning the ecosystem and how these possibilities become concrete ideas and ultimately new business models. Furthermore, this process provides two major advantages, namely that it is static but simultaneously dynamic, meaning that this framework is in general rather structured, but allows individual approaches, which is highly important when it comes to implementing new technologies.

This thesis provides a clear overview of the characteristics of business models, business model innovation and blockchain. In order to approach the issue of how the blockchain can be a source of business model innovation, current use cases are being illustrated by simultaneously deploying a framework to show a proper way of innovating a business model triggered by implementing the blockchain.

The outcome of implementing the blockchain can be manifold as it can either transform the process behind a product, such as in originating loans, or it basically is the product itself, such as tokens. This thesis shows possible new business models of both options. While using tokens to trade real estate assets can be seen as creating a new product, originating loans based on the
blockchain comes along with major changes in the process behind the product. In more detail, this thesis shows that business models do not necessarily be entirely reinvented. Implementing blockchain for example in loan originating in order to facilitate internal processes does not bring along significant changes in the business model itself, however, the bank most probably benefits from implementing blockchain as it reduces servicing costs, increases transaction speeds and improves transparency (Sindle et al., 2017, p. 2). The real estate industry for example, will also go through substantial changes if tokenizing real estate assets reaches the masses, as it will drastically reduce settlement times to a fraction of what is needed now. Furthermore, it expands the target group as trading tokens is globally available (Quarshie et al., 2018, p. 1). The actual business model innovation process is affected by external as well as internal factors. Companies can for example respond to societal pressure by implementing blockchain to increase transparency. The business model innovation process can help to identify opportunities or problems, which the blockchain can solve. Based on these opportunities, new business ideas are developed, and with the help of the framework, these ideas are transformed into concrete business models.

Based on these findings, it can be said that blockchain can indeed disrupt many industries and make certain occupational groups, such as trustees, become obsolete. This thesis should serve as a basis to get a facilitated understanding of the blockchain and its effect on business models. How to use the blockchain and how to implement it right in order to exploit the advantages requires a comprehensive analysis of several factors, which is done within this thesis.
2. Introduction

This introductory chapter focuses on the problems that come along with this topic as well as the objectives of this work and the ultimate research question. Furthermore, the way the thesis is going to be structured and the methodology is being explained.

2.1. Problem Statement

Business Model Innovation driven by blockchain is rather sparsely discussed in academia as a combined search for “blockchain” “business models” and “business model innovation” in the EBSCO-database only yields four results as of January 2019. Therefore, innovating a business model triggered by implementing blockchain as well as the outcome, namely possible new business models, has to be evaluated.

The vast majority of literature about blockchain originate from cryptocurrencies or computer science, which in fact often lack a connection to business applications (Nowiński & Kozma, 2017, p. 176). Therefore, to ultimately establish a linkage between blockchain and business model innovation turns out to be difficult, due to the previously mentioned lack of literature. Furthermore, not only the fact that literature is sparsely available, also real-life data may not exist as blockchain is in its early phase of development and there are few firms which already use blockchain in their day-to-day business. Taking the United States as an example, the rate of firms which currently deploy blockchain is at only 14% (Deloitte, 2018, p. 31).

The outcome of implementing the blockchain can be manifold as it can either transform the process behind a product, such as in originating loans, or it basically is the product itself, such as RealBlocks, a company that offers tokenization for real estate assets. Crosman (2018, p. 1) states that especially in the real estate sector, complicated processes that come along with buying or selling real estate assets can be simplified by using blockchain since nearly each component in real estate transactions can be managed on blockchain, whereas, Aholt et al. (2018, p. 30) argue that blockchain is not the solution to every problem. While Kejriwal & Mahajan (2017, p. 19) for example highlight settlement times as a massive obstacle when it
comes to trading real estate assets, Mishra (2018) and Quarshie et al. (2018, pp. 8, 11) claim that illiquidity is the result of these long-lasting transaction processes. Kejriwal & Mahajan (2017, p. 19) further mention that commercial real estate transactions are characterized by being solely paper-based, time-consuming, complex in managing cash-flow and lack of real-time data.

Crosman (2018, p. 1) states that blockchain will not only be helpful when it comes to trading real estate assets, but also when it comes to financing them. Regardless of whether real estate is solely traded, or a development is being financed, in almost any process there are middlemen involved, such as in valuing the property, registering titles or in escrowing transactions. However, companies still have to deal with taxes, legal compliance or accounting complexity when buying real estate assets, whereas, tokenization can circumvent these complex processes as the transaction is solely based on trading tokens (Crosman, 2018, p. 1).

Limitations currently stem from governments, investors and private households as they firstly have to accept this technology, meaning that courts for example need to acknowledge smart contracts (Crosman, 2018, p. 1). The true value of blockchain for businesses is yet not fully assessed, however, the implementation of blockchain in the real estate sector is inevitable (Patterson, 2018, p. 30).

The implementation of blockchain comes with the implication that companies have to be aware of the potential and in order to fully exploit the advantages, they have to adapt their business models. This in turn is difficult to handle as the process of innovating a business model based on using blockchain can be as versatile as the possible use-cases it generates, hence, there does not exist a framework or guideline tailored to the implementation of blockchain yet.

2.2. Research objectives and structure

Technological innovations constantly enable new ways for creating value (Martins & Fernandes, 2015, p. 29). In this regard, it is indispensable to fully understand the technology
itself and how it can be used as a catalyst for business model innovation. By reading this thesis, the reader should get a facilitated understanding of how the blockchain works and how companies in certain industries may be able to change their business models. Furthermore, a framework should serve as a guidance in order to successfully innovate a business model regardless in which industry it is applied.

In pursuance of reaching this goal, a superficial analysis of the blockchain technology with its most important characteristics is being applied. Furthermore, theoretical background of business models as well as business model innovation is of crucial importance in order to establish a linkage between the blockchain-technology and Business Model Innovation. Potential use-cases should represent the potential blockchain has, by simultaneously showing possible new business models in the real estate and finance industry as well as the business model innovation process.

This thesis will be split in several sections in order to provide a well-structured overview, which should facilitate the understanding of blockchain, its implementation and how possible business models can look like, while simultaneously providing a step-by-step guidance to innovate a business model without any concrete reference to an application area.

The first section serves as an introduction to the topic, where the problems in this field are mentioned, followed by research objectives and formulating the main research question. The second section provides a profound theoretical background of business models, business model innovation and blockchain, which is required to evaluate the effects an implementation of the blockchain can have on business models. This area of discussion inter alia contains the analysis of the term business model, as there is still a lack of clarity in terms of defining what business models are in academia. By comprehensively elaborating on the evolution of this term and simultaneously providing different views of researchers, the underlying concept of business models should be presented to the reader. Subsequently, the focus of the discussion moves on to innovating those previously described business models. This area will entirely focus on the characteristics and core elements that are involved when it comes to reinventing a firm’s business model with respect to implementing new technologies. Lastly the characteristics of the
blockchain are highlighted. This concludes the second area of discussion, where it is all about the theoretical input that serves as a basis to elaborate on merging the technology “blockchain” with strategic realignment alias “Business Model Innovation”. The third section provides a linkage of these three terms. Therefore, the focus, in the course of this section will be on comprehensively answering the research questions. Elaborating on possible use-cases should help to get an idea in which areas the blockchain is applicable and how business models may look like when blockchain is implemented. With the help of Frankenberger et al’s (2013) framework, combined with several tools and methods, a detailed process of innovating a business model based on implementing the blockchain technology is being presented in the fourth section. The last part of this thesis will be a conclusion of the most important findings while simultaneously discussing future research perspectives.

2.3. Research Questions

The main goal of this thesis is to comprehensively elaborate on the following research question:

**What are possible changes in a business model when blockchain is implemented?**

The main focus will lay on generally showing the myriad possibilities of blockchain applications. Taking selected industries as an example, it shall be shown how an implementation could alter business models. In order to answer this question, a comprehensive analysis of business model innovation as well as the blockchain technology itself has to be conducted beforehand.

**How can blockchain innovate a business model?**

With the guidance of a framework and the usage of several tools and methods, the process of innovating a business model based on the application of blockchain is going to be examined. Furthermore, ways to assess the newly created business model as well as protection mechanisms will be additionally explained.
The findings to the previously proposed research questions are primarily derived from academic literature. Since the blockchain-technology has emerged recently, literature is rather sparsely available, at least in academic journals, therefore, also reports developed by consulting companies as well as blog entries and magazine content are being used for the purpose of identifying potential business applications, which ultimately result in business model innovation. The actual number of sources that have been cited within this thesis, represents only a fraction of the actually examined sources.
3. Business Models

In order to analyze how the blockchain-technology will change, innovate or even create business models, it is crucial to understand the underlying concept of business models. This section will contain an analysis of the history of the term “business model” up to the point to what scholars are currently discussing. Furthermore, there will be an attempt to form a definition which ultimately should serve as a basis to work with, in the context of evaluating the impact an implementation of the blockchain-technology will have on the business model.

3.1. Introduction

The popularity of the term “business model” has significantly grown during the dot-com era. From then on, scientific research has been constantly paying attention to business model research. Figure 1 reveals this evolution by showing that there has been a steady increase in published articles which contain the term “business model” in the title or abstract. (Wirtz et al., 2016, p. 7, 9)
The reason behind this increase in importance can inter alia be attributed to the "[…] intensified competitive conditions in the last two decades. If companies want to remain successful in globalized and increasingly digitalized markets, they have to be able to continually adjust to varying market conditions and to cope with a highly dynamic and competitive business environment". (Wirtz & Daiser, 2017, p. 2)

Although the term “business model” is widely spread among scholars, a universally accepted definition is yet not available. The characteristics of these myriad of definitions differ widely, reaching from being a simple phrase in which a business model is described within one sentence, to extensive definitions containing components or dimensions. Magretta (2002, p. 92) claims that this term is “among the most sloppily used terms in business” and that “they are often stretched to mean everything – and end up meaning nothing”. Furthermore, Magretta (2002, p. 92) adds that these concepts are essential for a firm’s performance, hence, firms have to avoid such blurry thinking. Linder & Cantrell (2000, p. 2f) argue that the underlying concept of a business model is often being misinterpreted, as this term frequently gets solely referred to single components of a business model, such as revenue models or pricing models. This misinterpretation is reasoned by the fact that there has not been consensus among definitions to which researchers can revert to. Osterwalder (2004, p. 15) illustrates this by taking an online auction as an example, which is merely a pricing mechanism, hence a component of a business model, not the business model itself.

In the first place the term “business model” has to be separated in its components – “business” and “model”. This may help to get a fundamental understanding why it is called a “business model”. Osterwalder (2004, p. 14) broadly defines the term “business” as an "activity of buying and selling goods and services and earning money", whereas the term „model“ refers to describing, predicting and understanding „business“. In combination, a business model is according to Osterwalder (2004, p. 14) a “representation [“model”] of how a company buys and sells goods and services and earns money [“business”].
3.2. Evolution of the term “business model”

The latter definition of the term “business model” sets the initial point for further discussing the myriad definitions of business models. As these definitions substantially vary among researchers and suffer a lack of uniformity (Peric et al., 2017, p. 1), the following section will provide an overview of the evolution of business model definitions, or in other words, how this term has developed over years. The chronological order of the various definitions may often be disrupted as some of the definitions have been modified by the authors, therefore, these adjusted definitions are attached directly to the original definitions of those authors to directly observe the changes the authors have made to their definitions.

The term “business model” has been present for more than sixty years, yet, there does not exist a uniform definition (Peric et al., 2017, p. 1). Going back to where the term “business model” firstly appeared may help to find an answer to why this term is depicted in such an imprecise way. If the ongoing discussion to what extent the term “business model” and “strategy” differ from each other (Casadesus-Masanell & Ricart, 2010, p. 196) is being ignored, then the roots of the term are rather settled in the early 1950s, where Nash (1951, p. 1) mentions in his 32-page dissertation the phrase “good strategies” in the context of non-cooperative games. In more detail, a good strategy in a non-cooperative game suggests that firms, which do not coordinate in decision making, should choose a point - the so-called “Nash-equilibrium” - in which none of the participating firms can be better off when changing the strategy (economist.com, 2016). This implicates that firms have to choose their activities rationally, or in other words, pursue a good strategy in order to maximize profits and not lose against the competitor, as the classical game theory suggests (economist.com, 2016). This concept of choosing activities rationally in order to maximize profits may eventually be declared as a business model. Budler & Trkman (2017, p. 1) support this assumption by arguing that the game theory is a valid approach to develop and innovate business models, by using the prominent prisoners’ dilemma to illustrate how “ [...] the desirable outcome – a goal that delivers most value for all players – is achieved”. However, Nash (1951) does not provide an explicit definition nor does Bellman et al. (1957, p. 470), who have conducted a real business game with the aim of simulating a competitive situation in which companies had to make decisions on where to
allocate money in order to gain market share, generate total asset growth and provide a measure of success. As mentioned above, this literature does not provide a clear definition of a business model but rather a vague transcription of what is now called the business model. Putting it differently, Bellman et al. (1957, p. 490f) provide a mathematical model for observing the progress and outcome of a set of decisions companies make, which ultimately affect profits. The assumption that can be drawn from the latter definition is that the mentioned “set of decisions” where “money is allocated” can be seen as a business model [allocation of money] to pursue a strategy [set of decisions].

Jones (1960, p. 621), who also does not provide an explicit definition, although the term “business model” is in the title of the article, describes the basic idea of a business as follows:

“[...] the unity, the interdependence of functions that makes a business, the closely woven matrix of sales effort and stockholder relations, of the skill of patternmakers, the brute strength of giant presses, and the midnight oil of the book balancers. These myriad functions and duties and activities are integrated into a complex which we call “a business”.

Furthermore, Jones (1960, p. 621) emphasizes that the different divisions, such as marketing, accounting or production, often forget that they are within one complex. This definition in particular deserves attention since it already shares some similarities with recent ones, although it was generated in the year 1960.

Shapiro (1989, p. 126) contributes to Nash’s (1951, p. 23) opinion of having situations where firms are in a non-cooperative setting and therefore act competitive, thus, being unaware of the others’ firms strategy. This unawareness leads to a variation of strategic as well as tactical decisions, for example when it comes to pricing mechanisms, which should help to strive for profit maximization. Again, these variations of strategic and tactical decisions can eventually be transferred to be the business model.
Moving further towards to when the term “business model” is gaining presence in scholars - as shown in Figure 1 - the definitions are getting more leaned against current definitions as well as more separated from the term strategy.

Prior to when Timmers (1998, p. 4) firstly used the term “business model”, Slywotzky (1996, p. 4) called it “business design” and defined it as “[...] the entire system for delivering utility to customers and earning a profit from that activity”. One year later, Slywotzky & Morrison (1997, p. 10f) reformed the definition of business design, which is now centered around four strategic elements: customer selection, value capture, strategic control and scope. These key elements need to be in line in order to serve the customers’ most eminent preferences and simultaneously remain profitable, which is consensus with Jones (1960) opinion of being within one complex, which, in turn, supports the author’s opinion that the definition from Jones (1960) is sharing similarities with more recent definitions.

Timmers (1998, p. 4) was one of the first researchers who has explicitly described the term “business model” as being

“[...] an architecture for the product, service and information flows, including a description of the various business actors and their roles; and a description of the potential benefits for the various business actors; and a description of the sources of revenues.”

Timmers et al. (2008, p. 294) further adds that business models are “centered around the definition and identification of value”. However, Timmers (1998, p. 4) mentions that there already exist different approaches of the usage of the term “business model” in internet electronic commerce literature without providing a proper definition, therefore, this term must have been around in scholars before.

Markides (2000, p. 2, 51f., 81f.; 2008, p. 7) contributes another definition in which he argues that every firm should occupy a spot that is within a three-dimensional strategic map. These three dimensions are defined as (1) “Who should I target as customers”, (2) “What products or services should I offer them?” and (3) “How should I do this?”. In more detail, once a firm has
selected its target group, the other two elements can build on this first element. The decision on what value the company should offer is therefore shaped by the previously defined target group. Finally, the last dimension is about establishing the right operational processes in order to be able to deliver the value to the customers. The definition of Markides (2000; 2008) is derived from Abell’s (1980, p. 7) framework for defining the business from the year 1980, hence, this framework seems to be an even earlier definition of the business model. As Figure 2 illustrates, Abell (1980) called it “business definition” rather than “business model”. Markides (2000; 2008, p. 7) adapted these three dimensions from “Who is being satisfied?”, “What is being satisfied?”, and “How are customer needs being satisfied?” respectively to the above mentioned dimensions.

Mahadevan (2000, p. 59) came up with three streams, […] the value stream for the business partners and the buyers, the revenue stream, and the logistical stream” which, in a “unique blend”, shape a business model in the Internet economy. Mahadevan (2007, p. 2) also expanded the definition over the years by adding that a business model should include three important components –
“a need to understand the customer requirements, linking it to various operational choices to be made and activities (transactions) of the business and the need to include supply chain elements”.

Chesbrough & Rosenbloom’s (2002, p. 533f) definition is similar to Afuah & Tucci’s (2003) definition, which is described further below, as they also provide a more specific and operational definition of the functions a business model has by developing six attributes: (1) “articulate the value proposition”, (2) “identify a market segment”, (3) “define the structure of the value chain”, (4) “estimate the cost structure and profit potential”, (5) “describe the position of the firm within the value network” and (6) “formulate the competitive strategy”. Jointly, these six attributes should result in evaluating what financial capital the model needs and how business can be scaled up.

Magretta’s (2002, p. 87) definition considers a more humane aspect rather than focusing on internal operations, therefore, she even compares business models with stories,

“[…] stories that explain how enterprises work. A good business model answers Peter Drucker’s age-old questions: Who is the customer? And what does the customer value? It also answers the fundamental questions every manager must ask: How do we make money in this business? What is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?.”

