
# How do Web 3.0, blockchain- and token-based businesses create and capture value?

Lukas Mehrens
152121373

Dissertation written under the supervision of René Bohnsack and Arash Rezazadeh

Dissertation submitted in partial fulfilment of requirements for the MSc in Management (Specialization Business Administration), at the Universidade Católica Portuguesa,
03.01.2023.

## Abstract

The development of technology is constantly being driven forward. With that companies are in the need to adapt their business model to certain technologies to optimize their economic value. In the age of Web 3.0, blockchain technology and the possibilities and risk that come with decentralized applications and digital currencies plays a central role in the current state of technological development. Hence, it is of utmost importance to understand how this technology is used or can be used to optimize the company's activities. This thesis aims to gain knowledge about the way businesses utilize blockchain technology to gain economic value. For that, the following research question has been examined: How do Web 3.0, blockchain- and token-based businesses create and capture value? To answer the question, existing literature about blockchain and business models has been reviewed and semi-structured interviews have been carried out. Specifically, the study looks at areas or existing business problems for which solutions can be found through the application or support of blockchain technology to generate or optimize economic value. Therefore, current literature as well as information collected through semi-structured interviews with four experts, founders, and employees in the German blockchain space have been analyzed. The research shows that the technology currently finds the most use in the financial sector and supply chain management, in which in a B2B relationship the value is created through offering a blockchain-based service network to improve security and transparency and the value is mostly captured through charging fees for that service.

**Keywords**: Blockchain, Web 3.0, Token types, Business models, Business model patterns

**Author:** Lukas Mehrens

**Title:** How do Web 3.0, blockchain- and token-based businesses create and capture value?

## Abstrato

A fim de maximizar o seu valor económico, as empresas precisam de adaptar o seu modelo de negócio ao desenvolvimento de certas tecnologias. Na era Web 3.0, a tecnologia blockchain e as suas possibilidades e riscos, consequência de aplicações descentralizadas e moedas digitais, têm um papel importante no desenvolvimento tecnológico atual. Portanto, é da maior importância entender como esta tecnologia pode ser utilizada para melhorar as atividades das empresas. Esta dissertação tem como objetivo entender como é que as empresas utilizam a tecnologia blockchain de forma a obter valor económico. Para tal, a seguinte pergunta de investigação será analisada: Como é que a Web 3.0, Blockchain e empresas baseadas em tokens criam e obtêm valor? Para responder a esta pergunta, recorreu-se a literatura sobre blockchain e modelos de negócio, e foram realizadas entrevistas semiestruturadas. Este estudo analisa áreas ou problemas de empresas, para os quais é possível encontrar uma solução através da implementação ou ajuda da tecnologia blockchain de modo a gerar ou otimizar valor económico. Assim sendo, e para além da literatura, foi analisada a informação obtida através de entrevistas semiestruturadas com quatro especialistas, fundadores e funcionários do espaço blockchain alemão. Este estudo demonstra que esta tecnologia tem atualmente bastante utilidade no setor financeiro e na gestão de cadeia logística onde, numa relação B2B o valor é criado através da oferta de um serviço baseado em rede blockchain para melhorar a segurança e transparência, sendo que o valor é maioritariamente obtido através das taxas cobradas por esse serviço.



**Palavras-chave**: Blockchain, Web 3.0, tipos de tokens, modelos de negócios, padrãos de modelos de negócios



**Autor:** Lukas Mehrens


**Título:** Como é que a Web 3.0, as empresas baseadas em cadeias de blocos e fichas criam e capturam valor?

Acknowledgment

This dissertation finalizes my studies for the Master Degree of Science in Management with a specialization in Business Administration at Católica Lisbon School of Business and Economics.

Even though the pride of studying at one of the best Business Schools in Europe, enjoying the beauty of Lisbon's endless sunny hours, and meeting incredible people throughout my journey is indescribable, there were times in which studying abroad, missing home, and especially the academic entitlements have demanded everything from me. Therefore, I would like to thank those people who have supported me not only in terms of my academic performance and career but also in my personal growth throughout my journey.

First and foremost, I would like to thank René Bohnsack, Cláudia Antunes Marante, and Marcela Leme for their assistance throughout the development of my dissertation in terms of hosting seminars, providing knowledge, and always being open to giving feedback. A special thank you goes to Arash Rezazadeh, my "personal" supervisor, who was always willing to invest his time to answer my questions and help me to look at certain obstacles through an optimistic lens.

Moreover, I would like to express my gratitude to my longtime friends as well as the people I met during my studies in Lisbon. Besides the academic support through study groups and study-related exchange of information and knowledge, my friends both in Lisbon and back home have made this period of my life unforgettable.

Finally, I want to thank my family. Even before I started studying in Lisbon and during my studies, every part of my family has been incredibly supportive in different areas of my life. In the moments not even myself believed in me, they always reminded me of how far I´ve already come and showed me my strengths and capabilities, which in some situations were overshadowed by self-doubt.

To conclude, to everyone mentioned in this section: Thank you.

# Table of contents

# List of tables and figures

# 1. Introduction

Blockchain technology was originally developed to create a global, decentralized transaction network without having to trust a third party. Cryptocurrencies started in 2008 with Bitcoin as the only application built on its native blockchain and peaked in 2021 with a market capitalization of 3 trillion USD (Lau, 2016), and 12.000 different blockchain-based projects (Daly, 2022), showing rapid growth and mass adoption of the technology in multiple areas of the economy. It is said that the age of blockchain technology or Web 3.0 will disrupt the ways how companies do business even more than Web 2.0 did.

Chesbrough & Rosenbloom (2002) articulate that technological innovations have no economic value in themselves, only the design of an appropriate Business model, in terms of commercializing the novel technologies, unlocks the opportunities. Web 2.0 and technologies that are brought up in that age such as social media, cloud computing, big data, and mobile applications already transformed the way businesses operate. These technologies have enabled businesses to reach more customers and reduce costs by automating processes and leveraging customer data. They have also created new opportunities for businesses to engage with customers, provide personalized services, and create new revenue streams. In short, businesses could immensely benefit from technological innovations if the business model is set up appropriately.