Afuah & Tucci (2003) have defined the term business model within the context of Internet business, which is no surprise since this definition has been generated during the dot-com era. However, in contrast to Magretta’s (2002, p. 87) definition, Afuah & Tucci (2003, p. 3) provide a more generic definition in which a business model is a

“[…] method by which a firm builds and uses its resources to offer its customers better value than its competitors and to make money doing so […] A business model can be conceptualized as a system that is made up of components, linkages between the components, and dynamics.”,
meaning that the interplay of the various components, such as the target group, products/services or pricing, is crucial in order to impact the firm’s performance. For illustrative purpose, Afuah & Tucci (2003, p. 4) mention that if a firm pursues a low-cost strategy, it has to be reflected throughout all of these components. To put it differently, the components, as Slywotzky & Morrison (1997, p. 10) and Jones (1960, p. 621), also mention, have to be consistent and within one complex in order to have a functioning system. Besides that, a high degree of changeability of the components is essential due to a dynamic environment, which, in turn, generates opportunities a company can take advantage of.

Osterwalder et al. (2005, p. 3) concludes, after assessing the origin, the present and the future of the concept of business models, that the following definition embraces several areas such as computer science or e-business:

“A business model is a conceptual tool containing a set of objects, concepts and their relationships with the objective to express the business logic of a specific firm. Therefore we must consider which concepts and relationships allow a simplified description and representation of what value is provided to customers, how this is done and with which financial consequences.”

Another business model definitions comes from Johnson et al. (2008, p. 2), who identified four determinants which outline a successful business model: (1) customer value proposition, (2) profit formula, (3) key resources and (4) key processes. Customer value proposition plays a key role as it defines how the firm is transferring value to its customers. However, Johnson et al. (2008, p. 6) furthermore argue that firms should focus on one particular job rather than to “[…] do lots of things. In doing lots of things, they do nothing really well”. The idea of the profit formula is to create value for the firm by simultaneously creating value for the customers. Furthermore, the profit formula is compound of a revenue model, which is basically defined as price times volume, the cost structure, a margin model that defines the mark-up in order to achieve profits and resource velocity, which determines how quickly inventory can be moved (M. W. Johnson et al., 2008, p. 4). The last two determinants, key resources and key processes,
determine the firm’s specific advantage to transfer the value to the customers (M. W. Johnson et al., 2008, p. 4)

Santos et al. (2009, p. 11) claim that they add a relationship dimension to their definition, although Osterwalder (2005, p. 3) for example also integrates a relationship dimension in his definition. However, according to Santos et al. (2009, p. 11) “a business model is a configuration of activities and of the organizational units that perform those activities both within and outside the firm designed to create value in the production (and delivery) of a specific product/market set.”

Wirtz (2010, p. 274) provides a rather broad definition of a business model, namely “A business model reflects the operational and output system of a company, and as such captures the way the firm functions and creates value.” After reviewing the origin and development of the term “business model”, Wirtz et al. (2016, p. 6) concretized and extended the definition of a business model:

“A business model is a simplified and aggregated representation of the relevant activities of a company. It describes how marketable information, products and/or services are generated by means of a company's value-added component. In addition to the architecture of value creation, strategic as well as customer and market components are taken into consideration, in order to achieve the superordinate goal of generating, or rather, securing the competitive advantage."

Amit & Zott (2012, p. 42) came up with a more organizational oriented perspective, hence it focuses not only on internal processes, but also include connections to external partners:

"We define a company's business model as a system of interconnected and interdependent activities that determines the way the company “does business” with its customers, partners and vendors. In other words, a business model is a bundle of specific activities - an activity system - conducted to satisfy the perceived needs of the market, along with the specification of which parties (a company or its partners) conduct which activities, and how these activities are linked to each other."
Three years later, hence in 2015, (Amit & Zott, 2015, p. 346) contribute a different definition which still remains on an organizational level, however now they use the term ecosystems rather than customers, partners and vendors, which indeed broadens the definition more as ecosystems also contain for example the government.

“the business model describes how a focal firm taps into its ecosystem to perform the activities that are necessary to fulfill the perceived customer needs”. To put it differently, “it focuses on the activities performed by the subset of actors in the focal firm’s ecosystem from which the firm receives services that are interwoven within its own internal activity system.” (Amit & Zott, 2015, p. 346)

Choi (2014, p. 626) pursues a similar direction as Magretta (2002, p. 87), since it is also on a more humane level by describing the business model as being a “script as well as the blueprint to show how companies perform their business activities.”. However, the only contextual difference between Magretta’s (2002, p. 87) and Choi’s (2014, p. 626) definition are the terms “script” and “stories”.

Biloshapka et al (2016, p. 42) bring up a definition which can be extracted to two separate explanations of what a business model is. “A business model is the essential mechanism that allows a firm to serve its customers while ensuring that sufficient profit is generated for sustaining its operations and providing a fair compensation for its owners.” This phrase alone can be considered as a definition, however, Biloshapka et al (2016, p. 42) then summarize the above mentioned definition in the first sentence and simulatniously provide two essential components by saying that a business model “[...] outlines the way the firm makes money, comprising two essential components: the revenue model–types of revenues it generates – and the operating model needed to produce this revenue – including production processes, R&D, go-to-market approach, service strategy”- (Biloshapka et al., 2016, p. 42)

Massa et al. (2017, p. 2), defines the business model as “a description of an organization and how that organization functions in achieving its goals (e.g., profitability, growth, social impact,...)” by simultaneously arguing that scholars are lacking of definitions, which have an
operational character. This definition is the most recent provided in this thesis, which also indicates that, although research has been conducted for several years now, authors indeed have no consensus on how a business model can universally be defined.

These carefully selected definitions represent only a fraction of definitions that are available in academia. The purpose of this section was to shed a light on the development of this term and that it is crucial to deal with this topic as it is indispensable for a firm’s performance to clearly know what the firm’s business model is and what components/dimensions it contains. The following section discusses business model research by simultaneously provide a classification of the different definitions.

3.3. Current State and Future Research Perspectives

By analyzing the above-mentioned definitions, it can be observed that there truly exist various ways of how to describe a business model. Osterwalder et al. (2005, p. 11) argues that business model research is in a rather early stage and that the purpose of future research is to create concepts and tools which ultimately help firms to “[…] capture, understand, communicate, design, analyze, and change the business logic”. Furthermore, Osterwalder et al. (2005, p. 22) claim that literature should build more on each other, which would increase progress in research and avoid remaining on a rather superficial level.

Wirtz et al. (2016, p. 15) identified that the varying perception of the different authors has gradually converged to a more unitary one. However, there still exists heterogeneity concerning the conception of the term and concept of a business model. Especially the degree of abstraction of the used components vary among different authors. Furthermore, the interaction between those individual components has been neglected in business model research. Wirtz et al. (2016, p. 16) stress another issue that seems to be problematic and strives for better research, in particular measuring the success of a business model. Attempts of measuring a business model with regards to its success have completely failed due to the fact that there is a lack of which determinants determine the success of a business model.
Peric et al. (2017, p. 10) set the ultimate aim of business model research to put the focus on particular industries and generate competitive business models.

Jensen (2013, p. 77) even addresses the most fundamental question whether it is necessary to have a business model definition as they are not “[...] necessarily exhaustive, precise and static and heavily dependent on the audience.” Jensen (2013, p. 77) claim that, currently, there already exists a broad understanding in the area of business models, its components and potential interconnections. However, what research currently needs is to systematically coordinate research revolving around the core understanding of business models, rather than to provide another definition (Jensen, 2013, p. 78).

3.4. Categorizing business model definitions

In order to establish a structure among those various approaches in defining a business model, this section will entirely focus on categorizing them. This categorization will subsequently be the basis for constructing a business model definition, which is discussed in section 3.5.

While Amit & Zott (2012, p. 42) call it “a system”, Wirtz et al. (2016, p. 6) call it “a simplified and aggregated representation”. Furthermore, phrases such as “method”, “architecture”, “script” and “stories” are used to delineate a business model. Researchers are still assessing how business models can be defined, therefore, the following section provides a definition that has been extracted from literature and is adequate for evaluating the impact an implementation of the blockchain-technology will have on the business model.

Osterwalder et al. (2005), Wirtz et al. (2016), Peric et al. (2017) and Massa et al. (2017) all face the same problem: there exist myriad definitions which are broadly diversified and suffer a lack of uniformity. Therefore, their aim is to establish a structure in business model research by categorizing the different approaches, which is elaborated below.
Osterwalder et al. (2005, p. 7) categorized the evolution of business model theory into five phases. The first phase is about defining and classifying business models. Timmers (1998) was one of the pioneers in this phase. Chesbrough & Rosenbloom (2002) further started to develop elements, in their case six attributes, that make up a business model. Osterwalder et al. (2005, p. 7) classified this development as being part of phase two, which they call “list business model components”. Phase two is characterized by definitions that solely provide components without clarifying their function, which seems to eventually be too limiting since, according to Osterwalder et al. (2005, p. 7), Chesbrough & Rosenbloom’s (2002, p. 534f) work is settled in this phase, although they indeed provide a detailed description of these six attributes and the process of application. However, by entering the third phase, literature is now providing comprehensive explanations of these elements. Osterwalder et al. (2005, p. 7) mention Afuah & Tucci’s (2003, p. 3f) definition as an example, as they describe the components itself and how they have to be linked in order to generate a functioning system. Massa et al. (2017, p. 48), however, argue that none of the literature has hitherto provided a proper explanation to their definitions, which is obviously contrary to Osterwalder et al.’s (2005, p. 7) third phase, in which they state that literature already provides detailed explanations. The fourth phase is characterized by modeling business model components and testing them. Currently, research is settled in the fifth phase in which “models are being applied in management and in IS applications”.

As mentioned above, there are different ways to describe the definition of a business model. Osterwalder et al. (2005, p. 3) for example distinguishes between definitions which simply describe a view on how a company does business and so-called meta-models. Meta-models basically describe the phrases that are used in a definition, in other words, meta-models conceptualize specific components and elements of the definition.

Massa et al. (2017, p. 9, 19, 26), however, suggest three different possibilities of interpretations, namely business models that are “(1) an attribute of real organization, (2) a cognitive/linguistic schema, (3) or a formal conceptual representation of an organization’s activities”. In more detail, (1) is characterized by real-world business models such as “pay-as-you-go” or “freemium”, whereas the characteristic of (2) is that managers only have their business model
in their heads rather than to have specific attributes as in (1). Business models which are categorized in (3) include fundamental components, which vary depending on the field of interest. Furthermore, Massa et al. (2017, p. 98) provide a list of so-called first order components, which are themes, such as “revenue stream” or “value capture”, that are explicitly quoted in the definitions or have a similar meaning.

Peric et al. (2017, p. 4f) have also tried to categorize definitions contentwise by generating themes which are commonly used in business model definitions. Such themes are for example “core-strategy” or “value-proposition”. Peric et al. (2017) follow Massa et al’s. (2017) procedure, however, Peric et al. (2017, p. 6) further distinguish between first-order and second-order themes. In this very example “core-strategy” is classified as first-order theme and “value-proposition” as a second-order theme.

After assessing 681 peer-reviewed articles, Wirtz et al. (2016, p. 3) concluded that business model definitions can be categorized in three different fields, namely “technology-oriented”, “organization theory-oriented” and “strategy oriented”. Furthermore, they provide an overview of the evolution of business model literature by defining three different phases. Figure 3 illustrates this evolution by simultaneously considering the three different fields. The “early phase” began in the year 1975 directly followed by the “formation phase of first overall concepts” from 1997 to 2002 and the “differentiation phase” as being the ultimate phase between 2003 and – as the arrow indicates – to date. Furthermore, Figure 3 provides a structured overview of how different literature was assigned among the above-mentioned fields and periods of business model research.
There exist various ways to categorize business model definitions. Osterwalder et al.’s (2005, p. 7) approach was to divide the definitions into different phases, which became more and more precise from phase to phase. Wirtz et al. (2016, p. 3), however, divided business model definitions into three main areas – technology oriented, organization oriented and strategy oriented, while simultaneously taking chronology into account. Anyhow, categorizing business model definitions should at least bring somewhat of a structure into this jungle of definitions.

### 3.5. Constructing a business model definition

By knowing the different approaches how the definitions can be categorized, the following will be an attempt to combine all available insights to generate a definition that is specifically tailored to the field of technology, which will subsequently serve as a basis for answering the research questions. The author’s approach is to provide a definition which has three characteristics – the definition has to be (1) narrow enough to be applicable in one specific field by simultaneously (2) mention necessary components which are ultimately (3) described in a meta-model. Characteristic one is derived from Wirtz et al.’s (2016, p. 3) three fields, in this particular case the field “technology-oriented” is chosen, since the definition should be applicable for blockchain-based innovations. Massa et al.’s (2017) classification serves as a
degree of how detailed the definition should be. For better understandability the definition should, on the one hand, be not too complex and on the other hand not too superficial. Therefore, the following definition is going to be classified as “a formal conceptual representation of an organization’s activities” (Massa et al., 2017, p. 1), which fulfills the second characteristic since the definition should also include components. Osterwalder et al.’s (2005, p. 3) meta-model approach ensures that the components used in the definition are properly described in order to fully understand the underlying concept of a business model.

Afuah & Tucci’s (2003, p. 3) definition already fulfills the first characteristic, since it is, according to Wirtz (2016, p. 23) among the technology-oriented business model approaches. Therefore, a business model is a [...]

“[...] method by which a firm builds and uses its resources to offer its customers better value than its competitors and to make money doing so [...] A business model can be conceptualized as a system that is made up of components, linkages between the components, and dynamics.”

As this definition already contains the term “components”, it simply has to be exchanged with the elements mentioned in Table 1, which were developed by Afuah & Tucci (2003, p. 49). Table 1 illustrates different components specifically tailored to embrace all areas that are affected when changes in technology happen, in this very case, the implementation of the blockchain-technology. Furthermore, the above-mentioned third characteristic – the meta-model – is represented by the column “Questions specific to blockchain-technology Business models”. The column “Question for all Business Models” serves as an easy-to-understand explanation for the components.
<table>
<thead>
<tr>
<th>Component of Business Model</th>
<th>Questions for all Business Models</th>
<th>Questions specific to blockchain-technology Business Models</th>
</tr>
</thead>
</table>
| **Customer value**          | “Is the firm offering its customers something distinctive or at a lower cost than its competitors?” | Does the blockchain-technology allow the firm to offer its customers something distinctive or at a lower cost than its competitors?  
Can the blockchain-technology allow the firm to solve a new set of problems for customers? |
| **Scope**                   | “To which customers (demographic and geographic) is the firm offering this value? What is the range of products/services offered that embody this value?” | What is the scope of customers that the blockchain-technology enables the firm to reach?  
Does the blockchain-technology alter the product or service mix that embodies the firm’s products? |
<p>| <strong>Pricing</strong>                 | “How does the firm price the value?” | How does the blockchain-technology make pricing different? |</p>
<table>
<thead>
<tr>
<th><strong>Revenue source</strong></th>
<th>“Where do the dollars come from? Who pays for what value and when? What are the margins in each market and what drives them? What drives value in each source?”</th>
<th>Are revenue sources different with the blockchain-technology?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Connected activities</strong></td>
<td>“What set of activities does the firm have to perform to offer this value and when? How connected (in cross section and time) are these activities?”</td>
<td>How many new activities must be performed as a result of implementing the blockchain-technology? How much better can the blockchain-technology help the firm to perform existing activities?</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>“What organizational structure, systems, people, and environment does the firm need to carry out these activities? What is the fit between them?”</td>
<td>What does the blockchain-technology do to the strategy, structure, systems, people and environment of the firm?</td>
</tr>
<tr>
<td><strong>Capabilities</strong></td>
<td>“What are the firm’s capabilities and capabilities gaps that need to be filled? How does a firm fill these capabilities gaps? Is there something distinctive about these capabilities that allows the firm to offer the value better than other</td>
<td>What are the firm’s capabilities and capabilities gaps that need to be filled? What new capabilities does the firm need?</td>
</tr>
</tbody>
</table>
firms and that makes them difficult to imitate? What are the sources of these capabilities?”

What is the impact of the blockchain-technology on existing capabilities?

Is there something distinctive about these capabilities that allows the firm to offer the value better than other firms and that makes them difficult to imitate?

<table>
<thead>
<tr>
<th><strong>Sustainability</strong></th>
<th>“What is it about the firm that makes it difficult for other firms to imitate it? How does the firm keep making money? How does the firm sustain its competitive advantage?”</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Does the blockchain-technology make it more difficult for firms to imitate it? How can the firm take advantage of it and sustain its competitive advantage?</td>
</tr>
</tbody>
</table>

Table 1 Elements of a Business Model; Source Afuah & Tucci (2003, p. 49) (modified by the author)

Within this section, the history of the term business model up to the point to what scholars currently discuss has been comprehensively described. Furthermore, a definition which ultimately should serve as a basis to work with, in the context of evaluating the impact an implementation of the blockchain-technology will have on the business model, has been constructed by combining several different approaches of different researchers. The goal was to provide a definition which has three attributes – it has to be (1) narrow enough to be applicable in one specific field by simultaneously (2) mention necessary components which are ultimately (3) described in a meta-model. From the author’s point of view, this constructed definition is proper for evaluating the impact an implementation of the blockchain-technology will have on the business model.
4. Business Model Innovation

4.1. Introduction

While the previous chapters covered the static part of business models by providing a facilitated understanding of the underlying concept of business models, this chapter will discuss the dynamic aspect of business models, namely how business models can be innovated. As the main goal of this thesis is to find out how blockchain can be the trigger to redefine a company’s business model, this chapter is of high importance. Defining the term business model innovation as well as elaborating on key characteristics that are crucial in order to change business model are subjects of this section.

Amit et al. (2012, p. 44) claim that new markets can be created, or existing markets can be exploited by an innovative business model. Especially technological progress enables the possibility to change the way companies interact with economic agents (Amit & Zott, 2015, p. 331). However, Chesbrough (2010, p. 354) argues that technology itself is not valuable until it is being commercialized through a business model. Furthermore, the way a technology is being commercialized is crucial since “a mediocre technology pursued within a great business model may be more valuable that a great technology exploited via a mediocre business model”. This implies that a suitable business model has to be found in order to yield maximum value for the firm. (Chesbrough, 2010, p. 354)

Companies should address the fundamental concern regarding what should be changed in their business processes to be successful, which in turn can help strategic managers to boost the usefulness of this technology through a new business model. Therefore, new business models should be based on the characteristics and opportunities of new technologies. (Khorram Niaki & Nonino, 2017, p. 9)
4.2. Innovation

Breaking the term business model innovation down to its components is a good procedure to start defining this term. As the term “business model” has already been broken down in chapter 3.1 the light is being shed on the term “innovation”. One thing should be made clear at the outset: exactly the same as with the term “business model”, there is no generally valid definition of the term “innovation”, nevertheless, Peter Drucker (1985) defined innovation within an organizational context as follows:

“Innovation is the specific function of entrepreneurship, whether in an existing business, a public service institution, or a new venture started by a lone individual in the family kitchen. It is the means by which the entrepreneur either creates new wealth-producing resources or endows existing resources with enhanced potential for creating wealth.” - (Drucker, 1985, p. 5)

Kelly & Booth’s (2004, p. 90) definition of innovation and how it should be proceeded in order to innovate successfully is another approach to describe this term.

“Innovation involves the ability to think differently, to come up with a new idea, a fresh take, a unique offering. To innovate successfully, this playful approach needs to be coupled with tough-minded execution, discipline, and seriousness. So an innovative strategy requires out-thinking and out-executing the competition. The key is to take smart risk and make it pay.” - (Kelly & Booth, 2004, p. 90)

To exploit innovations, so-called innovators are needed, Teece (1986, p. 285) defines innovators as „firms which are first to commercialize a new product or process in the market“.

Debruyne (2014, p. 8) highlights the concept of open innovation, which is characterized by relying not only on internal R&D, but also to allow external ideas in order to foster rapid development. Furthermore, access to newer technologies as well as knowledge creation are few
of many advantages that come along with opening up innovation towards external influence (Debruyne, 2014, p. 8).

This general view of the term innovation provides a picture of how creative the process of innovating the business model may get. However, as there is no uniform definition of innovation, there is also no uniform type of innovation, which can be seen in Figure 4.

4.2.1. Different types of innovation

Before making the decision between innovating the business model or leveraging an existing one, Pisano (2015, p. 50) claims that the type of innovation must be determined first. Four different innovation types should help to decide whether an existing business model should be leveraged, or a new business model should be established by leveraging existing technological competences or creating utterly new technical competences. Figure 4 shows a matrix based on examples of the various innovation types.

Figure 4 How does a potential innovation fit with a company’s existing business model and technical capabilities; Source: Pisano (2015, p. 51)
One thing in advance, it is not always clear to distinguish between the different innovation types. While Beck & Müller-Bloch (2017, p. 5390) mention that blockchain being a radical innovation, Holotuik et al. (2017, p. 912) call it a disruptive innovation. Following, the four different types of innovation are comprehensively described by simultaneously trying to clarify what type of innovation blockchain actually is.

**Disruptive Innovation**

As illustrated in Figure 4 disruptive innovations require a new business model, while simultaneously leveraging existing technical competences. In the case of blockchain, it can be said that it will definitely disrupt whole industries, such as the real estate industry or the financial industry (Holotuik et al., 2017, p. 912; Kejriwal & Mahajan, 2017, p. 1), but can it be classified as a disruptive innovation by definition?

Disruptive innovation is probably among the most discussed topics in the context of strategic innovation. Innovations, such as the blockchain-technology, can inter alia be classified as disruptive technology as it “[...] can attack a traditional business model with a lower-cost solution and overtake incumbent firms [...] It has the potential to create new foundations for our economic and social systems” (Iansiti & Lakhani, 2017). A disruptive innovation itself can be defined as “[...]a process by which a product or service takes root in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors” (Christensen, n.d.). Disruptive technologies are firstly introduced in niche markets, where these technologies are relatively unattractive for the mass-market. Constant improvements let these new disruptive technologies emerge in the mainstream markets, where market leaders with traditional technologies are getting continuously obsolete (Christensen, 2013, p. 15).

Furthermore, Christensen (2012) explains in an interview with Harvard Business Review that “disruptive innovation transforms a product that historically was so complex and expensive that only a few people with a lot of money and a lot of skill had access to, to a product that is
so much more affordable and accessible that a much larger population have access to it.” Transferring this statement to blockchain-technology, one can obviously see that the technology itself is much more complex than a regular database, however, the ability of reducing costs through, for example diminishing intermediaries, will eventually result in cheaper products.

Christensen (2013, p. 75) illustrates the latter mentioned development by using the steamship case as an example. The first steamships that were introduced had major problems, that is why sailing ships kept on leading the ship-market. After years of development and improvement, the disruptive technology of steamships was as good and reliable as sailing ships. As a consequence, a substantial amount of sailing ship producers had withdrawn from the market. Christensen (2013, p. 76) points out that the sailing ship industry made a major mistake by missing out on a strategic reorientation. Hence, the failing of the sailing ship industry was majorly caused by the lack of a strategic change rather than the lack of a technological change.

Habtay (2012, p. 291) further distinguishes between technology-driven disruptive business model innovation and market-driven disruptive business model innovation. The latter can be described as "low-tech" innovations, hence, technology-driven innovation is rather settled in the "high-tech" segment. Market-driven disruptive business model innovations happen more likely after consumers created pressure on the demand side. Such innovations use market opportunities as a source, where value chains and propositions for existing customers are changed, whereas technology-driven disruptive business model innovations happen before the market demands it.

**Architectural Innovation**

Architectural innovations “change the way in which the components are linked together, while leaving the core design concepts (and thus the basic knowledge underlying the components) as untouched” (Henderson & Clark, 1990, p. 10). A product consists of several components, which jointly become the architecture of the product, meaning that blockchain can be seen as a simple component within an architecture. Henderson & Clark (1990, p. 12) add that a change in a single component, in this case the implementation of blockchain, can lead to architectural
innovations, hence, it creates new interconnections with other components in an established product. However, for incumbents, this kind of innovations are the most difficult to pursue (Pisano, 2015, p. 50).

**Routine Innovation**

Routine innovations are, according to Pisano (2015, p. 50), characterized by continuous development of existing technologies. Putting it differently, routine innovations or also referred to as incremental innovation exploit existing designs by introducing relatively marginal changes to the existing product (Henderson & Clark, 1990, p. 9). This kind of innovation does not require an utterly new business model nor new technical competences, hence, considering these characteristics, blockchain can definitely not be classified as a routine innovation.

“Routine innovation is often called myopic or suicidal.” (Pisano, 2015, p. 50)

**Radical Innovation**

According to Pisano (2015, p. 50), radical innovation is the exact opposite of disruptive innovation as this type of innovation are in a good fit with the firm’s existing business model but are based on entirely new technical competences. This kind of innovation opens up new markets as well as new applications, therefore, they requires a different set of engineering and technical skills (Henderson & Clark, 1990, p. 9). Thus, blockchain can also be classified as a radical innovation as it requires new technical competences, such as more computing power, however, it does not necessarily require a new business model in order to make use of this technology.
4.3. Definition of business model innovation

The origins of business model innovation may come from Schumpeter (1950, p. 83), who once argued that “the opening up of new markets [...] and the organizational development [...] illustrate the same process of industrial mutation, that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating a new one”. Schumpeter (1950, p. 83) calls this process “creative destruction”. Schumpeter’s (1950, p. 83) “creative-destructive” process shows similarities with (Kelly & Booth, 2004, p. 129) allegation that innovations come along with a creative-destructive effect.

Santos et al’s. (2009, p. 14) definition of business model innovation is especially tailored to incumbent firms where a business model usually already exists. Therefore, according to Santos et al. (2009, p. 14) business model innovation is “a reconfiguration of activities in the existing business model of a firm that is new to the product/service market in which the firm competes.”

According to Girotra & Netessine’s (2014), business model innovation does not require new technologies, products or new markets, “Business model innovation is a wonderful thing. [...] It’s about delivering existing products that are produced by existing technologies to existing markets. And because it often involves changes invisible to the outside world, it can bring advantages that are hard to copy.” - (Girotra & Netessine, 2014)

Wirtz (2016, p. 191) provides a definition which should be a synthesis of definitions within the context of business models and, simultaneously include core characteristics of classic innovation:

“Business model innovation describes the design process for giving birth to a fairly new business model on the market, which is accompanied by an adjustment of the value proposition and/or the value constellation and aims at generating or securing a sustainable competitive advantage.” - (Wirtz, 2016, p. 191)
Following there are other relevant definitions of Business Model Innovation. These different definitions should emphasize the heterogeneity of this term, however, there are also commonalities that can be extracted from these definitions. (Wirtz, 2016, p. 189)

<table>
<thead>
<tr>
<th>Author</th>
<th>Definition</th>
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<tbody>
<tr>
<td>(M. W. Johnson et al., 2008, pp. 54, 59)</td>
<td>“It’s not possible to invent or reinvent a business model without first identifying a clear customer value proposition. [...] Established companies’ attempts at transformative growth typically spring from product or technology innovations. Their efforts are often characterized by prolonged development cycles and fitful attempts to find a market. [...] Their success comes from enveloping the new technology in an appropriate, powerful business model.”</td>
</tr>
<tr>
<td>(Lindgardt et al., 2009, p. 1)</td>
<td>“A business model consists of two essential elements – the value proposition and the operating model – each of which has three subelements. [...] Innovation becomes BMI when two or more elements of a business model are reinvented to deliver value in a new way. Because it involves a multidimensional and orchestrated set of activities, BMI is both challenging to execute and difficult to imitate.”</td>
</tr>
</tbody>
</table>
(Demil & Lecocq, 2010, p. 228)  
“[...] the [Business Model] concept represents a transformational approach, where the BM is considered as a concept or a tool to address change and focus on innovation, either in the organization, or in the BM itself.”

(Gambardella & McGahan, 2010, p. 263)  
“In this conceptualization, business-model innovation occurs when a firm adopts a novel approach to commercializing its underlying assets. One arena in which many firms with important knowledge assets are currently innovating is in the rising ‘markets for technology’, where firms sell rights to their intellectual property rather than themselves directly commercializing products and services based on their knowledge capital.”

<table>
<thead>
<tr>
<th>Table 2 Definitions of Business Model Innovation; Source: Wirtz (2018, p. 189)</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are many different point-of-views to what business model innovation is and how it actually works. Nowinsky &amp; Kozma (2017, p. 175) argue that business models are “inherently exposed to changes”, meaning that changes in technology can lead to a change in the business model. Some authors describe these changes as a reinvention (M. W. Johnson et al., 2008, pp. 54, 59; Lindgardt et al., 2009, p. 1), others say it is a transformation (Demil &amp; Lecocq, 2010, p. 228) or an adaptation (Gambardella &amp; McGahan, 2010, p. 263) of the business model. Wirtz (2016, p. 191) even uses adjustment, design process and generation to describe the process of innovating a business model. This implies that similar to the definition of business model, there does not exist a uniform definition of the term business model innovation.</td>
</tr>
</tbody>
</table>
4.4. Generic innovation process by Frankenberger et al. (2013)

Frankenberger et al. (2013) has shown in a detailed study that processes which come along with business model innovation are, despite some deviations in the single phases, rather structured. Based on this assumption Frankenberger et al. (2013, p. 265) developed the 4I-framework, which comprises four phases:

- Initiation
- Ideation
- Integration
- Implementation

The first phase is called the initiation phase, this phase comprises the task of scanning the ecosystem that surrounds the innovating firm. The ideation phase is, what the term implies, the phase where ideas for possible new business models are created. Followed by the integration phase, within this phase the ideas that were created in the ideation phase are used to actually construct new business models. The last phase basically deals with putting the previously created business model into action, hence, this phase is also called the implementation phase. (Frankenberger et al., 2013, pp. 260–263)

Within this process, Frankenberger et al. (2013, p. 264) found that if companies struggle with their business model, they usually go back from the final stage, implementation, to the previous stage, integration, to adjust certain dimensions. This process of business model innovation can take several years (Frankenberger et al., 2013, p. 264). Following, there will be a comprehensive description of the 4I-framework based on Figure 5.
Figure 5 is a graphical illustration of the previously mentioned 4I-framework, containing all phases to successfully innovate a business model. It is shown that these four phases are categorized in two blocks, design and realization. The first three phases are within the design block, while the last phase is within the realization block, however, the two blocks are linked with each other as an iteration process with each of the three phases in the design block is occurring throughout the whole business model innovation procedure. Furthermore, in the design block, it is also possible that the individual phases are repeated. (Frankenberger et al., 2013, p. 265)

As previously mentioned, the initiation phase is the starting point in the, as Frankenberger et al. (2013, p. 261) calls it, generic innovation process. Within this phase, the innovating firm analyzes the surrounding ecosystem, meaning that “customers, suppliers, competitors, universities or governments” are scanned if they are directly influencing the innovating firm (Frankenberger et al., 2013, p. 260; Wheelen & Hunger, 2012, p. 127). However, according to Frankenberger et al. (2013, p. 260), this process of monitoring the ecosystem comes along with
two challenges, namely “understanding the needs of the players [note: e.g. customers and suppliers]” and “identification of change drivers”. While the former challenge refers to customers, suppliers or governments being the igniting point for triggering the need for innovating the business model, the latter describes that technology changes or regulatory changes are catalysts for innovating the business model. Therefore, there can be for example customers who demand business model innovation, or technology changes that require a whole new business model (Habtay, 2012, p. 291). In summary, within the initiation phase, “firms need to identify changes in the environment and in technology in order to be able to respond to those changes with adequate innovations.” (Frankenberger et al., 2013, pp. 260–261)

The ideation stage directly follows the initiation phase while simultaneously using the data that has been gathered during scanning the ecosystem of the innovating firm (Frankenberger et al., 2013, p. 261). This data is now being transformed into concrete ideas for a new business model (Frankenberger et al., 2013, p. 261). Within this stage there may occur three challenges. One of these challenges is when there is the risk to not overcome the existing business model, meaning that the innovating firm is having difficulties thinking out-of-the-box (Frankenberger et al., 2013, p. 261; Mateu & March-Chorda, 2016, p. 1212). Therefore, breaking out of the current business logic is crucial for creating new ideas for business models (Frankenberger et al., 2013, p. 261). The second challenge concerns the attitude of thinking in terms of business models, meaning that firms tend to use their whole R&D budget to develop products and neglect to also focus on innovating the business model (Frankenberger et al., 2013, p. 261). Frankenberger et al. (2013, p. 261) highlight that there does not exist a tool or mechanism to foster the generation of ideas for business model, however, there exist many systematic tools to develop ideas for products or services. Therefore, an appropriate repertoire of methods with approaches and tools to support the creation of ideas for new business models is crucial. A possible way of overcoming these three mentioned challenges is that firms should integrate external experts into the process of finding ideas (Baden-Fuller & Haefliger, 2013, p. 424; Frankenberger et al., 2013, p. 262).

The third phase is dealing with the development of a new business model while using the ideas that have been elaborated during phase two (Frankenberger et al., 2013, p. 262). These ideas do
not automatically form a whole new business model, however, this should be done within the integration phase. This phase also comes along with challenges, namely that, although it is easy to modify one piece of the business, adjusting the rest is the difficult part. The second challenge refers to the difficulty of aligning and integrating the new business model with the rest of the firm’s divisions. Hence, this process requires long discussions, energy and skill and the result is a complex agreement. A newly established model only works if the partners are actively managed. (Frankenberger et al., 2013, p. 262)

“The most challenging thing with business model innovation is to successfully implement the new business model. Only if you convince everybody of the new business model and get their full commitment, you can be successful.” (Frankenberger et al., 2013, p. 263)

The ultimate phase in the generic innovation process is called the implementation phase. Having a fully thought-out new business model is only implementable with high investments and risks. Due to the fact that, unlike newly innovated products, which can be tested throughout the development process, business models have to be fully implemented in order to test them (Frankenberger et al., 2013, p. 263). Also, within this phase, there are several challenges that arise. The first challenge concerns the problem of avoiding internal changes as people are resistant against change, simply because of being anxious of new situations (Frankenberger et al., 2013, p. 263). Furthermore, people still have the thinking of “never change a running system”. Mateu & March-Chorda (2016, p. 1212) have a similar way of thinking. Their explanation is that highly experienced professionals do stick to their “traditional way of doing things”, hence they refuse using rule-breaking approaches. Another challenge would be the duration of implementing a new business model as it usually happens in small steps (Frankenberger et al., 2013, p. 263). However, taking time with the implementation has one particular advantage, namely to be able to monitor, and if necessary, adjust some parameters of the business model (Frankenberger et al., 2013, p. 263).
As mentioned earlier, these phases do not follow a strict procedure as firms tend to go back to the previous stage in order to adjust some parts of the business model (Frankenberger et al., 2013, p. 265). Furthermore, within the implementation phase, the trial-and-error method is used to successfully implement the newly generated business model. However, the process of going back and forth within the generic innovation process is similar to a trial-and-error method due to the fact that if there are for example difficulties in integrating a business model, then rethinking the idea is most probably the best way to overcome those difficulties (Sosna et al., 2010, p. 383).

The reason for taking Frankenberger et al.’s (2013) business model innovation process as a basis is that it is characterized by a continuous innovation process, as can be seen by the several iteration phases (Tesch, 2019, p. 7). Furthermore, this process provides two major advantages, namely that it is static but simultaneously dynamic, meaning that this framework is in general rather structured but open for changes, which is highly important when it comes to implementing new technologies.

4.5. Measuring the success of a business model

As a framework of business model innovation has been comprehensively discussed in the previous section, this section follows up by dealing with the question of how to measure the success of a newly invented, but also of a traditional business model.

It is rather ambiguous whether it is possible to measure the success of a business model. Is it the business model that is causal for the profits, or are other processes within the firm accountable? The purpose of this chapter is to find characteristics which make it possible to evaluate the success of a business model.