Whereas Web 2.0 can be seen as scratching on the surface in terms of possibilities of connectivity, Web 3.0 is driven by decentralized applications and services in form of a distributed ledger technology that enables secure, verifiable, and immutable transactions and record-keeping, as the basis of digital currencies. With companies now having access to a secure and trustless infrastructure as well as smart contracts, how does this change the way how businesses operate? How do companies create and capture value? How does the technology impact certain business models and are there specific patterns that can be identified?

To gain knowledge about that, existing literature about the history of blockchain and current areas of application are analyzed, and the categorization of token types gets explained. In addition to that, the current state of research regarding business models, the impact of technological development, and business model patterns will be examined. After that, the scholar aims to collect information about how Web 3.0, blockchain- and token-based businesses

create and capture value through semi-structured interviews with founders, experts, and employees in the blockchain sector of Germany.

# 2. Literature Review

## 2.1 The Blockchain Technology

After the introduction of Bitcoin in the year 2008 and its increased popularity over the years, more and more coins, tokens, areas of application, projects, and businesses appeared. All of them have one thing in common. Every project in Web 3.0 is built based on a blockchain, through which Web 3.0 is characterized as the autonomous integration of data and services, which increases the pre-existing capabilities of Web services, as well as the creation of new functionalities (Rudman & Bruwer, 2016). Hence, the introduction of Bitcoin in the year 2008 was also the introduction of the blockchain technology, as Bitcoin is built on its blockchain. Comparing the current market of cryptocurrencies in the year 2022 to the initial invention in 2008, we can see rapid growth as well as thousands of new businesses, which either created their own blockchain as the fundament of the project or are based on a blockchain already existing. As not only blockchain- and token-based businesses, but also the blockchain technology and its areas of application are evolving over the years, it needs to be explained why there is seen so much value in this technology, as well as the development over the years.

The offspring of the blockchain technology was, as mentioned above, the invention of Bitcoin in 2008. Out of his concern, that every transaction to this date is based on trust towards a third party, Satoshi Nakamoto, an anonymous developer, or developer group, has invented a decentralized financial system, in which anonymous parties can complete reliable transactions without the need of trusting an entity. Through the blockchain technology, the details of transactions are verified by its consensus mechanism called “proof of work” (given the example of transactions through the Bitcoin network) and are added to existing blocks. Once added to the chain, the block cannot be modified. This validates each transaction whenever it occurs (Lee, 2019). Furthermore, the transactions go through a process of approval on whether the information is legitimate under the network agreement. If so, the valid transactions will be stored in the block and a node that creates the block through a process called mining will receive bitcoins as compensation. This procedure adds valid transactions to the blockchain (Vranken,

2017). Hence, there is no need for a trusted central entity, as all transactions based on the blockchain technology are validated and recorded by the consensus of the network nodes (Rennock, Cohn, & Butcher, 2018). In his Whitepaper (2008) about Bitcoin, Satoshi Nakamoto describes the blockchain technology, as a distributed ledger system in which information on transaction details is shared and verified by P2P network participants. The transaction shifts from needing a centralized entity to a decentralized process. This stage is called blockchain 1.0. Here we see a payment system based on cryptocurrencies. The pioneer is Bitcoin, based on its blockchain, which provides a global transaction system, which is decentralized, reliable, and very efficient in transaction costs and transaction speed.

Further development of the technology leads to the second generation blockchain or blockchain 2.0. Vitalik Buterin shapes this stage of development to this day. With his invention of Ethereum, a token connected to the Ethereum blockchain, he introduces the so-called smart contract. It is an autonomous contract, where the content conditions as well as the execution of the contract are set in advance and automatically executed if those conditions are met (Buterin, 2014). Here the execution of legally effective contracts, without a third party, was made possible through the blockchain technology. This demonstrates the applicability of blockchain as not only a tool for payments but rather an online platform, that enables all types of transactions beyond Bitcoin (Reyna et al., 2018). For the sake of completeness, in comparison to Bitcoin, Ethereum uses another consensus mechanism called proof of stake. It is more efficient in terms of energy as the proof of work consensus, as the validation of blocks or nodes is not related to computing power, but rather to the number of Coins that the user is staking.

This leads to Blockchain 3.0, a mass adoption of society with rapidly increasing areas of application, in which experts see the blockchain technology as a tool to create a new industrial ecosystem in various fields beyond the financial sector. In addition to that in this phase, projects arise, that intend to solve problems related to Bitcoin and Ethereum. As there are some concerns about processing speed or lack of governance function, already existing blockchain-based businesses not only try to develop and fix those, but also new projects compete to be a better alternative such as Cardano or EOS, just to name a few (Chatsko, 2018). To conclude, before heading to a more in-depth approach regarding the tools and potentials for the economy and businesses, the blockchain technology can provide decentralized, reliable, global, and fast transactions, which pave the way for businesses to improve in a variety of areas and sectors. The table below serves to demonstrate a brief visualization of the history and development of the blockchain technology.

| Phase | Examples | Characteristics | Source |
|---|---|---|---|
| **Blockchain 1.0** | Bitcoin (BTC) | Provide a global, decentralized financial system without the need for trust. | Nakamoto (2008) |
| **Blockchain 2.0** | Ethereum (ETH) | Introduction of smart contracts.<br>Applicability of blockchain technology grows beyond financial transactions only. | Buterin (2014)<br><br>Reyna et al. (2018) |
| **Blockchain 3.0** | Cardano (ADA)<br>Solana (SOL)<br>Polkadot (DOT)<br>… | Mass adoption in economy.<br>Projects aim to be "better" alternatives (ADA, SOL).<br>Interoperability services emerge (DOT) | Chatsko (2018)<br><br>Wood (2014) |

*Table 1. History and development of blockchain*

### 2.1.1 Token types

Throughout the development of the blockchain technology, thousands of projects have been founded. All of them, especially the sustainable projects worth mentioning, can be categorized into at least one of the following token types. The payment token, the utility token, and the asset token. The payment token is used for the payment of certain goods. An example of this one would be Bitcoin, as a successful application of blockchain, which is the first global decentralized cryptocurrency where its tokens can be used for payments.