The Value Matrix is a tool to test the efficiency of a business model apart from financial indicators. To do that, a firm has to define the customer value as well as the business value that is created by the business model. The business value can be evaluated by considering financial indicators such as gross margin (EBITDA) and return on investment (ROI). The core question
is whether margins go to suppliers and customers or is the firm able to ultimately make profit from the business model. The customer value can be measured by evaluating whether customers receive value, meaning that the customer is being satisfied by solving problems. This can inter alia be evaluated by the number of customers. Biloshpka et al. (2016, p. 42) illustrate this by taking Tesla as an example: even by charging a substantial premium, Tesla “achieves a flood of orders from customers who perceive great value even at that high price”. (Biloshapka et al., 2016, p. 41)

Biloshpka et al. (2016, p. 43) emphasize that it is not obvious that these two dimensions, namely customer value and business value, always correlate, meaning that although the customer value proposition of a firm is great, it is still possible to miss out on generating money with this business model.

![Figure 6 Business model value matrix; Source: Biloshapka et al. (2016, p. 43)](image)

Figure 6 shows this value matrix with the two dimensions on the axis and four quadrants. By considering Figure 7, which illustrates the business model lifecycle, the first quadrant to be explained, the “Giver”, is simultaneously the starting point in the business model lifecycle. The “Giver” perfectly illustrates the previously mentioned lack of correlation, hence, the firm delivers a great customer value but is not able to make profit out of it due to failing to evaluate the real cost of delivering this value to customers. Biloshpka et al. (2016, p. 43) argue that internet startups typically get stuck within this quadrant as they usually provide great value for customers in order to gain customer base but simultaneously struggle to earn money. Following to the “Giver” type of business model, which is characterized by gaining customer base first,
firms move into the “Winner” quadrant, where they are able to monetize their business model. Within this quadrant, firms are able to generate sustainable revenue streams and acquire customers from competitors. The main goal is to stay in the “Winner” quadrant as long as possible, however, this necessitates strategic decisions. Before ending in the “Loser” type of business models, the “Taker” quadrant basically describes the stage where firms rely upon their prominent position they experienced in the “Winner” quadrant, without showing effort to maintain customer value. The “Loser” is apparently situated in the lower left corner, which indicates that customer value as well as business value is low, meaning that neither the customers are satisfied, nor this business model yields sufficient profit. “In such cases, the companies are the fallen giants of disrupted industries”. (Biloshapka et al., 2016, p. 43ff.)

Figure 7 Business model life cycle; Source: Biloshapka et al. (2016, p. 45)

4.6. Key players in business model innovation

This section will provide several standpoints on who is responsible for BMI. This is going to be relevant in the final section, where the roadmap to implement a business model is being described, which deals with the question of who is responsible for selecting the teams that actually implement the business model (Batocchio et al., 2016, p. 721).

While Chesbrough (2010, p. 362) suggests that firms have to determine internal leaders which manage these business model innovation processes in order to establish a better business model
for the firm, Pisano (2015, p. 54) claims that senior leaders are responsible for creating a new strategy, due to the reason that the complex system, where almost any process is affected by innovation, can only be steered by the senior leader. Baden-Fuller et al. (2013, p. 424) argue that when introducing new technologies, managers should stick to the so-called “architecture of participation” principle introduced by Baldwin et al. (2006), meaning that when adapting a business model, managers should include technology developers into the business model innovation process as they thoroughly understand the characteristics of the technology, hence, they can help to transfer the potential of the technology to the customers and users. However, Sosna et al. (2010, p. 383) state that business model innovation is characterized by an organizational learning process that includes trial and error. Mougayar & Buterin (2016, p. 126) highlight the role of the “reeengineering czar”, which basically coordinates the reengineering activities and supports the single processes. Mougayar & Buterin (2016, p. 126) even call this individual the “blockchain czar”. When it comes to implementing blockchain, this person can act as the single point of contact internally as well as externally.

The main drawback of the business model innovation process is that it is hardly measurable ex ante. There exist some tools, such as the Value Matrix, which is described in chapter 4.5., to assess business models. However, choosing the right business model is often based on assumptions. Mateu & March Chorda (2016, p. 1209) have determined a set of eight indicators, which should help figuring out whether provisionally available business models have potential or not. Indicators such as value creation, access to potential customers or superiority over competitors are negatively influenced by the experience of the individuals, who are responsible for generating a business model. The question might arise in which way experience can have a negative influence on establishing new business models. Mateu & March-Chorda’s (2016, p. 1212) explanation of this result is that highly experienced professionals do stick to their “traditional way of doing things”, hence they refuse using rule-breaking approaches such as non-experienced individuals do. In contrary, Amshoff et al. (2015, p. 9) state that companies, which operate in the field of disruptive technology struggle to analyze new business models simply because of the lack of market-knowledge.
There is a slight discrepancy between Amshoff et al.’s (2015) findings and Mateu & March-Chorda’s (2016) results. Amshoff et al. (2015) determines the lack of market-knowledge as the driving force of having difficulties in analyzing new business models. The lack of market-knowledge may get compensated with experience or the process of becoming more familiar with the new market happens faster, due to experience. However, as mentioned in the previous paragraph Mateu & March-Chorda (2016, p. 1212) state that experience has negative influence on assessing (analyzing) business models, which is in fact the opposite effect.

4.7. Strategies to protect existing business models

Due to the fact that the blockchain technology is in its early phase, a newly invented business model driven by blockchain is most probably attractive for competitors. This fact is also considered in the components of the previously generated business model definition in chapter 3.5. Therefore, protecting the newly generated business model, which was under certain circumstances renovated at great expense, is crucial to maintain the competitive advantage. Following, several ways to protect a business model are explained in more detail below.

Value-creating innovations do not only attract customers, but also competitors, therefore, this value that is being created with new innovations has to be protected (Pisano, 2015, p. 49). Afuah & Tucci (2003, p. 69) established a combination of three generic strategies which should protect a firm’s business model from being imitated. The first generic strategy is called the “Block Strategy”, which focuses on two different ways a firm can “block” competitors from imitating business models. The first way of blocking is characterized by limiting access to certain components of a firm’s business model which are intellectual property and therefore distinctive and inimitable enough to provide unique value for the customer. As an illustrative example they name Amazon’s “1-Click” technology, which was copied by Barnes and Nobles and subsequently led to a law-suit. However, Pisano (2015, p. 49) argues that blocking rivals through intellectual property is not sufficient enough. The second way of blocking refers to prices, as incumbents should create entry barriers by signaling lower prices after a firm, which is capable of performing the same activities, wants to enter the market. Putting it differently,
firms can for example menace others who try to imitate components of its business model. These mentioned two ways of blocking should maintain competitive advantage, however, it is not the most effective way as the internet provides several possibilities to learn from the competitors’ business model, thus, bypass certain entry barriers. (Afuah & Tucci, 2003, p. 69)

The second generic strategy, the “Run Strategy”, relativizes the first generic strategy by arguing that such blockades provide the possibility for competitors to catch up and overcome the blockade. Therefore, firms have to literally run ahead by changing business models or even reinventing the whole business model. First-mover advantages are the result of “running”, which enables a firm to control its environment. Afuah & Tucci (2003, p. 70) take Dell’s way of selling its computers as an example, as they often introduce new business models, while others were still copying the old one. With the “Team-up Strategy”, Afuah & Tucci’s (2003, p. 70) combination of generic strategies is complete. This strategy revolves around cooperation with others as it is difficult to innovate on its own. It enables firms to share resources, which facilitate knowledge sharing, this in turn can be seen as a disadvantage, since the protection of technologies or other components of the business model becomes more difficult. In order to achieve or keep competitive advantage, a combination of these three generic strategies is necessary, however, the question of when it is useful to use each strategy is essential as it determines the evolutionary stage of the technology and when competitors have planned to pursue related strategies. (Afuah & Tucci, 2003, p. 70)

“It takes more than technology to profit from technology” - Afuah & Tucci

(2003, p. 70)

Afuah & Tucci (2003, p. 71) argue that the imitability and complementary of an invention or technology determine to which extent a firm can benefit. While imitability revolves around the possibility of copying, substituting or leapfrogging the technology by a firm’s competitors, complementary describe all other capabilities, such as distribution channels, brand name or marketing, a firm requires to leverage the technology. These two attributes are, according to
Afuah & Tucci (2003, p. 70), essential for developing business models to optimally exploit new technologies.

Chapter 4. has shown that Business Model Innovation represents the dynamic part of a business model, as it is driven by creativity and new innovations. Defining the term business model innovation combined with elaborating on key characteristics that are crucial in order to change business models has been covered in this section. Similar to the definition of business model, there is also a lack of uniformity in the definition of business model innovation, however, the result is that the general view of business model innovation provides a picture of how creative the innovation process may get. Several types of innovation require different actions, therefore, those different types of innovation were described while simultaneously referring to the blockchain technology. The ultimate goal was to evaluate what type of innovation blockchain is, hence, which actions need to be made in order to get the most out of this technology. Following to defining the most important terms, Frankenberger et al.’s (2013) 4I-framework has been comprehensively described, as this framework will be of high importance when it comes to answering the second research question. Additionally, elaborating on ways to measure the success of the newly innovated business model in order to see if it requires adaptions as well as ways to protect the business model, due to the threat of replication, have been described.
5. Blockchain

The origin of the blockchain-technology stems from the cryptocurrency Bitcoin, which was introduced in 2008 by Satoshi Nakamoto (2008) (Morabito, 2017, p. 5). The original purpose was to prevent cryptocurrencies from being spent twice – also known as the double spending problem – by using a peer-to-peer network, which consists of computers (nodes) that provide their computational power to all members of the network without the need of a central coordinator (Drescher, 2017, p. 14). Putting it differently, digital currencies already existed before Bitcoin, however, they were not practicable due to the risk of replication, meaning that the holder sent a copy of the transaction to the merchant and kept the original transaction (double-spending) (Bitcoin.org, 2017; Morabito, 2017, p. 6; Nakamoto, 2008, p. 1). Nakamoto (2008, p. 1) then developed a mechanism in which transactions are being hashed “into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work”. Explanations of the terms “hashed” and “proof-of-work” are documented in chapter 5.2.2. From then on, blockchain forms the basis for most cryptocurrencies that currently exist. Following to Bitcoin, Buterin (2014) launched a next-generation blockchain called Ethereum, that goes far beyond cryptocurrencies.

“Ethereum is open-ended by design, and we believe that it is extremely well-suited to serving as a foundational layer for a very large number of both, financial and non-financial protocols in the years to come.” (Buterin, 2014, p. 34)

Ethereum gives access to a wider field of applications beyond financial transactions. It basically adds an economic layer to the existing “Bitcoin blockchain” by enabling decentralized applications (DAPPS), which are of high interest for companies. Decentralized applications run on the blockchain, hence, they use the advantages blockchain offers, namely immutability, zero downtime and security. Almost any service can be transmuted to a decentralized application, hence, the possibilities for businesses are manifold. (Blockchainreview.io, 2018, pp. 11–12; Buterin, 2014, p. 34)
In order to facilitate the understanding of why the blockchain is a potential source for business model innovation, the following section will entirely focus on the blockchain architecture and its characteristics. The explanation of the technology itself gives an idea of the advantages the blockchain will have for different areas.

5.1. Characteristics of a blockchain

A blockchain is a specific type of a distributed ledger that maintains a growing list of transactions arranged in blocks with multiple protection measures against manipulation and revision (Samman & Seibold, 2016, p. 2). A distributed ledger is according to Samman & Seibold (2016, p. 1) a “digital record of ownership that differs from traditional database technology, since there is no central administrator or central data storage; instead, the ledger is replicated among many different nodes in a peer-to-peer network, and each transaction is uniquely signed with a private key.”

The blockchain allows the storage of a list of transactions which are exchanged by members (peers) of a network. Transactions can be for example money transfers or so-called smart contracts (Wüst & Gervais, 2017, p. 1). A rather simplistic description of the potential of the blockchain could be:

“With blockchain, we can imagine a world in which contracts are embedded in digital code and stored in transparent, shared databases, where they are protected from deletion, tampering, and revision.[...] every process, every task, and every payment would have a digital record and signature that could be identified, validated, stored, and shared.[...] this is the immense potential of blockchain. – (Iansiti & Lakhani, 2017, p. 120)

The blockchain-technology is often compared with the Internet-technology due to the fact that it was the first tool that enabled the distribution of information, whereas blockchain is going to be the distributor of value (Swan, 2018, p. 9). While the hype focuses on the implementation of
blockchain in the financial sector to cut out the middleman, blockchain has the potential to go beyond that and transform businesses, governments and society. (Tapscott & Tapscott, 2016, p. 3)

Blockchain is probably the most hyped term in the history of technology. However, Gartner’s Hype Cycle suggests that blockchain has not yet reached the stage of “Trough of Disillusionment”, which directly follows the stage “Peak of inflated expectations”, which focuses on “experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process [e.g. IBM Hyperledger]” (Walker, 2017, p. 66). It will bring along many use-cases for businesses in the future, with the emphasis on “in the future” as it will approximately take five to ten years until blockchain reaches the “Plateau of Productivity”, or in other words the final stage, where real-world benefits are demonstrated and the degree of adoption of this technology is at about 20% percent (Walker, 2017, p. 66).

Peck (2017, p. 38) argues that more than 50% of the worlds’ largest firms consider to integrate blockchain into their products. According to Peck (2017, p. 38), there exist several areas which will be disrupted, namely health care, property titles, know-your-customer, and supply chains. Furthermore, the World Economic Forum (2015, p. 24) predicts that by 2025 10% of global gross domestic product (GDP) is saved on the blockchain. According to Kharif (2017) the market for products and services which are based on blockchain will reach almost 8 billion USD in 2022, which is highly impressive due to the fact that the value was at around 240 million USD in 2016 (Kharif, 2017). Kharif (2017) further mentions that six large companies out of ten are considering to implement blockchain based solutions.

5.1.1. Technical and market evolution of blockchain

The evolution of blockchain can be separated into three stages, namely blockchain 1.0, 2.0 and 3.0. blockchain. 1.0 is referred to be the first generation of blockchain, which has been used for
digital payments including the cryptocurrency Bitcoin. Blockchain 2.0 is a further development, which enables the storage of smart contracts or property information on the blockchain. The final stage is blockchain 3.0 which focuses on creating applications that can be used by the government or in the health sector (Swan, 2015, p. 9). The term blockchain 4.0 has already seen the light of the day, however due to a lack of a specific definition, it is not mature enough to pay attention, at least for now.

Due to the technological evolution of blockchain, it is getting pushed towards the mainstream market. For this reason, Geoffrey Moore (1999) developed a framework that focuses on how to bring cutting-edge technologies, such as blockchain, to mainstream consumers. According to Moore (1999, p. viii), “the chasm model represents a pattern in market development that is based on the tendency of pragmatic people to adopt new technology when they see other people like them doing the same.”

Moore (1999, p. 5) argues that almost any tech innovation starts out as a fad, something with no known market value or purpose but with “great properties” that generate a lot of excitement within the early market, or as Moore (1999) calls that the “crowd”. Then, he states, comes a phase during which the masses have an eye on the innovation in order to extract possible use cases – Moore (1999) calls that the “chasm”. He explains that if this innovation can be used and generates value that can be transferred to a set of customers at an affordable price, then a new mainstream market is being created.
In that regard, Moore (1999, p. 9) identifies five major Groups: “Innovators”, who constantly follow an innovation. “Early adopters” support new innovations at an immature state, however, they are no experts such as innovators. The “early majority” show similarities to the early adopter’s, as they are also no technologists but tend to relate to the feasibility of the innovation. The “late majority” share some similarities with the “early majority”, however, unlike in the “early majority”, they are not able to handle such new innovations. The last group is called the “laggards”. This group of people simply avoid confronting themselves with new technologies, either due to personal attitude or due to economic reasons. However, if the innovation is a component of a product and it is not recognizable that, then these people unknowingly use this technology. Blockchain for example can be such an innovative component of a product, which is not visible to the customer, yet they use this technology.

According to Hall (2018) blockchain is in the innovators and early adopters stage, however, as the progress and funding continues, it will not take long until the chasm can be crossed. As soon as blockchain applications reach the stage where it is not about the technology anymore but the easiness to use, then the chasm can be crossed. (Hall, 2018)
5.2. Blockchain architecture

The following section deals with the architecture of the blockchain as it is important to understand the technology behind it in order to be able to exploit its advantages for future business model innovations. For a better understanding of the technical background and as a basis for the further discussion, the most important terms will be explained in the following section.

Before going deeper into the architecture of blockchain, a simplified illustration of the blockchain should help to visualize the technology itself. Figure 9 shows that the blockchain is - what the term implies - a chain of blocks, which contains several records.

![THE RECORD THE BLOCK THE CHAIN](image)

Figure 9 Illustration of the blockchain; Source: Murray (2018)

These blocks are chronologically linked with a so-called “cryptographic hash” (Wüst & Gervais, 2017, p. 1). Figure 10 basically exemplifies that in order to become a chain, the hash of the previous block and the new block has to be identical.
As Figure 11 illustrates, each block contains a block header, which stores the hash of the previous block that simultaneously acts as the chain link that connects the blocks. Furthermore, a timestamp, which basically records the time the block was created as well as a merkle root hash and a random nonce (“number used once”) are also part of the block header. The merkle root hash is generated by hashing the hashes of the transactions within a given block. The “body” of the block contains transactions, for example a bitcoin transaction or a smart-contract. (Pluralsight.com, 2017)
Figure 12 should serve as a simplified illustration to get a facilitated understanding of the structure of the blockchain. It can be seen that the block hash of Block 15 (which is in this case not a valid SHA256 hash as it only has 10 characters) is written in Block 16, which creates the linkage of these two blocks. The block hash of Block 16 is basically the previously mentioned merkle root hash. If a transaction in Block 16 is slightly changed, the hash of Block 16, in this case 87ea2ffe94, will change to, for instance, 12ab3cde45. As a result, the block hash of Block 17 is not identical with the merkle root hash of block 16, hence, the chain is broken.

![Figure 12 Structure of a Block; Source: Gaur et. al (2017, p. 15)](image)

Following to this rather simplified explanation of how the blockchain becomes a chain and how the block itself is constructed, important terms that need further explanation are discussed as it is of high importance to fully understand this technology in order to draw conclusions if or how the blockchain innovates business models.

**5.2.1. Peer-to-peer network**

In a blockchain system data is distributed via the peer-to-peer architecture. A peer is basically a computer-system in a network. Within a peer-to-peer network, each peer has a complete copy of the transaction which is replicated multiple time across the peers. Each update initiates a chain of communication among the peers. However, each computer-system is still independent, meaning that it can continue working without the other peers. Especially from a security perspective, the lack of a central server makes it difficult for the network to experience hacks such as denial of service attacks (DOS). (Morabito, 2017, p. 64)
5.2.2. Hashing

Since transaction data within a peer-to-peer network can be substantially high, easy identification of these transactions is crucial. Cryptographic hash functions, which are among the most important groups of hash functions, generate a unique “digital-fingerprint” which facilitates identification, therefore, the purpose of a hash function is to compare strings quickly. Hashing is a process where any type of input (e.g. document or message of arbitrary length) can be transformed into a fixed-length output, which is generated via a set of mathematical transformations within the hash-function. These cryptographic hash functions are deterministic, meaning that the output is always the same for a given input. If the input is slightly changed the output [hash] will be completely different. (Drescher, 2017, pp. 71–72; Weisstein, 2018)

Figure 13 shows examples of how a certain plain text, in this case “Hello World!”, is converted into four different hash types (MD5, SHA1, SHA256 and SHA512) with different lengths. Blockchain for example uses the SHA256 algorithm to hash content, which leads to a 64 characters long hash. (Van Boesschoten, 2018)

![Figure 13 Calculating hash values of a short text; Source: Drescher (2017, p. 74)](image-url)
For illustrative purpose, the SHA256 hash for the phrase “Blockchain and business model innovation: An analysis of opportunities and the innovation process” is generated by using an online converter:

b34aaa19913b72954b33f53699bb60e836364ca12cffde9ffdf7b971679c13a5

If this phrase is slightly changed by for instance omitting the first letter, then the hash will be completely different. Therefore, the hash for the phrase “lockchain and business model innovation: An analysis of opportunities and the innovation process” is:

8a98a53903aa02f217e2d89de843d8b7ab46b8ecbd8bcb8ba2d782803e0dca3e

The reason why hashing is an elementary component in the blockchain is as follows: Assuming that a transaction in a block within the blockchain is minimally changed, the merkle root hash changes entirely as a result. This in turn has an effect on the newer block, as it contains the “old”, or in other words the “before the change is made”-hash of the previous block, which is indeed different than the hash that has changed due to the manipulation of the transaction. Therefore, hashing is decisive for why the blockchain is immutable.

However, until 2017, cryptographic hash functions, more precisely SHA-1, were considered as collision resistant, meaning that it is almost impossible to find the exact same hash value for different pieces of data (Drescher, 2017, pp. 71–72; Weisstein, 2018). Nonetheless, this particular type of Cryptographic hash function [SHA-1] has recently been cracked, meaning that there indeed exists a way to generate a collision, which in turn means that the same hash value is produced for two different messages. Nevertheless, this breakthrough discovery was only possible with infrastructure from google, hence, high computational power. (Stevens et al., 2017). However, this can probably turn out to be a weak point in the blockchain in the future, when access to high computational power is given to the mass.
5.2.3. Consensus

The consensus mechanism is basically the core of a blockchain as it guarantees the transaction security due to the fact that all participants have to approve a transaction by following certain rules. This in turn implies that no central authority is needed in this process (Samman & Seibold, 2016, p. 2). A consensus mechanism can be defined as “method of authenticating and validating a value or transaction on a blockchain or a distributed ledger without the need to trust or rely on a central authority. Consensus mechanisms are central to the functioning of any blockchain or distributed ledger” (Samman & Seibold, 2016, p. 1). Putting it differently, this protocol allows new blocks to be added to the blockchain. Nevertheless, the concept of consensus is only effective when there is “common acceptance of laws, rules, transitions and states in the blockchain; (ii) common acceptance of nodes, methods and stakeholders that apply these laws and rules; (iii) a sense of identity such that members feel that all members are equal under the consensus laws” (Morabito, 2017, p. 69). Samman & Seibold (2016, p. 3) state that one major advantage of such consensus protocols is that if a member of this group of connected machines fails, the system still works and new blocks can be added to the blockchain, whereas in a traditional database a central authority has to approve any transaction, which implies that if this central authority fails, the whole process of approving fails.

Figure 14 shows the process of initiating a transaction to finally become a complete block that can be added to the blockchain. The consensus mechanism is applied in steps three and four. The process begins when multiple parties start transacting with each other. These transactions, which cannot be changed anymore, are then sequentially added into a network’s block. The block is broadcasted to every participant in the network for verification and confirmation. Within the consensus mechanism application steps, the ledger is continuously replicated. Finally, the consensus is recorded, which provides the basis for the trust mechanism. The last two steps basically represent the process of adding the confirmed block in a chronological order to the chain.
There exist several different consensus protocols such as proof-of-work, proof-of-stake, Byzantine Fault Tolerance (BFT), N2N, Leader-based consensus, Round Robin and many more (Samman & Seibold, 2016, p. 4). Three of the most popular consensus protocols, which are simultaneously the basis for most of the other consensus protocols, are described in more detail below.

Proof-of-work is currently the most publicly proven consensus mechanism and used in the bitcoin blockchain. Validating a transaction of another participant with a proof-of-work consensus mechanism is done by participants who repeatedly run algorithms, this in turn implies that proof-of-work requires a lot of computational power, hence, it wastes a lot of electricity (Samman & Seibold, 2016, p. 5; Zheng et al., 2017, p. 557).

Proof-of-stake is a further development introduced in 2012. This consensus protocol is characterized by betting a stake on whether a consensus outcome takes place or no. Putting it differently, a participant can enter new transactions depending on how many transactions they already have. The difference between proof-of-stake and proof-of-work is that the latter does not require as much computational power, has lower latency and improves smaller chains’ security. (Morabito, 2017, pp. 69–70; Samman & Seibold, 2016, p. 5; Swan, 2015, p. 84)

IBMs Hyperledger for example is based on the Practical Byzantine Fault Tolerance (PBFT) protocol (Swan, 2015, p. 84), which is characterized by reaching consensus “on the state of faulty nodes of a network” (Gaur et al., 2018, p. 10). With PBFT a substantial amount of transactions can be processed with minimal latency. PBFT is based on the Byzantine General’s
Problem, which is around since the 1960s. This Problem can be best illustrated by the following explanation:

We imagine that several divisions of the Byzantine army are camped outside an enemy city, each division commanded by its own general. The generals can communicate with one another only by messenger. After observing the enemy, they must decide upon a common plan of action. However, some of the generals may be traitors, trying to prevent the loyal generals from reaching agreement. The generals must have an algorithm to guarantee that“
- (Lamport et al., 1982, p. 382)

Transferring this to the case of a current blockchain example, the different nodes can be seen as the generals deciding on an acceptable level of failure, meaning that how many transactions can be faulty without causing the system to decline a transaction and not damaging the system’s reliability. If two-thirds of the nodes [generals] are trustworthy, the network can be declared as reliable. (Samman & Seibold, 2016, p. 5)

Morabito (2017, p. 73) further distinguishes between permissioned and permissionless consensus mechanisms. The former is characterized by knowing the participants that are involved in the validation process, or in other words, only participants are allowed to decide on what is happening in the blockchain, whereas within a permissionless consensus protocol, a former relationship with the ledger is not required in order to participate in the validation process (Morabito, 2017, p. 73). The Ripple blockchain, which is based on the bitcoin blockchain, is one example for using a permissioned consensus protocol, which, however is unlike to bitcoin’s blockchain not based on the proof-of-work algorithm, while Ethereum [Casper] or Bitcoin are using a permissionless consensus protocol (Samman & Seibold, 2016, p. 4).
5.2.4. Smart-contracts

“I call these new contracts "smart", because they are far more functional than their inanimate paper-based ancestors. No use of artificial intelligence is implied. A smart contract is a set of promises, specified in digital form, including protocols within which the parties perform on these promises.” - (Szabo, 1996)

According to Buterin (2014, p. 1), smart-contracts “[...] automatically move digital assets according to arbitrary pre-specified rules”, meaning that it is a coded contract written on the blockchain, that works on the “if-then-else” logic (Morabito, 2017, p. 15). Although smart contracts have already been mentioned in 1996 by Nick Szabo, attention has probably begun to focus with the launch of Ethereum. However, smart contracts seem to be the most promising and useful blockchain based development, since an infinite number of use-cases are generated (Drescher, 2017, p. 241). These self-executing contracts guarantee compliance of all participating parties as they execute when pre-defined conditions are fulfilled (Cant et al., 2016, p. 2; Iansiti & Lakhani, 2017).

Figure 15 illustrates the growing hype smart contracts have experienced in 2016. According to Bartoletti & Pompianu (2017, p. 1) the number of github projects related to smart contracts has reached 445 units up until late 2016.

![Number of new blockchain- and smart contract related projects created on github.com](https://example.com/number_of_projects.png)

Figure 15 Number of new blockchain- and smart contract related projects created on github.com; Source: (Bartoletti & Pompianu, 2017, p. 2)
The Ethereum blockchain provides a built-in programming language that can be used to code a contract on the blockchain (Buterin, 2014, p. 1). However, a smart contract can be executed on any blockchain, not only Ethereum.

Figure 16 and Figure 17 demonstrate a coded smart contract to sell 100 beanie babies for 5000 at a certain date. In Figure 16 the contract partners are defined by storing their Ethereum address. Furthermore, a deadline is specified, to which the conditions, mentioned in Figure 17, must be fulfilled.

As soon as the contract partners have been determined, the actual condition can be coded. This example shows a “if-then-else” condition, meaning that if the agreed amount is received on time [deadline], then the buyer is being designated as the new owner and the seller is being paid.

A real-world example should clarify the purpose of smart contracts: By combining for example “Internet of things” with blockchain-based smart contracts, companies are able to make use of self-executing contracts, which immediately enter into force by instantly transferring payments, provided that all of the coded terms of the smart contract are fulfilled. If for example a trade finance contract is set up for someone paying for a shipment of goods, the contracting partner
probably wants to receive proper tracking information such as when the goods have been released from the Customs Border Protection Bureau, or where the goods currently are. Furthermore, if the goods are frozen, the contracting partner wants to know whether the temperature inside the container remained below freezing while they were in shipment. All of these metrics of contractual completion can be transferred to the blockchain in form of a data feed via sensors using Internet of things technology. Therefore, if the cooling chain is not maintained and temperature exceeds an in a smart contract defined threshold, the smart contract immediately becomes void due to noncompliance and no money will be transferred.

With smart contracts, costs for verification and enforcement can be reduced. Furthermore, they provide permanence and guaranteed execution, while no-one is able to interfere. (Gaur et al., 2018, p. 50) However, smart contracts have to be used cautiously, as a programming error can lead to a serious loss of money (Bartoletti & Pompianu, 2017, p. 2).

5.2.5. Smart property

Smart property is, according to Bambara et al. (2018, p. 42), about owning, accessing and controlling physical as well as virtual assets over the blockchain network. Essentially, it enables placing the ownership of some property on the blockchain and making it tradable (Bambara et al., 2018, p. 42). Bambara et al. (2018, p. 42) see the main advantage of smart property in reducing costs but also making risk of fraud negligibly small, as ownership is clearly defined on the blockchain.

Again, a real-world example should help facilitate the understanding of what smart property is. Taking a car as an example, it can be transformed into smart property by controlling ownership via blockchain. A typical example of connecting smart property with smart contracts would be when taking out a loan for buying a car in combination with a lien. Again, the smart contract contains an “if-then-else”-condition that says, if the loan debtor is not able to pay the instalments back, then the bank can assert the lien and automatically take over control of the car keys, hence, the actual owner is not able to use it anymore. This however, requires further
In this example, the car key is used to define ownership. Having this ownership information on a blockchain makes it possible for banks to immediately get ownership when the loan debtor is not compliant with the terms in the earlier coded smart contract. (Szabo, 1994)

5.2.6. Blockchain & other technologies

As a fast-rising technology, Internet of Things (IoT) is able to offer promising solutions in transforming the operation and role of many existing industrial systems such as manufacturing systems and transportation systems. The IoT comprises information-sensitive devices or sensors such as radio frequency identification devices (RFID) or infrared sensors. IoT is made up of four layers, which ultimately have one goal, namely to process the gathered data in order to use it for plans and managing and controlling objects. The first layer, sensing and perception, basically has the task to collect data, the second layer is for connecting devices in order to share these information. The third layer is for controlling, processing and managing the devices and the fourth layer is responsible for processing the gathered data in order to make use of it. (Dweekat et al., 2017, pp. 270–271)

What comes along with connected devices is, that there exists a security problem, but also scalability can reach its limits. When using a central server in which all data is collected and processed, it can easily result in a total failure if, for example, a denial of service (dos) attack is carried out. That is where blockchain comes into action, as it provides security due to the fact that the gathered data is stored in a decentralized way. Furthermore, this network allows scaling in order to support billions of devices. (Bambara et al., 2018, p. 52)

Bambara et al. (2018, p. 53) establishes the connection between IoT and blockchain as follows: “Imagine a world where your washing machine can detect when you are running low on detergent, automatically engage with the market, negotiate the best price, and reorder the necessary product.” While IoT is responsible for detecting the level of detergent via sensors, blockchain takes care of the reordering process by using smart contracts which immediately become effective as soon as the detergent-level is low. (Bambara et al., 2018, p. 53)
Swan (2018, p. 32) highlights the necessity of deep learning blockchains, as blockchain provides deep learning systems the necessary security to be able to implement them more safely in the open-internet. Swan (2018, p. 31) establishes a connection between deep learning and blockchain by arguing that “[...] computing networks with intelligence built in such that identification and transfer is performed by the network itself through protocols that automatically identify what things are (deep learning technology), and validate, confirm, and route transactions (blockchain technology) within the network”, Swan (2018, p. 31) calls this a “smart network”.

This combination of technologies opens up new ways how to make business, or in other words, it will most probably be a source for business model innovation, as for example washing machine manufacturers can use the same business model as printer manufacturers use, namely to automatically inform the retailer if ink is low.

5.2.7. Decentralized Applications (DAPPs)

DAPPs, also called decentralized applications, are similar to a web application. They typically combine a user interface with a backend service, which usually utilizes the Ethereum blockchain (Bambara et al., 2018, p. 122). Swan (2015, p. 23) argues that DAPPs are nothing less than highly complex smart contracts, which indeed become self-reliant entities, as they conduct complex programmed operations. According to the website “stateofthedapps.com” (2018), there currently exist 1835 decentralized applications on the Ethereum and POA blockchain. Such DAPPs could be for example a simple file storage platform, but with the advantages the blockchain offers. (Swan, 2015, p. 22).

As mentioned above, DAPPs are not capable of creating a whole company behind them. Also existing companies can enter new markets by offering DAPPs to the customers in order to facilitate certain services or make the user experience more comfortable. To name one example, banks can make use of a DAPP that facilitates know-your-customer processes for customer.
5.3. Types of blockchain

It is necessary to distinguish between the different types of the blockchain-technology due to the fact that it does not always make sense to use this technology. Blockchains can either be private blockchains (e.g. Hyperledger/Corda), or public blockchains (e.g. Ethereum/Bitcoin) and consortium blockchains. (Wüst & Gervais, 2017, p. 1)

A blockchain that supports a cryptocurrency is most probably public or permissionless, meaning that anyone can participate. Therefore, the data in a public blockchain are open to anyone who wants to read data, whereas the data in a private blockchain can only be read by defined parties. When it comes to creating “blocks” in a blockchain there has to be distinguished between a permissioned and a permissionless blockchain. The former type of blockchain allows anyone to create blocks and write data in the blockchain, whereas in a permissioned blockchain, write access is restricted to certain participants (Wüst & Gervais, 2017, p. 2).

Newest developments suggest, that there already exists a hybrid blockchain, which combines the advantages of a private and a public blockchain (Luu, 2018). Glaser (2017, p. 1548) suggests that a hybrid blockchain can be compared to a club in which there are certain participants who are not admitted using the system services, whereas those who are admitted face no restrictions. On the contrary, a public blockchain can be seen as a public good as users cannot be excluded from using the services. Table 3 summarizes the differences between the previously mentioned types of blockchains.