While defining an example for the payment token is rather simple, the suspect switches very fast towards terms of financial politics when trying to categorize a token as a utility token, asset token, or a token that fits in utility and/or asset, as well as a payment token. Hence, Ethereum is an example of a utility token as it can be used for applications or services such as smart contracts on its blockchain platform but also is able to perform as a payment token, as it can be traded for other cryptocurrencies, fiat money, or goods. The main utility of Ethereum however is to allow the user to use the platforms` services (Häfner, 2021). Given the recent technological developments, more and more alternatives to Ethereum emerged, as already mentioned above in the third phase of blockchain. Businesses such as Cardano with its native token ADA, or

Solana with its native token SOL aim to offer the same but improved services in comparison to the pioneer Ethereum and are categorized as utility tokens as well. Polkadot (DOT) is an example of a utility token too, however, its utility is not based on the services of its own platform, but rather on "*trusted-free interchain transactability*" inside "*a set of independent chains*" (Wood, 2014, p.3).

The third category demonstrates the asset or security token. They are equivalent to stocks or bonds for example but in form of a digital asset. Owning an asset or security token leads to rights, cash flow, and/or voting rights for the investor (Lambert, Liebau, & Roosenboom, 2022). These security tokens can be seen as digital contracts, that define ownership of a digital asset. Since those tokens act like traditional securities, in contrast to payment and utility tokens, they are usually regulated by the government of countries. An example related to the security token is Polymath (POLY), which aims to push the tokenization of traditional securities (Dossa et al, 2021). The main aspects of the different token types are summarized in the table below. To be clear here, the token types are just a tool to categorize. Still, most of the tokens fit into more than only one category, and especially a strict separation between payment and utility tokens can be difficult.

| **Token types** | **Examples** | **Characteristics** | **Source** |
|---|---|---|---|
| **Payment token** | Bitcoin (BTC)<br>… | A token that is used to buy certain goods | Nakamoto (2008) |
| **Utility token** | Ethereum (ETH)<br>Polkadot (DOT)<br>… | Applicability beyond transactions only.<br>Provides utility in terms of giving access to applications or services inside the native network.<br>Provides interchain transactability. | Buterin (2014)<br><br>Häfner (2021)<br><br>Wood (2014) |
| **Asset/Security token** | Polymath (POLY)<br>… | Digital contract which proves ownership of a digital asset.<br>Regulated by the government.<br>Tokenization of traditional securities such as bonds, stocks, or real estate. | Lambert, Liebau, & Roosenboom (2022)<br><br>Dossa et al. (2022) |

*Table 2. Token types*

### 2.1.2 Blockchain-enabled applications and tools

To analyze the business models, as well as certain business model patterns in the following of this dissertation, it is crucial to get to know the current possibilities, use cases, and areas of application, which are possible through the blockchain technology and worth it adapting an existing business model due to innovative tools creating or improving economic value. The token types discussed above, show the overall purpose of a specific token or project as the payment token is used to execute transactions and the utility token provides value through service or utility inside its platform, to explain it in the simplest way possible. In this paragraph, it is necessary to explain specific possibilities and processes which are blockchain enabled and make them eligible to fit into one of those categories.

To begin with a general approach, the blockchain enables token-based processes or overall, a token-based economy, which, as we already know, can offer decentralized, more reliable, and faster transactions around the globe. To optimize the distribution of tokens and create a well-operating token economy, the number of tokens issued, the distribution of wealth, and an ongoing service engagement are of utmost importance for the project to succeed. Thus, a properly implemented token economy leads to the desired quality of the services as well as the desired starting position for participants to optimize their activities, regarding the pursuit of their interests (Pazatitis, De Filippi, & Kostakis, 2017). Furthermore, since blockchain 2.0, applications can create and execute contracts autonomously through smart contracts without a third entity, demonstrating one of the blockchain technologies' most important tools to build on. In general, when discussing Web 3.0 in a business-related context, "*it describes a broad range of emerging internet applications being built on blockchain technology,* [which enable*] a decentralized, public database, that allows information to be securely recorded on a network of computers rather than verified and controlled by centralized entities*" (Murray, Kim, & Combs, 2022, p.2). There are several applications and tools which are central components of the applications and tools which were made possible through the blockchain technology, such as Cryptocurrencies (fungible tokens), Dapps (decentralized Apps), NFTs (non-fungible tokens), DAOs (decentralized autonomous organizations), Metaverses and IoT (Internet of Things).

**Cryptocurrencies** are most likely the native token of its blockchain protocol. Any activity, which creates information on a blockchain requires payment through the native token in form of a transaction fee or so-called gas fee. Furthermore, the native token of a blockchain can be

used to pay the miners running the blockchain and create new blocks inside the ecosystem. The more use case this specific blockchain protocol enables, the more value the currency has. For example, the value of one Ethereum can be related to its value inside the protocol as well as real-life value through using the service of the protocol. Bitcoins value for example can be determined by society's attitude towards it regarding an improved global currency, without the need for a trusted entity, or as a scarce raw material such as gold. The currency can always be transferred into other cryptocurrencies or fiat money without the need for regulations or additional authority (Murray, Kim, & Combs, 2022).

Another tool is **Decentralized Apps (Dapps),** which are applications running on a blockchain network. The main benefits are user privacy and the lack of censorship as well as being free from the interference of a single authority (Frankenfield, 2022). While YouTube, for example, is run by a centralized authority, DTube, as a decentralized application, provides a platform on which users can publish content without interference from a central authority. Furthermore, the creators are not depending on an entity to decide how much he or she is eligible to earn. On a platform like DTube, the creators as well as the consumers interact, pay, and buy with the native token of the platform. Hence, the more the consumer likes the creator's work, the more native tokens the creator is likely to get. Therefore, the platform is creating something like its own economy without any regulations through a third party.

Next, one of the newest inventions of blockchain-based technology is **NFTs**, cryptographic, tradeable, and digital assets that represent proof of ownership (Chalmers et al. 2022). Unlike Ethereum or Bitcoin, which are fungible assets (1 ETH = 1 ETH; 1 BTC = 1 BTC), NFTs are non-fungible. The perceived value depends on the individual characteristics of the NFT such as utility, beauty, or rareness, just to name a few. Examples of NFTs can be something like profile pictures such as the collection of BAYC (BoredApeYachtClub), where the holder of the NFT not only has a profile picture to use on social media, providing a certain type of status in the community for the user, but also owning an NFT makes him eligible for private parties only holders of this NFT collection can participate, or allows the holder to participate in future projects of the brand. Another example would be an NFT of an athlete for a soccer manager game (Sorare, Ultimate Champions), where the NFT of the specific player scores points depending on his real-life performance, and the owner can receive rewards depending on how many points his set up teams scored. So far, the gaming industry is currently the biggest area of application for non-fungible tokens. Additionally, NFTs can be used to represent a piece of

land in a specific virtual world inside the metaverse, more about the metaverse is in the following paragraph.