<table>
<thead>
<tr>
<th>Public blockchains</th>
<th>Private blockchains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants do not necessarily know each other</td>
<td>Participants are known</td>
</tr>
<tr>
<td>Participants do not necessarily trust each other</td>
<td>Participants are trusted</td>
</tr>
</tbody>
</table>
Participants can read data without having permission | Participants need permission to read data
---|---
Participants can write data without having permission | Participants need permission to write data

| Table 3 Difference between Public blockchains and Private blockchains; Source: Morabito (2017, p. 9) (modified by the author) |

It can be argued that permissionless-public blockchains, to which anybody has access to, are unsuitable for companies, whereas the permissioned-private blockchain is more appropriate as it limits network participants and the access to defined parties. However, for companies, it is anything but trivial to choose the right type of blockchain, or if it even makes sense to use a blockchain at all and rather stick to a traditional database (Cuomo, 2016; Peck, 2017, p. 39; Walker, 2017, p. 54; Wüst & Gervais, 2017, p. 7). According to Glaser (2017, p. 1548), a private permissioned system is simply an inter-group technology upgrade. Without having trust issues among the participants with regard to validity of data, opting for a blockchain is only reasonable if companies seek for immutable historical transaction logs for auditing purposes. However, the application case determines which type of blockchain should be used. For companies that want to use the blockchain, it is essential to know who is authorized to read or write on the blockchain (Gaur et al., 2018, p. 10)

5.4. When to use blockchain

Peck (2017, p. 39) as well as Wüst & Gervais (2017, p. 1) deal with the question whether to use blockchain or keep the traditional database. Blockchain is, according to Peck (2017, p. 38), not the solution to every problem. Figure 18 should serve as a guidance to decide whether to use a blockchain or not by asking simple questions such as if the data is sensitive or question the trust relationship among the participants. In more detail, Wüst & Gervais (2017, p. 3) state that it is only feasible for entities to implement a permissionless or permissioned blockchain if they are mutually mistrusting each other.
The decision as to whether a blockchain should be used is not only a technological decision, but also an economic one. Decision makers have to justify the adoption by finding real use cases that solve organizational problems at lower costs than the benefits the blockchain brings. (World Economic Forum, 2018, p. 4)

The first question is rather simple: Does data has to be stored? Common sense already implies that if not, no blockchain is needed. If data has to be stored, then it depends on the number of writers, in other words the number of people who can add data to the database, whether a blockchain does provide additional value or not. In the case of only one writer, a traditional database makes more sense due to its performance. The third question is about whether a trusted third party (TTP) is always available, meaning that transactions are verified at any time write operations are delegated. If the TTP is partially offline, and the writers are all unknown, then a permissionless blockchain should be the first choice. However, if all writers are known and can be trusted, then a permissioned blockchain is the better choice. (Wüst & Gervais, 2017, p. 2)

![Figure 18 Do you need a blockchain?](image)

Figure 18 Do you need a blockchain?; Source: (Wüst & Gervais, 2017, p. 3)
However, this guide is solely for orientation purpose, as it most probably requires substantially more thinking than answering these six basic questions. This short digression is motivated by the earlier mentioned hype blockchain is currently experiencing driven by the bitcoin. Firms may tend to implement the blockchain for marketing purposes only, therefore, elaborating on when it is appropriate for firms to use the blockchain represents a fundamental issue.

Chapter 5. was all about the characteristics and architecture of the blockchain technology. The goal was to generate a well-founded basic knowledge of the technology itself in order to understand why in some cases it is of advantage to implement blockchain. The reader now knows where the blockchain has its origin and how it becomes a chain. Furthermore, the most important key mechanisms, such as hashing, or the consensus protocol are explained due to the fact that these mechanisms represent the core elements of the blockchain. The combination of blockchain and Internet of Things, smart contracts and DAPPs are among the most useful innovations, hence, firms which make use of these applications are able to entirely change their business model as new ways of making business are enabled.

6. Blockchain use cases

The purpose of this section is to generally show the myriad possibilities where blockchain could be used. Companies have already detected the potential of blockchain, otherwise there would not have been made such high investments to explore this technology (Del Castillo, 2018). Blockchain could for example potentially reduce costs, which represents the main strategic value of blockchain (Carson et al., 2018). Cut operational costs can be done by removing intermediaries or reducing the effort of record keeping (Carson et al., 2018). According to Carson et al. (2018) about 70 percent of the value is generated by cost reduction, new revenues and capital relief.

The following table shows that many of the leading companies heavily invest into blockchain to facilitate existing procedures, such as improving the supply chains, or even create new fields of applications in order to cut costs (Del Castillo, 2018; Lawson, 2018, p. 2).
<table>
<thead>
<tr>
<th>Company</th>
<th>Use-cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial and Commercial Bank of China</td>
<td>Uses blockchain to authenticate digital certificates instead of using middlemen</td>
</tr>
<tr>
<td>China Construction Bank</td>
<td>Foster the cooperation of banks and insurance companies to combine some of their financial products with the help of the IBM blockchain</td>
</tr>
<tr>
<td>Bank of America</td>
<td>Uses blockchain to automate the process of creating letters of credit</td>
</tr>
<tr>
<td>Wells Fargo &amp; Company</td>
<td>Uses blockchain to track securitized home mortgages.</td>
</tr>
<tr>
<td>Apple</td>
<td>Is going to use blockchain technology to timestamp data.</td>
</tr>
<tr>
<td>Royal Dutch Shell</td>
<td>Develops an energy commodities platform based on blockchain</td>
</tr>
<tr>
<td>Toyota</td>
<td>Is part in the Blockchain Mobility Consortium; explores how blockchain payments give access to self-driving cars.</td>
</tr>
<tr>
<td>Samsung</td>
<td>Launches a platform for tracking supply chains.</td>
</tr>
<tr>
<td>BNP Paribas</td>
<td>Is working with a “Big Four” accounting firm, to use blockchain for its internal treasury operations.</td>
</tr>
<tr>
<td>Microsoft</td>
<td>Monetizes blockchain services and provides several blockchains on its Azure platform</td>
</tr>
<tr>
<td>Walmart</td>
<td>Uses Hyperledger Fabric to track the meat supply chain</td>
</tr>
<tr>
<td>Company</td>
<td>Application</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Daimler AG</td>
<td>Is testing its own cryptocurrency and issued corporate bonds on the Ethereum blockchain</td>
</tr>
<tr>
<td>Banco Santander</td>
<td>Uses Ripple as a token for their payment app and also invested in it.</td>
</tr>
<tr>
<td>AXA Group</td>
<td>Uses smart contracts to automate flight insurance payments.</td>
</tr>
<tr>
<td>Pfizer</td>
<td>Collaborates with startups improving supply chains.</td>
</tr>
<tr>
<td>Nestle</td>
<td>Is working with IBM to remove unnecessary middlemen within supply chains.</td>
</tr>
<tr>
<td>Siemens</td>
<td>Invested into blockchain energy companies, which help to trade solar power</td>
</tr>
<tr>
<td>Ford Motor Company</td>
<td>Launched a blockchain research group in the automotive industry</td>
</tr>
<tr>
<td>IBM</td>
<td>Has made the widely used Hyperledger Fabric open source and is part of multiple blockchain initiatives.</td>
</tr>
</tbody>
</table>

Table 4 Companies exploring Blockchain; Source: (Del Castillo, 2018)

The automotive value chain for example provides various possible applications for blockchain. With blockchain, tracking, selling and paying goods gets facilitated, as it provides the possibility to implement smart contracts, which automatically pay if the good has been successfully transported. The good should not be solely transported from A to B but it needs to stay intact, which in turn can be measured by using Internet of Things technology (see chapter 5.2.4.). Car dealers often suffer from receiving fake spare parts, which are not as reliable as original parts, hence, with blockchain it is possible to give the spare parts an ID and a timestamp in order to facilitate the identification of the spare parts. Furthermore, securely keeping records of a car’s maintenance schedule or ownership are useful applications for blockchain, as it basically substitutes a physical log book. Renault for example calls this the digital car maintenance book. (Lawson, 2018, pp. 6–8; Renault, 2017)
Blockchain unfolds its true potential when used with other technologies such as Internet of things or big data. Internet of things enables several useful blockchain applications such as in odometers, where a built-in device automatically sends mileage data to the blockchain. With this combination, odometer fraud is practically no longer possible. (Chanson et al., 2017, p. 1; Lawson, 2018, p. 8)

Figure 19 Architecture of the prototype presented; Source: (Chanson et al., 2017, p. 2)

Figure 19 shows the process of hashing odometer data and GPS data into a secured private database, while simultaneously creating hashes of these datasets which are stored in an Ethereum blockchain. More specifically, the data from the odometer is processed in the dongle, which also provides GPS data. This dongle sends the data to a core application, where it is locally encrypted and a timestamp and a random nonce is added due to hash guessing issues. This encrypted data is stored in a cloud storage and hashed into a blockchain. If the car owner needs to verify the odometer data, the hash from the blockchain has to be exactly the same as the hash of the transmitted data, meaning that the original data has not been changed. In order to get access to this data, an app is used to provide a user interface. (Chanson et al., 2017, pp. 2–3)

Ledra Capital (2018), a venture capital firm, created the so called “Mega-Master blockchain list”, in which many potential applications are listed. These entries are the result of a “twitter-sourced” attempt of brainstorming areas where it is theoretically possible to implement a blockchain model (Ledra Capital, 2018). This list currently contains 84 entries, which is impressive, but also far from complete.
Figure 20 shows a matrix which determines the feasibility and the impact of blockchain in various industries, such as agriculture or financial services. As can be seen in Figure 20, financial services potentially have the highest feasibility compared to the other fourteen industries.

Carson et al. (2018) go further by extracting actual use cases for the blockchain. The first use case, a static registry, is probably the simplest one, as blockchain is simply used as a distributed database for storing reference data, such as land title, food safety and origin or patents. The second use case is similar to the first one, as blockchain can be used to store identity information, such as civil-registry, identity records or voting. Probably the most interesting use case are when smart contracts come into application, which represents the third use-case scenario. Smart contracts and its advantages are comprehensively described in chapter 5.2.4. These first three use cases are characterized by using blockchain as a static record keeping system. The following use cases require the dynamic aspect of the blockchain. Hence, blockchain can also be used when goods or assets are exchanged, meaning that the distributed database constantly updates, such as in a drug supply chain for example. Other prominent use
cases are payment transactions, such as cross-border peer-to-peer payments or when blockchain is used for initial coin offerings. (Carson et al., 2018)

6.1. Blockchain in the real estate industry

Kejriwal & Mahajan (2017, p. 19) claim that nowadays, there are many weak links in the process of financing real estate projects. First of all, typically, it takes about three months for closing a commercial mortgage. Second, there is plenty of bureaucracy involved that slows settlement times due to due diligence processes, documentation and data integrity concerns. (Kejriwal & Mahajan, 2017, p. 19)

Financing commercial real estate projects often involve cross-border transactions, implicating that multiple intermediaries are involved, which ultimately lead to longer transaction times. Therefore, tokenizing real estate assets with the help of smart contracts is an alternative option to raise capital, which simultaneously guarantees transparency, security, accessibility and instant liquidity. (Kejriwal & Mahajan, 2017, p. 20; Quarshie et al., 2018, p. 3).

Tokenization is a way to digitally represent ownership rights of real-world assets in the form of a token on a blockchain. With tokenization it is possible to make asset securitization less costly and more efficient. Any tangible or intangible asset can be tokenized, meaning that for example a token can be generated that is backed with the value of real estates. Especially in real estate financing, it represents a new way of raising money. Compared to conventional loans, tokenization reduces fees and the investment threshold, meaning that even with little money, it is possible to invest into real estate assets. This in turn leads to smaller transaction sizes, which ultimately generates business that would not have been beneficial before blockchain, due to the costs of intermediaries. Furthermore, it increases diversification of investors and the most important aspect is that it instantly provides liquidity, which creates newer capabilities in the real estate industry. (Y. Chen, 2018, p. 569; Cohen & Shapiro, 2017; Nowiński & Kozma, 2017, p. 184; Quarshie et al., 2018, p. 8; Wolfson, 2018)
Instant liquidity is made possible through the facilitated transaction process. On the issuers’ side, it is also relatively easy to issue tokens and simultaneously cost effective, this can be seen in Figure 21. While traditional transactions from A to B are only possible by passing several intermediaries, such as attorneys, title agents, lenders and financial institutions, with tokens, the verification process is done in a network of computers, which are within a decentralized system, meaning that intermediaries are being substituted. This ultimately leads to faster transaction processes, which in turn leads to instant liquidity. This way of financing real estate is similar to crowdfunding, however, with crowdfunding, the problems of non-transparency, illiquidity and fees still exist. (Mishra, 2018; Quarshie et al., 2018, pp. 8, 11; Remeika et al., 2018, p. 2,3)

![Image of Figure 21](image)

Figure 21 Liquidity vs. cost effectiveness of tokens; Source: (Remeika et al., 2018, p. 3)

The process of issuing such tokens functions as follows: First the potential token buyer has to pass an authentication process by providing Know-Your-Customer (KYC) and Anti-Money-Laundering (AML) information. After successful registration, the buyer can choose from a diverse portfolio of real estate assets and buy tokens either with regular currency or with the cryptocurrency Ethereum. As soon as the purchasing process has been done, the holder’s Ethereum wallet address is being added to a smart contract, hence, into the blockchain. From then on, the token can be traded by using several other smart contracts which for example verifies that the trading only happens within accredited investors. (Quarshie et al., 2018, p. 25)
Tokenization opens up new ways of financing real estate and therefore being a serious threat to banks, as real estate developers do not have to fulfill the strict specifications the bank requires. (Choudhury, 2018) The main problem for real estate investors is that banks usually require liens, other securities and most importantly equity in order to receive a loan. Furthermore, the bank has to stick to key figures such as loan-to-value, meaning that the bank does not lend 100 percent of the needed capital. Therefore, an alternative way to raise capital is highly welcomed by real estate developers. By using Table 1 as a reference, the attempt of developing a possible business model for a real estate developer is being conducted.

<table>
<thead>
<tr>
<th>Component of Business Model</th>
<th>Questions specific to blockchain-technology Business Models</th>
<th>Using blockchain for tokenizing real estate assets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer value</strong></td>
<td>Does the blockchain-technology allow the firm to offer its customers something distinctive or at a lower cost than its competitors?</td>
<td>Yes, customers/companies experience a new way to invest/finance real estate projects at lower cost as intermediaries become redundant. (Quarshie et al., 2018, p. 8) Furthermore, transaction times are shortened leading to higher operational efficiency and lower costs, which in turn enables small size transactions. (Nowiński &amp; Kozma, 2017, p. 184)</td>
</tr>
<tr>
<td></td>
<td>Can the blockchain-technology allow the firm to solve a new set of problems for customers?</td>
<td>Customers have the possibility to trade tokens faster, as it does not require an intermediary to check the transaction (Y. Chen, 2018, p. 571).</td>
</tr>
</tbody>
</table>
Furthermore, security and transparency allow customers to track transaction history and prevent fraud. (Quarshie et al., 2018, pp. 8, 13)

<table>
<thead>
<tr>
<th>Scope</th>
<th>What is the scope of customers that the blockchain-technology enables the firm to reach?</th>
<th>With blockchain, investor access is extended globally. Furthermore, due to low investment minimums a wider range of individuals are now able to invest into real estate assets. (Quarshie et al., 2018, p. 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing</td>
<td>How does the blockchain-technology make pricing different?</td>
<td>The Price of the token, which is backed by real estate assets, is valued by the underlying asset itself. Furthermore, reduced fees and redundant intermediaries’ makes pricing different to conventional investing options. (Quarshie et al., 2018, pp. 8, 17; Remeika et al., 2018, p. 1)</td>
</tr>
<tr>
<td><strong>Revenue source</strong></td>
<td>Are revenue sources different with the blockchain-technology?</td>
<td>Revenue is generated through transaction commissions, a platform/technology fee and cryptocurrency conversion. (Quarshie et al., 2018, p. 19)</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Connected activities</strong></td>
<td>How many new activities must be performed as a result of implementing the blockchain-technology?</td>
<td>The implementation process includes: programming a user interface, provide back-end environment (server/database framework), programming smart contracts, implementing third party software such as “Metamask” for wallet integration. Furthermore, regulatory compliance and KYC/AML has to be fulfilled. (Quarshie et al., 2018, p. 21)</td>
</tr>
<tr>
<td></td>
<td>How much better can the blockchain-technology help the firm to perform existing activities?</td>
<td>Selling tokens provide instant liquidity, which is heavily influencing the firm’s ability to act. (Quarshie et al., 2018, pp. 8, 10)</td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>What does the blockchain-technology do to the strategy, structure, systems, people and environment of the firm?</td>
<td>Tokenization changes the way how to raise capital. Therefore, it improves the flexibility of a firm, which ultimately impacts the strategy and structure of the firm. (Quarshie et al., 2018, p. 13)</td>
</tr>
<tr>
<td>Capabilities</td>
<td>What are the firm’s capabilities and capabilities gaps that need to be filled?</td>
<td>Tokenization improves functionality and creates non-existent capabilities through generating liquidity (Quarshie et al., 2018, p. 8; Remeika et al., 2018, p. 2). The distinctiveness of these newly generated capabilities does not last long, because as soon as the blockchain reaches the mass market, tokenization is copyable by anyone who has the necessary resources.</td>
</tr>
<tr>
<td>What new capabilities does the firm need?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the impact of the blockchain-technology on existing capabilities?</td>
<td>Is there something distinctive about these capabilities that allow the firm to offer the value better than other firms and that makes them difficult to imitate?</td>
<td></td>
</tr>
<tr>
<td>Sustainability</td>
<td>Does the blockchain-technology make it more difficult for firms to imitate it?</td>
<td>Every company can tokenize assets. Nowadays there exist several companies which offer to manage the tokenization process, such as Harbor Platform, Inc.</td>
</tr>
<tr>
<td>How can the firm take advantage of it and sustain its competitive advantage?</td>
<td>Due to the fact that this kind of investing is globally accessible to a wider range of target-customers, it enables real estate developers to take advantage of the immediate</td>
<td></td>
</tr>
</tbody>
</table>
Table 5 Possible business model in the real estate industry for tokenizing real estate assets; Source: Afuah & Tucci (2003, p. 49) (modified by the author)

| | | liquidity and easier access to money in order to increase capacities. (Quarshie et al., 2018, p. 13; Remeika et al., 2018, p. 2) |

Table 5 represents a modification of Afuah & Tucci’s (2003, p. 49) set of components tailored to tokenizing real estate assets. It shows that each of the above-mentioned components are affected, this means that with implementing blockchain, the business model seeks for a major reinvention in order to exploit the benefits of this technology. However, currently, traditional bank loans are still popular in financing real estate, therefore, the financial industry has to actively adapt the way of originating and maintaining loans. The following chapter will not only show that implementing the blockchain does not require an entire reinvention of the business model, meaning that also small changes are beneficial, but also that the blockchain has the potential to substantially enhance efficiency.

6.2. Blockchain in the financial industry

Taking the banking sector as an example, it probably has become the most disrupted sector since blockchain became prominent (Peters & Panayi, 2016, p. 1). Many use cases have emerged, inter alia the creation of cryptocurrencies. As mentioned earlier, blockchain applications go far beyond cryptocurrencies, as they can be used for processing simple code applications such as smart contracts. However, especially in the banking and insurance sector, blockchain can be used for a wide range of applications. (Peters & Panayi, 2016, p. 2).

The findings in chapter 6. imply, that banks are strongly represented in the area of blockchain. Many of the most relevant blockchain advancements are currently happening in consortia of financial services institutions. These consortia represent a group of many companies, such as banks, which in turn collaborate with special blockchain companies to make this technology compatible for the banks’ field of application. A possible field of application can be for example
when money has to be transferred from one account to another. With blockchain, simple money transactions can be made faster, traceable and without the need of an intermediary, hence, banks heavily invest into this technology to avoid becoming obsolete (Sindle et al., 2017, pp. 1, 29).

Redshaw (2017, p. 46) argues that the 2008 financial crisis was the trigger for bitcoin to become an alternative monetary system, which in turn means, that bitcoin should make banks become obsolete. But it becomes apparent that it goes in the opposite direction as banks are heavily using the underlying technology of the bitcoin to their benefit, which may sound ironic.

**Lending**

Especially the field of lending plays a major role in the 2008 financial crisis, hence, this area seeks for reformations. Through blockchain, lending can become less expensive and more efficient due to higher transaction speed and transparency. (Sindle et al., 2017, pp. 1–2).

The following illustrative example shows how a smart contract could be used as a credit agreement.

![Figure 22 Originating a loan with a smart contract; Source: (Sindle et al., 2017, p. 6)](image-url)
As soon as the terms and conditions have been negotiated, the smart contract, with its “if-then-else” conditions, is being coded on the blockchain. This code usually resorts to external data, such as the current EURIBOR – rates. Once the smart contract has been coded, it is ready for execution. The main drawback is that it is hard to modify predefined conditions resulting from, for example, a repayment-rate change. As soon as the smart contract has been executed, the predefined terms and conditions have to be fulfilled in order to receive the desired outcome. If for example credit repayments are missed multiple times, the smart contract can automatically execute the right of lien. (Sindle et al., 2017, p. 7)

With smart contracts, monitoring a loan is made substantially easier as it is processed automatically with no human interaction. Taking a common credit agreement as an example: the bank grants an investment credit with the term of 20 years. The interest rate is floating and linked to the EURIBOR. The loan will be repaid at a flat rate, however, there is a special repayment of 50% of the loan after ten years. This loan is secured by a mortgage on a property. As soon as an agreement is reached, the smart contract can be coded with these predefined conditions. This smart contract contains the following variables: term, interest rate, instalment plan, collateral and the special instalment of 50%. Furthermore, the smart contract has an “if-then-else” condition, saying that if the special instalment is not paid after ten years, then the lien will be enforced, and the bank is automatically listed in the land registry, this however, requires a digital land registry that runs on a blockchain. Usually a bank employee has to monitor, if the consumer is meeting the conditions or not, but with a smart contract, monitoring is done automatically as well as executing, namely, listing the bank as the property owner in the land registry. This happens without the intervention of an employee, hence, costs are reduced. The biggest advantage is that there is no need of courts which enforce the law, since the smart contract automatically does it, meaning that banks have actual cryptographic control of the title, whereas before blockchain, it was solely a paper representing that they have control. This example has been derived from Sklaroff’s (2017, pp. 273–274) automated car lease example.
The following table is an extension to the table shown in chapter 3.5, with additional assumptions made by the author. It shows which components are affected if blockchain is implemented in the loan originating process of a bank.

<table>
<thead>
<tr>
<th>Component of Business Model</th>
<th>Questions specific to blockchain-technology Business Models</th>
<th>Using blockchain for originating loans</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Customer value</strong></td>
<td>Does the blockchain-technology allow the firm to offer its customers something distinctive or at a lower cost than its competitors?</td>
<td>The outcome of the product is basically the same – receiving a loan from the bank, but the costs may be lower due to less human interaction because of smart contracts.</td>
</tr>
<tr>
<td></td>
<td>Can the blockchain-technology allow the firm to solve a new set of problems for customers?</td>
<td>In the case of originating loans, the problem of a customer is not solved differently than without using blockchain as the ultimate outcome is that the bank lends money to the customer.</td>
</tr>
<tr>
<td><strong>Scope</strong></td>
<td>What is the scope of customers that the blockchain-technology enables the firm to reach?</td>
<td>The blockchain will not change the product itself, but the way this</td>
</tr>
<tr>
<td>Does the blockchain-technology alter the product or service mix that embodies the firm’s products?</td>
<td>By using smart contracts, the bank may reduce its mark-up and commissions, as servicing the loan may get cheaper due to the absence of an intermediary, such as trustees.</td>
<td></td>
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<td>---</td>
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<td></td>
</tr>
<tr>
<td><strong>Pricing</strong></td>
<td>How does the blockchain-technology make pricing different?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>By using smart contracts, the bank may reduce its mark-up and commissions, as servicing the loan may get cheaper due to the absence of an intermediary, such as trustees.</td>
<td></td>
</tr>
<tr>
<td><strong>Revenue source</strong></td>
<td>Are revenue sources different with the blockchain-technology?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The revenue source stays the same: commissions and mark-up on interest rate</td>
<td></td>
</tr>
<tr>
<td><strong>Connected activities</strong></td>
<td>How many new activities must be performed as a result of implementing the blockchain-technology?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Credit contracts have to be coded, which represents a new task.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How much better can the blockchain-technology help the firm to perform existing activities?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Smart contracts substitute the humane factor, meaning that servicing a loan is done more efficient.</td>
<td></td>
</tr>
<tr>
<td><strong>Implementation</strong></td>
<td>What does the blockchain-technology do to the strategy,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The implementation of the blockchain will most probably result</td>
<td></td>
</tr>
<tr>
<td>Structure, systems, people and environment of the firm?</td>
<td>in the substitution of credit issuers with programmers.</td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Capabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What are the firm’s capabilities and capabilities gaps that need to be filled?</td>
<td>The capabilities of a bank increase as servicing the loan gets automated, hence, credit issuing can be increased.</td>
<td></td>
</tr>
<tr>
<td>What new capabilities does the firm need?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>What is the impact of the blockchain-technology on existing capabilities?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there something distinctive about these capabilities that allows the firm to offer the value better than other firms and that makes them difficult to imitate?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sustainability</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the blockchain-technology make it more difficult for firms to imitate it?</td>
<td>No – each bank can implement smart contracts. There can be a cost competitive advantage if smart contracts are well coded and risk is reduced.</td>
<td></td>
</tr>
<tr>
<td>How can the firm take advantage of it and sustain its competitive advantage?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
As can be seen in Table 6, an implementation of a blockchain in the area of loan originating does not affect each component of a business model. In order to exploit the advantages of the blockchain, the bank does not need to entirely change the business model, it simply has to redefine it. This eventually enables possible new revenue streams. However, in the case of loan originating, being more efficient probably leads to cost reduction. This cost reduction can eventually be transferred to the customer.

Securitization

“Blockchain and smart contracts could catapult the securitization industry into a new digital age.” – (Sindle et al., 2017, p. 2)

Now that originating loans on a blockchain has been elaborated, the actual advantages of blockchain based loans in the securitization process seek for further explanation. The Securitizing process contains the origination of loans which get pooled, rated, priced and ultimately brought to the market (Sindle et al., 2017, p. 9). These pooled loans contain more reliable information due to the blockchain, meaning that if changes are made, they immediately get visible and transparent for the investor. Such changes can be for example the exchange of the owner of the loan, or the credit rating. This transparency reduces the risk of asymmetric information and cuts the cost for due diligence. Before pooling the loans, they need to be structured, which can also be facilitated by using smart contracts. Smart contracts automatically choose loans which fulfill the required criteria. This in turn speeds up the pooling process and enables the issuance of more securities to the market. Servicing these securities is also facilitated due to the transparency of the underlying loans. (Sindle et al., 2017, pp. 11–12)

The reason for why the securitization process seeks for more transparency is the recent financial crisis. This awareness stems from restructuring mortgages into bonds and selling them by the name “mortgage backed securities” (MBS) to investors. It even developed further as investment banks restructured the bad selling tranches of these mortgage backed securities again and pooled them. These were called “collateralized debt obligations” (CDOs). The interesting fact about CDOs was that although most CDOs were based on bad selling MBSs, the pooling
applied the magic by providing the rating agencies a reason to rate such diversified portfolios with a triple A rating, due to the fact that diversification means lower risk for the investors. Nevertheless, the value of these CDOs was extremely hard to assess. (Blanchard et al., 2013, p. 450 ff.; WSO, n.d.). This is where blockchain can come into play. According to Zone (2018), blockchain based securities would diminish the human factor in the markets, as they get substituted by automatically executed code. As previously explained, the underlying mortgages are more transparent, and investors can easier assess the value of the CDO.

Chapter 6. shows a fraction of how the blockchain could be used and furthermore, how business models may be altered when implementing blockchain in entrenched systems such as loan originating and securitization. It has been shown that business models do not necessarily seek for entire reinventions, but also rather small optimizations may be enough in order to exploit the advantages of implementing blockchain. Tokenization, which has been elaborated in chapter 6.1. is merely another way of securitizing assets discussed in chapter 6.2., therefore, with the advantages of security-tokens, securitizing becomes more transparent, more efficient and provides higher liquidity as formerly illiquid assets become liquid. This could have avoided the great recession due to the fact that with blockchain, the underlying mortgages of the MBSs, which were faulty, could have been detected earlier.

Now that several use cases have been elaborated, the next section will focus on how companies can innovate their business model to exploit the benefits of the blockchain. Based on the previously gained knowledge of whether to use the blockchain or not and in which situations the blockchain is beneficial for the company, the actual process of innovating the business model is being explained by using a framework. This business model innovation process can be triggered by finding use cases for the company, which have the potential for improvements on both sides, the customer and the firm. Bearing this in mind, the following section is going to be about the process of innovating the business model while avoiding focusing on a specific area, hence, this process may be applicable in most of the above-mentioned areas.
7. Application of Frankenberger et al.’s. (2013) generic innovation process

Explaining the technology behind blockchain is important to become aware of the potential of this technology, however, the right way to handle the implementation in the context of strategy will be the subject of this section. Based on the earlier mentioned characteristics of the business model and the blockchain, this section will describe the process of innovating a business model by using the earlier described framework from Frankenberger et al. (2013) as a guidance.

Within this section, Frankenberger et al.’s. (2013) 4I-framework is going to be used to elaborate how the blockchain can be used for business model innovation. This framework is characterized by being separated into four steps which interact throughout the whole process of business model innovation. Detecting key players and change drivers which surround the ecosystem of the company lays the foundation from which to build upon. As soon as the company is aware of its competition’s moves and actions in the area of blockchain based applications, it can start to create its own ideas how the blockchain can be used in order to affect the current business model. This stage emphasizes the importance of thinking in business models and overcoming existing business models, meaning that not only the idea how blockchain is changing products but also how blockchain can change a business model. Following to finding ideas is the process of integrating these new ideas and pieces by sensitizing managing partners and adapt these ideas to fit the four dimensions of business models: Who? What? How? and Why?. Within this stage, the new business model is built. The final stage is perhaps the most difficult one as it is all about the actual implementation of the newly generated business model. Overcoming internal barriers and convincing the organization can be mastered by using trial-and-error processes. (Frankenberger et al., 2013, p. 260 ff)

As soon as the company is able to successfully practice the new business model built upon blockchain, it can measure it by using the measurement tools which were described earlier. Following, all stages are described separately by always using blockchain as the initial driver for why the company wants to innovate its business model.
7.1. Initiation

As previously mentioned, the initiation phase is characterized by analyzing the innovating firm’s surrounding ecosystem (Frankenberger et al., 2013, p. 260). As for this reason, the most important competitors and change drivers have to be elaborated. Wheelen & Hunger (2012, p. 51) argue that a business needs to analyze the external environment to determine who represents the perfect customer for the business in its current form. Furthermore, who are the most direct competitors for that kind of customer, what are the actions of this competitor, what does it require to be able to compete, and what does the company do to differentiate itself from its competitors are important questions a company has to ask (Wheelen & Hunger, 2012, p. 51). These elements can be reformulated into the company’s strengths, understanding its weaknesses compared to its competitors, the opportunities that would be most promising, and the threats that may impact the organization’s main competitive advantage (Wheelen & Hunger, 2012, p. 51). Following, several tools to analyze the external environment of a company are described.

7.1.1. Tools to analyze the surrounding ecosystem

There exist several approaches to analyze the surrounding ecosystem of a firm. Wheelen & Hunger (2012, p. 126) for example, propose the environmental scanning process. Wheelen & Hunger (2012, p. 126) argue that environmental scanning is crucial for the firm to find competitive advantage in order to guarantee its long-term health. The purpose of environmental scanning is to “monitor, evaluate and disseminate information” from internal and external environments to responsible employees within a company and to identify strategic factors. Such
strategic factors will determine the future of a company. Wheelen & Hunger (2012, pp. 126–127) emphasize three environments that companies must be aware of: natural environment, social environment and task environment. Implementing the blockchain will most probably have impact on each of these three environments to a certain extent.

**Natural environment**

Starting with the natural environment, Wheelen & Hunger (2012, p. 127) state that the natural environment comprises factors that are not directly controllable by the firm itself. As soon as they are controlled by the organization they are viewed as assets which bring value to the general economic system (Wheelen & Hunger, 2012, p. 127). Physical resources, wildlife, or climate are inter alia part of the natural environment (Wheelen & Hunger, 2012, p. 127). Companies have to be aware of how implementing the blockchain can have an impact on the natural environment. The most prominent use-case of blockchain is perhaps to create own tokens which can be used for Initial Coin Offerings (ICOs) to fund the company (Miles, 2017). If these tokens are mineable, then they usually require vast amounts of energy, hence, this use case is heavily influencing the natural environment (Malone & O’Dwyer, 2014, p. 1). It depends on the use case whether the natural environment plays an important role in innovating the business model. If blockchain is used in supply chain management, products can be transparently tracked from the origin to the store shelf, which in turn can reduce carbon footprint as well as unsustainable practices (Futurethinkers.org, 2018)

**Task environment**

The task environment contains elements or groups that have a direct impact on a business and are influenced by it. “Governments, local communities, suppliers, competitors, customers, creditors, employees/labor unions, special-interest groups and trade associations” are inter alia factors that directly influence a company. Analyzing which of these groups are affected by implementing a new technology, in this case blockchain, by involving all of them via individual reporting creates a set of external strategic factors. (Wheelen & Hunger, 2012, p. 137)

**Societal environment**
The societal environment is basically the social system of humanity (Wheelen & Hunger, 2012, p. 127). It includes general elements that do not directly affect the short-term activities of a company, but affect their actions in the long-term (Wheelen & Hunger, 2012, p. 127). Wheelen & Hunger (2012, p. 127) mention four factors that are within the societal environment: (1) Economic forces, (2) Technological forces, (3) Political-legal forces and (4) Sociocultural forces. Blockchain for example is probably affected by all of these forces as it (1) regulates the exchange of money or information, (2) is a problem-solving invention, (3) will most probably be regulated by restrictive and protective laws and (4) will have impact on the customs and values of the society as deep-rooted behaviors might become obsolete.

7.1.1.1. PESTEL

A useful tool to analyze the external environment that influences an organization is the PESTEL analysis. It comprises six environmental forces: Political, Economic, Sociocultural, Technological, Ecological and Legal forces (Wheelen & Hunger, 2012, p. 128). The PESTEL approach became a key factor with rapid changes and developments in today's economic world. These external levels cannot be affected by the companies themselves, which makes it more important to identify key factors within that global environment. Basically, the analysis process is as follows: First, in each area of the PESTEL framework, general factors are determined, which in the future can affect the company and this subdivided according to their importance to the company. Thereafter, from these selected factors, the identification of key factors selects the most important information for the organization. (Johnson et al., 2014, pp. 34–36)

The political and the legal factor refers to the importance and the influence of the government as well as the legislator (G. Johnson et al., 2014, pp. 34, 36). As mentioned above, it will approximately take five to ten years until blockchain reaches the stage of maturity and ultimately becomes applicable in the mainstream market (Gregorio, 2017, p. 2). Therefore, regulators will most probably focus on regulating this technology now rather than in five to ten years. This, however, will eventually shape the path of development of the blockchain and simultaneously highlights the importance of the political factor, as governments and lawmakers are able to entirely change the way blockchain can be used.
Macro-economic factors such as the business cycle or exchange rates may also influence the way blockchain can be used. Especially in the financial sector, exchange rates as well as the supply of cryptocurrencies determine the value of the currency (Hayes, 2017, p. 1308).

The social factor revolves around cultural as well as demographic changes (G. Johnson et al., 2014, p. 36). The earlier mentioned characteristics of blockchain play an important role when it comes to changing the habits and thinking of the people as this technology becomes a source of trust and transparency (Aste et al., 2017, p. 26)

Given the fact that blockchain is a technology, the technological dimension of the PESTEL analysis as well as its global trends are especially relevant for analyzing the surroundings of a firm, particularly in the field of technology. This factor refers to influences of technologies such as the internet, or in this case, blockchain. Technology became a key factor in assessing issues that could have an impact on an organization's operations and actions, meaning that the outcome can be twofold, while blockchain can generates opportunities (e.g. banking) it simultaneously can be a challenge for others (e.g. notary) (G. Johnson et al., 2014, p. 36). The fast-changing environment in technology is able to change markets rapidly and can lead to unexpected trends and changes. For example, the film industry changed from DVD to streaming. Or clearly visible the technological changes in the smartphone market with NOKIA losing its market leading position in the past through missing important developments (Worstall, 2011). These examples point out the importance of this factor in today's world. Wheelen & Hunger (2012, p. 131) undermine this opinion that the technological environment can be of high importance to multiple industries. Taking the improvements in computer processors as an example, this innovation has had a major impact on many other industries such as in the automobile industry (Wheelen & Hunger, 2012, p. 131).