Despite being ignored by many, the name change of one of the biggest tech companies Facebook to Meta shows the economic potential some experts see regarding the **Metaverse**, an online world where people can interact in social situations and create and represent their character through an avatar in a more interactive and individualized way as it was in Web 2.0. Stylianos Mystakidis (2022, p.1) describes it as *"the post-reality universe, a perpetual and persistent multiuser environment merging physical reality with digital virtuality [...] based on the convergence of technologies that enable multisensory interactions with virtual environments, digital objects and people such as virtual reality (VR) and augmented reality (AR)".* As many see the metaverse and digital assets as very speculative, the participation of brands like Adidas, Nike, or Dolce & Gabbana collaborating with NFT projects, or auctions, where digital real estate gets sold for millions of dollars, should be reason enough for companies to at least educate about this topic and not miss out on something due to ignorance. Examples of Metaverses are The Sandbox, Decentraland, or The Othersideland.

Being the holder of an NFT can also entitle the holder to participate in a **DAO (Decentralized Autonomous Organization)**, which creates opportunities for individuals as well as the community of the project, to organize quickly and securely, raise funds for the development and govern themselves while retaining anonymity and pseudonymity (Murray, Kim, & Combs, 2022). DAOs can be explained as organizations within a project, which are entirely managed through protocols that are encoded and enforced via smart contracts instead of a centralized authority (Murray et al. 2021). DAOs serve as an organizational structure through smart contracts, programmed on that specific blockchain, and their execution when specific terms are met, through which the users have the right to vote and represent a decentralized authority (Lumineau, Wang & Schilke, 2021). In other words, by holding a specific NFT, one gets access to propose decisions regarding the project or is eligible to vote on the proposals of others. Due to this automation and the abandonment of a central entity, DAOs not only reduce the impact of small groups or individuals breaking policies or rules but also increase factors such as security, reliability, and transparency. In conclusion, Levis, Fontana, & Ughetto (2021) communicate about the phenomenon of DAO, as an online collective that aims to be a decentralized form of coordinating virtual collaborations as an organization in which NFTs provide a way to define membership.

Another phenomenon enabled through the blockchain technology is known under the term **Internet of things (IoT).** This term describes scenarios, in which the network connectivity, computing ability, and sensors are combined to control devices or everyday items. Even though these processes already exist in a certain way, specific connectivity models and technologies based on the blockchain, which is too much to explain in the context of this dissertation, can generate, exchange, and consume data with minimum human intervention. In comparison to already existing procedures, the IoT is aiming to improve certain factors such as security, privacy, interoperability, legal aspects, and past development issues (Rose, Eldridge & Chapin, 2015). A possible area of application would be the improvement of aspects regarding supply chain management, where the secure transaction of sensitive data/information is of utmost importance. Here IoT systems could connect manufacturers, retailers, and consumers through network nodes, whereby transparent and reliable information concerning the product, the supply, and the consumption can be provided with a minimum amount of human intervention (Saberi et al., 2019). As seen in the recent paragraph, there are lots of aspects in which the blockchain as underlying technology has not only enabled certain projects such as NFTs and the Metaverse but also aims to improve already existing businesses and processes. The following question is now, how do those blockchains- or token-based businesses create and capture value? What are the business models and are there specific business model patterns?

## 2.2 How do Web 3.0, blockchain- and token-based businesses create and capture value

### 2.2.1 Business models. History and concepts

Despite the increasing amount of scientific literature about business models in the past years, there is still no universal understanding of them (Wirtz et al., 2016). However, with time and the consolidation of the research field, the definitions shift towards a common term (Zott, Amit & Massa, 2011). Even though some differences regarding definitions exist, there is somehow a common consensus in terms of business models. Wirtz et al. (2016) define a business model as a simplified demonstration of the company's activities, whereas the Business Model Canvas, invented by Osterwalder, Pigneur & Tucci (2005) states pretty much the same, as it is a demonstration of something like a management template, which represents the following categories. Key Partners, Key Activities, Key Resources, Value propositions, Customer Relationships, Channels, Customer Segments, Cost Structure, and Revenue Streams. The tool

can be used to visualize and document existing business models as well as develop new ones. A visualization of this approach to define a business model can be seen in the figure below.

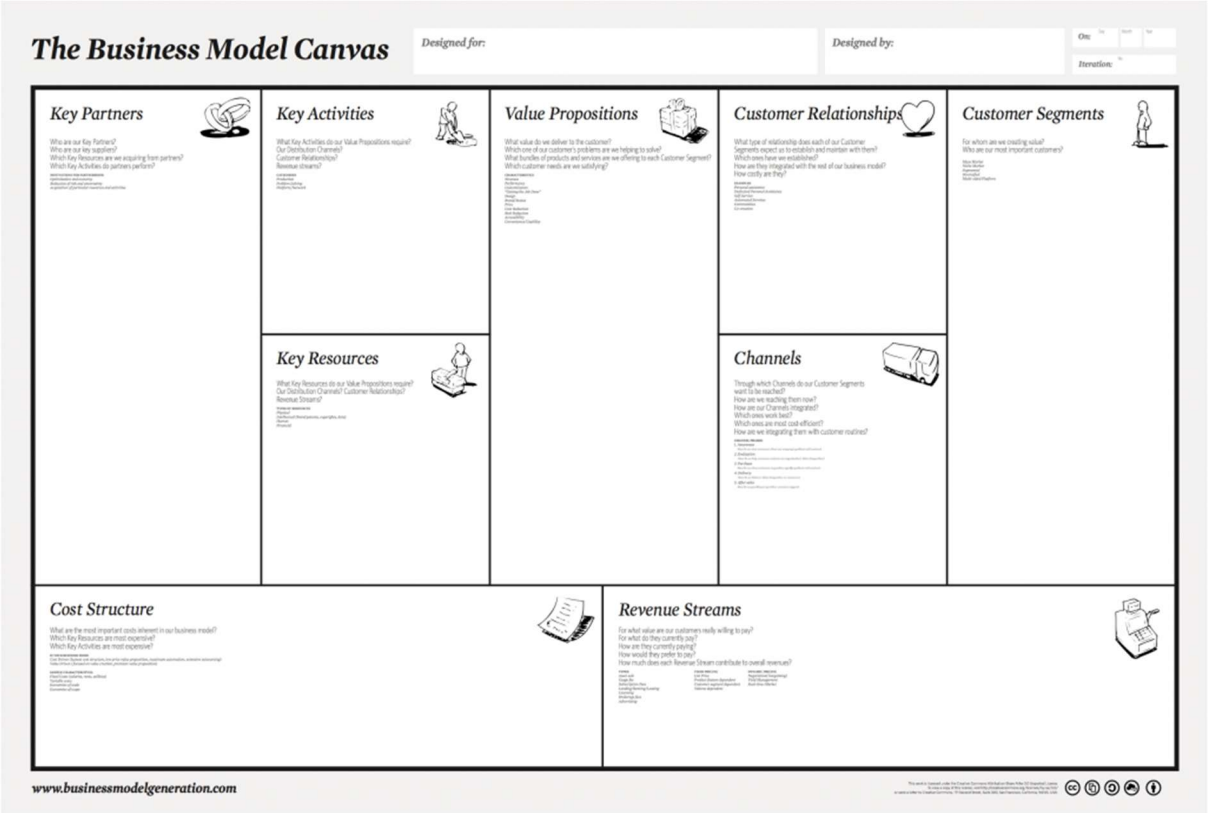


*Figure 1. Business Model Canvas. Available at: https://www.startplatz.de/startup-wiki/business-model-canvas/*

Further definitions see the business model as a conceptual tool that helps a company to understand how it makes money and how it creates value for its customers as well as to analyze the competitive structure of the firm (Hamel, 2000). Furthermore, the business model defines the company's value proposition, how it plans to make money, its key activities, and the resources and capabilities that it needs to support its strategy. Important to mention here is that the business model is used to support the strategy, stating that the business model and strategy itself are interdependent, but two different things (Magretta, 2002), and the value proposition explains the service or performance promise of the company towards the customer, a certain uniqueness, and what distinguishes the company from its competitors.

Lindgardt et al. (2009) structure the business model into two segments: the value proposition and the operating model. These two segments get subdivided into three more categories such as the target segment, product or service offering, and revenue model in the case of the value

proposition, as well as the value chain, cost model, and organization when it comes to the operating model. Another approach to setting a universal definition for that term was made by Jensen (2013, p.65) on a linguistic level, by analyzing the words in themselves and combining their meaning. Hence, as the business in itself is a performance of activities to exchange valuables and the term model or modeling describes "*a representation of reality or an example to follow",* this can be set as a foundation for at least the linguistic understanding of the concept business model. Summarized briefly, a business model is a valuable tool for companies because it helps them to understand how they make money and how they can improve their customer's experience. Hence, Casadesus-Masanell & Ricart (2010) see the business model mainly as a concept of how the company creates, delivers, and captures value. Furthermore, the business model can not only represent the current execution of the business idea but also help companies to identify new opportunities and to develop a plan for how to capitalize on those opportunities.

After reviewing a variety of explanations regarding business models, the Business Model Canvas seems to be the most appropriate one in terms of showcasing how Web 3.0 businesses create and capture value further down this thesis. The down break of a business model into several categories not only helps to identify specific processes of a company but also demonstrates how the symbiosis of those concludes in an individual business model. The fact that little literature exists regarding the value creation of blockchain-based companies, the identification of specific processes, which are demonstrated in the Business Model Canvas, may help to identify a specific business model for a specific Web 3.0 company. However, the business model definition which in itself aligns best with the research aims, objectives, and questions, in terms of how Web 3.0 businesses create and capture value is articulated by Juntunen, Ahokangas & Nguyen (2018, p. 23): "*The business model refers to the logic of the company, meaning how it operates and creates and captures value for stakeholders in a competitive marketplace".*

To draw the connection here, between the technological development in terms of the blockchain technology, as well as the importance of business models and business model patterns, researchers in the name of Wirtz et al. (2016) and Zott, Amit & Massa (2011) see those technological developments, which come along with innovative ways to create and capture value, as a cause for an increasing urge to research in the field of business models. Furthermore, Teece (2010) mentions, that recent research regarding business models show, that the implementation of a clear business model can have a strong impact on the success factor of the company. Hence, discussing the emergence as well as the development of the blockchain

technology in connection with business models and business model adaptation, business model innovation is a crucial concept to look at. In this regard, Chesbrough & Rosenbloom (2002) articulate a very interesting perspective on the connection between technological development and the importance of an adapted business model. From their point of view, technological innovations have no economic value in themselves, only the design of an appropriate business model, in terms of commercializing the novel technologies, unlocks the economic opportunities. The business model is seen as something like a catalyst for transforming the initial technological innovations into economic value. Many more scholars in that research field communicate similar positions as Massa & Tucci (2013) describe a business model as either a succeeding or an inhibiting factor for novel technologies to create and/or capture economic value. In addition to that, Bohnsack (2019) describes a business model as a translation device, which converts an idea into economic value, whereas a good translation initiates success and an unfavorable translation increases the chances of failure.

Some scholars go even further and communicate, that the business model innovation is even more important than the technological innovation itself, as it is harder to duplicate for competitors. Hence, a suitable business model is crucial to gain power in the economy, as the business model itself is already capable of creating a strong and sustainable competitive advantage itself (Magretta, 2002). Those statements get supported by scholars researching business model innovation such as Chesbrough (2007) and Lindgardt et al. (2012), who assign higher economic returns towards the innovation of a business model instead of product or process innovation. According to Evans et al. (2009), those implementations or innovations of a certain business model must be sustainable for an organization to realize the advantages of an appropriate business model. Concerning business model innovation, a variety of different approaches can be found in the literature. As already discussed above, the Business Model Canvas demonstrates certain dimensions of a business model. Therefore, innovating one or more of those dimensions leads to an innovation of the business model itself (Osterwalder & Pigneur, 2010). Another approach is discussed by Frankenberger et al. (2013) in which the business model innovation is enforced through a process of four phases, whereas the initiation phase focuses on analyzing the current business model, leading to the ideation phase in which ideas and suggestions for the innovation are collected. These ideas will be integrated into the business model in the integration phase and implemented into practice in the fourth phase, the implementation. Another tool used for the innovation of a business model is identified as business model patterns which will be discussed in the following paragraph.