The ecological factor includes environmental issues such as natural resources or climate change. As mentioned in section 7.1.1. the most prominent use-case of blockchain is perhaps the creation of own tokens which can be used for financing the company. Creating (mining) these tokens require vast amounts of energy, hence, this heavily influences the carbon footprint
(Malone & O’Dwyer, 2014, p. 1). This factor plays an important role for sectors such as trade or finance.

In conclusion it can be said that considering the earlier mentioned characteristics of blockchain such as immutability or transparency most of the factors of the PESTEL framework are important when it comes to the ecosystem of a company that tries to implement blockchain.

7.1.1.2. SWOT Analysis

Another tool for scanning the environment is the SWOT analysis, which can be used in conjunction with other auditing tools such as PESTEL analysis (Wheelen & Hunger, 2012, p. 198). The SWOT-Analysis is a tool to conduct environmental scanning in a simple way by understanding the firm’s strengths, estimate the effect of real or perceived weaknesses, utilize opportunities which simultaneously match the strengths and reduces the effect of threats (Wheelen & Hunger, 2012, p. 198). This should not only extract the competences of a company but also the opportunities the firm currently misses (Wheelen & Hunger, 2012, p. 198).

Following, a SWOT analysis of the technology itself is being conducted, the result can be seen in Figure 23. The result shows that companies can take advantage of the strengths of the blockchain such as cutting intermediaries or provide unprecedented transparency for the customers. However, it is still in its early stage, particularly in terms of security and data protection. The absence of standards, the capability of scaling or cybercrime are some of the most concerning issues, hence, weaknesses of the technology. Optimizing business processes or connecting IoT devices to the blockchain are key opportunities a company can take advantage of. Figure 23 shows that currently the threats mainly originate from governments which miss out on regulating the technology. This SWOT analysis shows that for example transparency can be seen as a strength of this technology, which in turn simultaneously creates a privacy and security problem. Furthermore, opportunities in optimizing business processes come along with high investments for implementation. The SWOT analysis shown in Figure 23 is a rather general approach, however, it depends on the industry which strengths, weaknesses, opportunities or threats can come along with implementing blockchain.
Figure 23 SWOT analysis of blockchain; based on: (Niranjanamurthy et al., 2018, p. 8) (created by the author)
The environmental scanning process may be applicable in several sectors, as it is a rather general approach, however, by knowing which kind of external influence will affect the company the most when implementing the blockchain, the next phase, ideation, can be initialized. Based on the tools which were described in this section, the company is able to detect the strengths, weaknesses, opportunities of the blockchain technology itself, which are driven by political, economic, technological or societal forces. This knowledge serves as a basis for creating ideas, which is described in the next section.

7.2. Ideation

As mentioned earlier, the ideation stage directly follows the initiation phase. Within this stage the data that has been gathered during scanning the ecosystem of the innovating firm is used for generating new ideas (Frankenberger et al., 2013, p. 261). This data is now being transformed into concrete ideas for a new business model (Frankenberger et al., 2013, p. 261). Ideas can for example stem from each of the earlier described attributes of the SWOT analysis, which is shown in the following section.

7.2.1. Idea creation methodology by Flynn et al. (2003)

Flynn et al (2003, p. 426) have developed an idea generation methodology that comprises four stages: (1) strategic direction, (2) environmental scanning, (3) opportunity identification and (4) idea generation. Figure 24 illustrates that this “idea creation” process starts with aligning
company goals while simultaneously conducting environmental scanning, directly followed by detecting opportunities. The result of this process is to define the final idea. Business goals support the development process of the company in the right direction and enable the focus on potential innovation to fit the organizational goals. These goals are usually stated in the vision statements of an organization. The corporate vision defines the ambitions of what the company wants to become. This stage is of high importance as it lays the foundation for the following ideation process. Therefore, defining a clear direction that is communicated to all members in the organization makes it easier to focus creativity. The second stage is environmental scanning, which should provide the company with potential stimuli which act as a catalyst for the opportunity identification stage. (Flynn et al., 2003, pp. 426–429)

In the opportunity identification phase, organizational resources interact with the potential stimuli that have been extracted in the previous stage. In the environmental scanning phase, a multitude of information and stimuli can be detected which should serve as an input for the opportunity identification stage. Employees explore new opportunities by using these stimuli within experiments and while brainstorming. The result of this phase is a set of potential opportunities that can be transformed into concrete ideas. (Flynn et al., 2003, p. 430)

Within the idea generation phase, the previously gathered potential opportunities are being transformed into specific and more recognizable concepts. The output can be twofold, either it is reactive, or it is proactive. While reactive ideas concentrate on solving a problem to get back to normal, proactive ideas aim for progress towards the goals that have been set in the first stage. (Flynn et al., 2003, p. 430)

Flynn et al’s (2003, p. 31) methodology of idea creation provides a step-by-step guidance to successfully transform opportunities that have been extracted through environmental analysis into concrete ideas and concepts, however, it heavily depends on the resources of a company. The results of each phase lay the foundation for the following phases. However, it is also possible that the process is reversed, meaning that for example a potential opportunity can influence the strategic direction phase. This also reflects Frankenberger et al’s (2013) model due to the fact that the ideation phase is constantly in iteration with the initiation phase. This
feedback loop is mostly initiated by employees due to the fact that skill, knowledge and experience can affect the idea creation process in every single phase, which has continuous adaptations as a consequence. (Flynn et al., 2003, p. 431)

Figure 24 Idea Generation Methodology; Source: (Flynn et al., 2003, p. 427) (modified by the author)

Summarizing this process, it can be said that in the case of blockchain, the company could apply the PESTEL analysis as well as the SWOT analysis to scan the surrounding ecosystem of the company concerning blockchain related issues. However, this step has already been done in step 1, initiation. The company can now use this information to set goals which it wants to achieve with using blockchain technology. Potential stimuli may be for example the society, which strives for more transparency and immutable data. This in turn may create opportunities which a company can use by creating ideas for blockchain based solutions. Each employee can contribute their skills, knowledge and experience to generate ideas for implementing blockchain (Flynn et al., 2003, p. 431). This implies that implementing blockchain is heavily dependent on the resources of the organization.
7.3. Integration

The integration phase is, as earlier mentioned, dealing with the development of a new business models while using the ideas that have been elaborated during phase two (Frankenberger et al., 2013, p. 262). These ideas, however, do not automatically form a whole new business model, therefore, these ideas need to be structured and visualized.

7.3.1. Business Model Canvas

A useful approach to support the process of getting from an idea to an actual business model is the Business Model Canvas (BMC) introduced by Osterwalder et al. (2010). The Business Model Canvas helps to visualize the initial idea in order to create a business model out of it. The canvas is as dynamic as the idea creation process as it continuously gets updated with newer information, however, its simplicity makes it a powerful tool to immediately convert ideas into an actual business model (O’Neill, 2015, p. 454).

Figure 25 shows the traditional business model canvas adapted to the attributes of the blockchain. The aim of this business model canvas is to provide existing business owners an action plan to identify areas in which companies can implement blockchain. Furthermore, it should serve as a catalyst for creating and validating ideas concerning blockchain based solutions to ingrained non-blockchain based processes. This framework should trigger the formulation and conversion of ideas to an actual business model. Following, the single elements
of the business model canvas are being explained by using Chikara’s (2018) assumptions referring to implementing blockchain by simultaneously using Osterwalder et al.’s. (2010) basic definitions of the single elements:

**System Touch Points**
The first element is all about internal systems that may be affected when implementing blockchain based solutions. Detecting systems which need to be changed and clarifying who is responsible for those systems are crucial points to consider before implementing the blockchain.

**Value components**
This element heavily depends on the product. Does the blockchain allow scalability for this product, or is it sensitive to data protection? Does it require anonymity or transparency? The question is whether some of the value components mentioned in Figure 25 apply to the product.

**Key dependencies**
This element refers to upstream and downstream processes for the product. These key dependencies can either exist within the company or they come from outside the company, meaning that for example the company requires a network in order that the product works, such as a network of banks for financial transactions.

**Value Propositions**
This is probably the most important element, as it is about the most fundamental question whether customers need a blockchain-based solution or not. Identifying the needs of the customers and how those needs can be satisfied are important points to ultimately achieve acceptance of the product. According to Osterwalder et al. (2010, p. 22), the simple question is whether the product does provide value to the customer segment and increases loyalty.

**User Relationships**
User interactions may also change when blockchain is being implemented. The outcome can be twofold, either it requires more interaction or less interaction. However, implementing the blockchain will most probably happen in the background, therefore, users may not even notice
that the blockchain has been implemented. The question is whether this increase or decrease in interaction is valuable. Osterwalder et al. (2010, p. 28) suggest that it is necessary to know which kind of relationship the company wants to establish with the customer.

**Leadership & Marketing**
Companies which implement blockchain now may benefit from the first mover advantage as they might be the first market leaders. Being the market leader makes it easier to implement newer technologies as they might become more accepted.

**User Segmentation**
Defining the target group that is benefitting from this technology is necessary in order to provide a solution which is tailored to them.

**Time**
Time is an important factor, because the longer the implementation takes the more expensive it becomes. This element also refers to dependencies, as it takes time to build these dependencies.

**Revenue/Cost/Profit**
Last but not least the questions whether it generates additional sources of profits, increases efficiency and if an implementation reduces costs is crucial to ease the decision of whether to implement blockchain or not.
<table>
<thead>
<tr>
<th>SYSTEM TOUCH POINTS</th>
<th>VALUE COMPONENTS</th>
<th>VALUE PROPOSITIONS</th>
<th>USER RELATIONSHIPS</th>
<th>USER SEGMENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which systems are affected?</td>
<td>Which value components apply to this product?</td>
<td>Which customer needs are we solving?</td>
<td>Would user interaction with the system change?</td>
<td>For whom are we creating value?</td>
</tr>
<tr>
<td>What systems need to change?</td>
<td>Contract Execution</td>
<td>How are those needs meet today?</td>
<td>Are users expected to interact more with this compared to the existing solution?</td>
<td>Is blockchain awareness expected of the user?</td>
</tr>
<tr>
<td>Who are the Product Owners of those Systems with whom we need to partner?</td>
<td>Scalability</td>
<td>How does a blockchain solution meet these needs more effectively?</td>
<td>Does such a solution already exist?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Geography/Location Security</td>
<td></td>
<td>How valuable are these interactions?</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Verification Tracking / Ledger Transparency Anonymity Identity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>KEY DEPENDENCIES</th>
<th>LEADERSHIP &amp; MARKETING</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are key dependencies for the product?</td>
<td>Could our new system establish us as market leader in our segment?</td>
</tr>
<tr>
<td>Do these exist in the market (buy vs. build)?</td>
<td>Who is seen as the technology leader today?</td>
</tr>
<tr>
<td>Can they be re-purposed within the organization?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIME</th>
<th>REVENUE/COST/PROFIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>How complicated is it to build?</td>
<td>Are there additional sources of revenue from users?</td>
</tr>
<tr>
<td>Which key dependencies don’t exist and need to be built?</td>
<td>Is there a cost saving?</td>
</tr>
<tr>
<td>Which key dependencies will be most time consuming to create/use/learn?</td>
<td>Is there time saving?</td>
</tr>
<tr>
<td></td>
<td>What is the revenue mix?</td>
</tr>
</tbody>
</table>
Inspired by the previously constructed Business Model definition, which is characterized by three limitations, namely that the definition has to be (1) narrow enough to be applicable in one specific field by simultaneously (2) mention necessary components which are ultimately (3) described in a meta-model, a business model based on the collected ideas is going to be formed in the following section.

Again, Afuah & Tucci’s (2003, p. 3) definition is taken as a basis, since it is, according to Wirtz (2016, p. 23) among the technology-oriented business model approaches. Afuah & Tucci’s (2003, p. 3) definition of a business model is as follows: a business model is a […]

“[…] method by which a firm builds and uses its resources to offer its customers better value than its competitors and to make money doing so […] A business model can be conceptualized as a system that is made up of components, linkages between the components, and dynamics.”

By carefully examining this definition, it can be seen that it is in-line with all of the earlier gained insights of how ideas are generated and ultimately transformed into a business model. Using resources such as employees to provide better value means that their skill, knowledge and experience is used to generate ideas. By scanning the environment, the actions of the company’s competitors can be detected, hence, this information can be used to provide an even better value to the customers. Therefore, by breaking this definition down, it is revealed that it is cohesive with the business model innovation process that has been described earlier.
7.4. Implementation

The final step in the generic innovation process is called the implementation phase. Once this stage has been reached a fully thought-out new business model exists, which has to be implemented, however, it is only implementable with high investments and risks, due to the fact that business models have to be fully implemented in order to test its success (Frankenberger et al., 2013, p. 263).

7.4.1. Roadmap for implementation of business models (RIBM)

Based on several business model implementation frameworks, Batocchio et al. (2016, p. 720) present their own approach for implementing business models. This nine-steps-encompassing roadmap for implementing business models provides a detailed description of the process (Batocchio et al., 2016, p. 720).

Before the implementation process begins, a carefully selected team is crucial due to the fact that the knowledge level has to be on the same level among all team members, this can be
guaranteed by training the team to reach the same level of knowledge (Batocchio et al., 2016, p. 721). Especially when it comes to implementing blockchain, a team that is thoroughly familiar with this technology and its advantages is of high importance due to its complexity and its wide range of application areas. In this context, reference should be made to chapter 4.6, where the key players in business model innovation are elaborated. As soon as steps one and two, namely selecting and training the team members, are settled, the actual implementation process begins. Batocchio et al. (2016, p. 721) call this the action plan, where all necessary activities are particularized in a document. If the business model already exists, the action plan includes a diagnosis of the actual situation. Batocchio et al. (2016, p. 722) put strong emphasis on risk analysis as it avoids failures due to the fact that potential risks are outlined. After formulating the action plan, step four includes the selection of key performance indicators in order to measure the activities of the action plan (Batocchio et al., 2016, p. 723). Batocchio et al (2016, p. 723) argue that these key performance indicators monitor and improve the performance of the project, however, they do not necessarily have to be of quantitative nature but also qualitative indicators help measuring the activities of the action plan. Batocchio et al (2016, p. 729) mention for example key performance indicators based on time. Step five revolves around assessing these key performance indicators and provide feedback for the action plan (Batocchio et al., 2016, p. 724). If feedback is positive, then the team can continue performing the activities from the action plan, however, if the feedback is negative, then the team has to adapt the action plan, which is done in step six (Batocchio et al., 2016, p. 725). Step seven concludes the implementation process by providing reports of the progress. Step eight and nine is all about communicating the outcome to the staff that has been involved in the process as well as to the whole company (Batocchio et al., 2016, p. 725).

Coming back to the self-constructed business model definition, it can be seen that the second part of Afuah & Tucci’s (2003, p. 3) definition contains the terms “components” and “linkages of these components”. This part can be best described by using the components and questions in Table 1. The process of innovating a business model ends with having a fully integrated business model. These components have been mentioned throughout this part of the thesis. The process of integration mainly focuses on creating these components, in this case with the support of the blockchain Business Model Canvas shown in Figure 25. Following to the
The aim of this chapter is to provide a guidance of how a business model can be innovated. By using Frankenberger et al’s (2013) 4I-framework, the business model innovation process has been disassembled in order to get an overview of what is actually necessary to change a business model. Tools and methods such as PESTEL and SWOT, which support for example the environmental scanning process, have been presented. Furthermore, the Business Model Canvas especially tailored to the blockchain has been used to ease the formulation of ideas. The last step in Frankenberger et al’s (2013) 4I-framework is the implementation of the newly generated business model, which was supported by evaluating the “roadmap for implementing a business model” (RIBM). While always referring to the blockchain-technology, this process is, however, rather general, therefore, it can be used in several industries which consider using the blockchain.
8. Conclusion

The purpose of this work is to identify possible fields of application, how business models may change when blockchain is used and to evaluate the process of innovating the business model based on implementing blockchain. In general, there is still uncertainty as to how a business model can be defined or what it specifically contains. Basically, the business model may differ throughout several industries, meaning that there is no list of fixed components and key characteristics which form a business model and business model innovation. Therefore, a specially constructed definition has been developed, which is tailored to the area of blockchain. It is limited to the following attributes: the definition has to be (1) narrow enough to be applicable in one specific field by simultaneously (2) mention necessary components which are ultimately (3) described in a meta-model. Furthermore, there is no uniform approach to reinvent a business model, however, with the help of a framework, an attempt was made to find a general approach in innovating a business model triggered by implementing blockchain. Once these two topics have been clarified to a certain extent, the focus moved on to the blockchain technology. The blockchain is still in its early phase, but its advantages and applications are already known. A list for applications should clarify the myriad possibilities and at the same time, it should emphasize areas in which business model innovation is possible through blockchain.

Business models may indeed change, however, it depends on the use case. While originating loans on the blockchain does not entirely change the business model, tokenizing real estate assets on the blockchain brings along major changes in the business model. Combined with Internet of things, completely new products can be created, hence, new business models emerge. For further assessing how blockchain changes business models, the innovation process supported by methods and applications such as PESTEL or SWOT show that there are several steps necessary in order to innovate a business model when blockchain has been implemented. In general, it can be said that the blockchain can be used in many ways due to its attributes. As a result, a wide variety of impulses arise to innovate the business model. Some may use it only because of the hype and build their business model specifically for this purpose, others integrate it into internal processes.
Future research should focus on finding a uniform definition of the term business model, although this attempt has been done by many researchers. Besides that, blockchain has the potential to be applied in several industries to provide cheaper solutions, therefore, evaluating possible new use-cases, which substantially change the human being is required to leverage the possibilities of the blockchain. Furthermore, as soon as blockchain crosses the chasm, regulating this technology will get indispensable, therefore, research in areas where the blockchain needs to be regulated is getting more and more important, especially in the financial sector.

*blockchain enables new business models, innovative organization forms, and novel work and production processes in which access is over ownership, and sharing is over property.*" - (Aste et al., 2017, p. 21)
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