### 2.2.2 Business model patterns

When analyzing the research field about business model patterns, lots of scholars refer to Christopher Alexander, who studied the field of business model patterns way before the 1980s and has published many scientific papers in the last few years. In one of his and fellow scholars' studies in 1977, he comes up with an explanation for business model patterns such as: "*Each pattern describes a problem which occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice."* (Alexander, Ishikawa & Silverstein (1977), Remane et al. (2017, p.6). Here, the stated environment is the field of architecture in which the scholars collected 253 specific patterns which, as defined through the definition above, state a reoccurring problem in the environment as well as a solution for that. In this case, those 253 specific patterns articulate problems as well as solutions for local cities, building rooms or cities, and so on. Still, those patterns are not exclusively connected to the field of architecture.

With the emergence of highly successful companies and the increasing research in business model patterns, every business model in any environment consists of a specific selection, configuration, and combination of business model patterns, whereas the implementation of those exact business model patterns can be a strong indicator of the company's success or failure (Bohnsack, 2019). When transferring this into the environment for entrepreneurship, for example, the database of business model patterns of highly successful companies can be used as something like a recipe or instruction manual to set up a company, grow a company, lead digital transformation, or even create a curricular economy (Bohnsack, 2019). Through the fact, that business model patterns serve as the solution to reoccurring problems in an environment, the knowledge of existing patterns reduces complexity, widens the horizon of all possibilities, and reduces the time and resources needed for an entrepreneur (Bohnsack, 2019).

With an increasing interest in business models and business model patterns, many scholars followed the approach of Alexander, Ishikawa & Silverstein (1977) to establish and improve a business model pattern database, as Remane et al. (2017) identify three issues namely incompleteness, overlap and inconsistent structure. The result of that was a published database with 182 business model patterns. The difficulties regarding incompleteness, overlap, and inconsistent structure get clear by analyzing the databases of former scholars. As Alexander, Ishikawa & Silverstein (1977) published the first business model pattern database with 253

patterns, Cantrell & Linder (2000) followed with 34 patterns, whereas Osterwalder & Pigneur (2010) just identified as less as five business model patterns. Four years after that Gassmann, Frankenberger & Csik (2014) published a paper with 55 individual patterns identified. In 2017 Remane et al. analyze existing literature and extract 356 patterns, which finally got revised and summarized into a database of 182 business model patterns. As seen so far, a properly aligned database of business model patterns can be very valuable in any field of economy, still, the collection and proper listing of such a database can be difficult. To cope with this, Remane et al. (2017) came up with the idea to demonstrate the patterns database through a well-structured Layout. As seen in the figure below, the patterns get assigned to a specific purpose, which aims to be fulfilled through the pattern, such as overarching, value proposition, value delivery, value creation, and value capture. Within those categories, the specific collection of patterns gets categorized in different Dimensions. These dimensions in turn are then again divided into subcategories regarding the characteristics per dimension, leading to a better overview of existing business model patterns.

| | Dimension (D) | Characteristics per dimension (number of patterns per characteristic) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Overarching | D1: Hierarchical impact | Prototypical pattern (87) | | | Solution pattern (95) | | | |
| | D2: Degree of digitization | Purely digital (55) | | Digitally enabled (35) | | Not necessarily digital (92) | | |
| Value proposition | D3: Product type | Physical (12) | Financial (7) | Human (5) | Intellectual property (36) | Hybrid (10) | Product type not specified (112) | |
| | D4: Strategy for differentiation | Quality (9) | Customi-zation (8) | Combination (13) | Access/con-venience (6) | Price (22) | Network effects (11) | No impact on differen-tiation (113) |
| Value delivery | D5: Target customers | Specific new customer segment (10) | | Lock-in existing customers (9) | | Other companies (B2B) (7) | | No impact on target customers (156) |
| | D6: Value-delivery process | Brand and marketing (7) | Sales channel (20) | | Sales model (9) | | Customer relationship management (3) | No impact on delivery process (143) |
| Value creation | D7: Sourcing | Make (17) | | | Buy (11) | | | No impact on sourcing (154) |
| | D8: Third parties involved | Suppliers (9) | Customers (12) | | Competitors (3) | | Multiple parties (18) | No impact on third parties involved (140) |
| | D9: Value-creation process | Research and design (7) | Supply (5) | | Production (8) | | Multiple steps (11) | No impact on creation process (151) |
| Value capture | D10: Revenue model | Sell (15) | Lend (20) | | Intermediate (18) | | Advertising (12) | No impact on revenue model (117) |
| | D11: Pricing strategy | Premium (11) | Cheap (9) | | Dynamic (12) | | Non-transparent (8) | No impact on pricing strategy (142) |
| | D12: Direct profit effect | Increase revenue (42) | | Reduce cost (15) | | Multiple effects (11) | | No direct profit impact (114) |

*Figure 2. The business model pattern database. Remane et al. (2017)*

Now as seen what business models are, the identification of business models as a catalyst to put an idea into economic value and the research consolidation into databases with well-categorized business model patterns, how can this be used in terms of technological innovation in the name of the blockchain technology to adapt a current business model to it or create a new one from scratch?

### 2.2.3 Value creation, delivery, and capture

As discussed so far, a business model can be seen as a game plan for transforming a business idea into economic value, in which certain business model patterns represent each problem/task and the solution for it. A supposedly perfect business model with a supposedly perfect composition of patterns still always depends on multiple factors such as the business idea itself, the current state of technology and its possibilities, as well as existing competition, and so forth. Therefore, in the case of staying competitive and being able to satisfy customer needs in a time when technology develops that fast, a steady innovation of a company's business model is necessary. The blockchain technology and its rapid development over the last few years can be seen as one of the most disruptive indicators of how companies do business (Frizzo-Barker et al., 2020). What started as an innovation regarding financial systems with the invention of blockchain technology and Bitcoin can now be seen as the digital driver for the economy (Upadhyay, 2020), as the distributed ledger system creates new capabilities in providing security and flexibility at lower costs than traditional transactions (He et al., 2020) as well as providing a unique opportunity to facilitate the building of trust among stakeholder in areas of the economy, such as logistics or project management, where sharing critical information is a sensitive problem (Abbas et al., 2020).

As already discussed in the first section of this thesis, the blockchain technology provides multiple applications in terms of a business perspective. Nevertheless, to identify specific business models, an appropriate adaptation of an existing business model, or the implication of certain business model patterns, how Web 3.0 businesses create, deliver and capture value must be analyzed. Given that the research field of the blockchain technology in terms of business models and business model innovation is relatively new and underdeveloped, the technological characteristics already mentioned in chapter one of this thesis, as well as existing literature are analyzed to demonstrate how Web 3.0 businesses operate. While reviewing the literature, one

recognizes that if at all any papers are existing, they are about creating and capturing value in terms of a B2B perspective, in which not the company offering a blockchain-based service gets analyzed, but more so the company capitalizing on that service and improving the existing business model or implementing own blockchain-based tools in an existing business model. It is also noticeable that the majority of current literature research focuses on supply chain and logistics.

With that in mind, **value creation** is identified by providing collaborative interaction regarding data accessibility and data validity (Marikyan et al., 2022). This can be ensured through the integration of smart contracts, ensuring immutable data, trust-free operability, and accurate collaborative activity through pre-defined consequences when certain conditions are met (Beck et al., 2016). In that regard, value is created through the security of transactions and data exchanges, improved efficiency, and quality of communication with internal and external parties as well as an improved level of predictability through the implementation of smart contracts (Kowalski, Lee, & Chan, 2021). Further benefits through secure and transparent accessibility of any kind of data are comprehensible transactions as well as increasing efficiency of the use of resources (Chong et al., 2019), leading to improved handling of resources and capabilities, which in turn helps to improve operations regarding service or product offerings (Caro et al., 2018). It emerges that the basic structure of the company in terms of its product/service, distribution, and production is little or not at all affected by the innovation or implementation of blockchain-based applications. The creation of value mainly takes place through the improvement of inter-company processes such as communication, data security, and information transfer.

In terms of **value delivery**, implementing smart contracts into the business model can not only reduce the time of transactions between all parties inside the network in a buyer-seller relationship (Morkunas, Paschen & Boon, 2019) but also optimize inter- as well as intra-operational processes by eliminating the need of a third entity or middlemen (Bauer et al., 2019). Furthermore, due to the accessibility and deployment of data and transaction information for every party in the network, the processes of cross-organizational business activities can be designed more efficiently than before (Morkunas, Paschen, & Boon, 2019). Speaking of cross-organizational activities, the application of smart contracts is particularly beneficial for companies in the supply chain or logistics environment, as pre-defined conditions and agreements can execute transfers of assets ownership autonomously (Caro et al., 2018). Another factor of value delivery, especially from a perspective of the global economy is dissimilar

currencies in different countries, whereas a blockchain-based system of transactions (cryptocurrencies) can be advantageous (Chen & Bellavitis, 2020). Hence, through a global payment system, the use of an intra- or inter-organizational platform to securely transact information and payments, no need for third parties and the possibility of real-time data tracking, the delivery of any kind of value (service/product) can be optimized (Behnke & Janssen, 2020). According to Sunyaev et al. (2021), the distributed ledger technology (DLT) articulates the tokenization of assets with the use of smart contracts for processing transactions pertaining to the asset, and a tamper-proof ledger shared by all authorized parties, which for example is already used by Walmart Canada.

In terms of the process of **capturing value** in a Web 3.0 environment, the independence of a third party regarding transactions would be a way to capture value through the reduction of costs. Marikyan et al. (2022) articulate a restructure of revenue streams as well as three ways of cost reduction to capture value. The first way is achieved through the distributed ledger system enabling data recording and storage. Therefore, the processes of verifying and accessing data, coordination of activities as well as processes of tracking data require less and less intermediation leading to a reduction in costs. The second way of capturing value is the independence of middlemen, as already discussed earlier. Therefore, implementing the blockchain technology into business activities leads to an absence of a third party which in turn leads to capturing value through cost reduction (Marikyan et al., 2022). The third way to capture value communicated by Marikyan et al. (2022) is rather an intangible process of cost efficiency, as the immutability of transactions based on the blockchain technology benefit from decreased risk of security and financial fraud (Zhang & Wen, 2017). Reviewing the current literature on how Web 3.0 businesses create and capture value, it can be seen, that only a few scientific papers exist. In addition to that, that information almost exclusively is concerned with companies using blockchain-based services/products and not businesses offering blockchain-based services/products. Nevertheless, this paragraph has been included in the thesis, as the information about companies benefiting from blockchain-based services could help to conclude in terms of identifying business models and business model patterns of Web 3.0 businesses. To identify blockchain- and token-based companies that create and capture value, one can not rely on the little existing and fragmented literature. Hence, the following methodology is used to collect clear and significant information.

# 3 Research Methodology

## 3.1 Research method and methodological connection

As this thesis aims to provide information on how blockchain- and token-based businesses create and capture value, a qualitative approach to research is necessary. With that, one has a clear vision of the problems and questions to be investigated, but also room to revise and adjust, as the type of knowledge expected to be obtained is known, but the extent of valuable information is not (Klopper, 2008). Whitepapers of specific projects, as well as some literature, almost exclusively focusing on companies using blockchain-based services or products, exist. Here, information about how Web 3.0 companies create, and capture value could be elaborated. However, that information would always be subjectively interpreted without any certainty. With that in mind, to present valid data about value creation in Web 3.0, information has to be collected right from the source. This ensures that business activities inside the blockchain- and/or token-based environment are directly identified as they are enforced inside the company in that moment of time, instead of an interpretation of public information by a variety of scholars.

With qualitative research, especially in terms of business models and business model patterns, important questions like “how companies did this” or “why companies did this” can be answered for the researcher to in turn demonstrate the innovation of a business model or the importance/opportunities of the blockchain technology. Here, Silverman (2000) states that a qualitative research approach is the best to answer “how” and “why” questions. With the broad range of areas of application in terms of the blockchain and the rapid development of the innovative and novel technology itself, the qualitative research aims to collect, explain, compare, and present Web 3.0 businesses, their business model, and business model patterns. As soon as a decent amount of literature regarding this topic is given, a quantitative approach for specific research questions in that field could make sense, but first, a foundation of valid information about how blockchain- and token-based businesses create and capture value must be accessible to gain a deeper understanding about the connection between the blockchain technology and certain business models as well as business model patterns.

## 3.2 Sample

In order to collect valid information about how Web 3.0 businesses create and capture value, the interviewees chosen are either experts in this specific field or currently working inside one of the so-called Web 3.0 companies. Therefore, general knowledge regarding that topic can be conducted through experts as well as sharp insights of employees or entrepreneurs managing or even executing blockchain-related business activities. The sample for this study exclusively includes companies in Germany. The reason for that is that there can be seen a small but rapidly increasing number of blockchain-based companies founded over the past years. Hence, the current market in Germany is growing and therefore very interesting to research, as well as expected not to be oversaturated with so-called hype projects. In addition to that, a possible language barrier gets eliminated as the researcher and the interviewees speak German as their native language. Hence, every reference or quote used in the results section is a translation from what has been spoken during the interview into English.

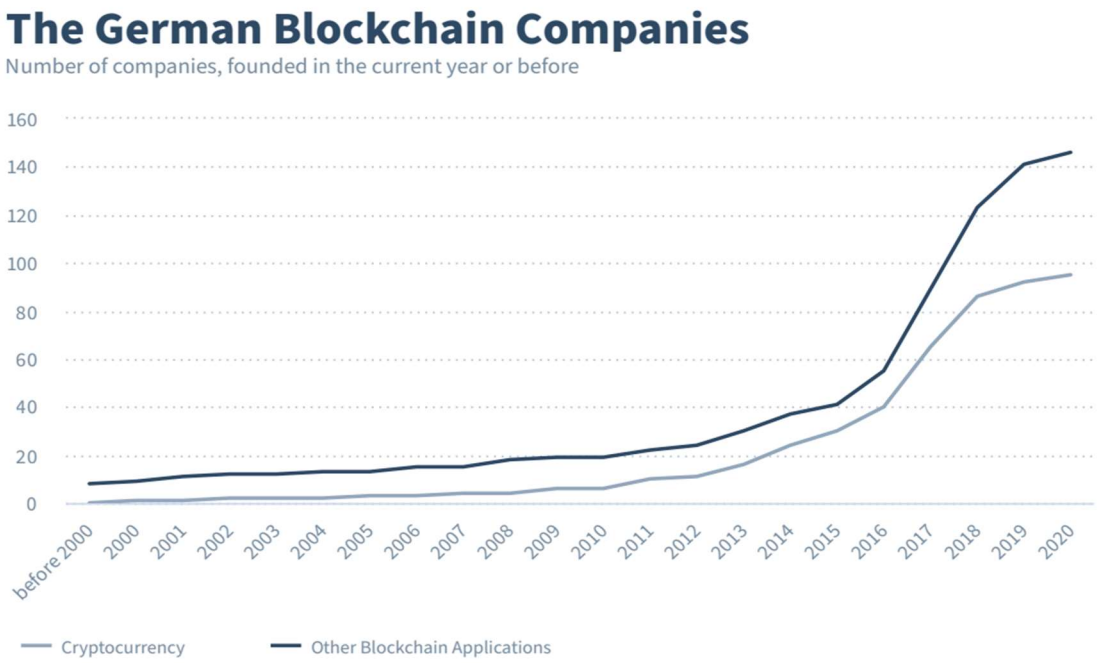


*Figure 3. The German Blockchain Companies. Demary & Demary (2021). A growing niche: German blockchain companies*

With this containment experts, founders, or employees of blockchain-based companies are selected and reached out to. Therefore, sampling methods named intensity and snowball are used to identify valuable but not unusual examples of the phenomenon of interest (Patton, 2014), as well as diminish the error of sampling through word-of-mouth recommendations of intense cases (Creswell,1998). Finally, the following interviewees have been selected:

| Part. Nr. | Position/Responsibilities | Referred to as | Company area | Interview duration |
|---|---|---|---|---|
| 1 | Project Manager | PM | Corporate Finance - Blockchain-based payments | 40 Minutes |
| 2 | Board Member | BM | Politics - Blockchain | 37 Minutes |
| 3 | Co-Founder | CoF | Blockchain Education | 32 Minutes |
| 4 | Chief Strategy Officer | CSO | Branding, Marketing, Strategy | 21 Minutes |

*Table 3. Interviewees*

## 3.3 Introduction of research instruments

The foundation of this exploratory research will be semi-structured interviews with meticulously selected interview partners. As the existing literature is thin, a completely structured interview would be inappropriate, as the researcher so far has limited knowledge about answering the research question and the course of the interviews could reveal important aspects regarding the topic, which could have remained hidden if the interview would be fully structured. Therefore, the need for versatility and flexibility, through the use of a semi-structured interview (Kallio et al., 2016) must be given. With a completely structured interview, the researcher takes full control of the interview as well as very specific directions in terms of the outcome of information, which always depends on the knowledge and certain subjective hypotheses of the researcher. As the aim of this thesis is to answer how Web 3.0, blockchain- and token-based businesses create and capture value, specific topics have to be addressed and there needs to be a course of the interview, which leads to relatively specific information, a non-structured interview wouldn't make any sense as well, as here the researcher would come to the interview with no predefined framework (Zhang & Wildemuth, 2009). Therefore, the approach of conducting semi-structured interviews has been chosen to not only guide the interview in a certain direction but also give the experts space to bring up important information regarding the research question, which the researcher wouldn't have come up with due to

limited knowledge. Hence, the following guideline for the interviews has been elaborated.

| Question | Purpose |
|---|---|
| What is the value proposition of your company? (What do you offer and how do customers benefit? | As the value proposition is the key element of a business model, with that question the researcher aims to collect relevant information about the company itself to better allocate and elucidate information obtained during the interview. |
| How do you use Web 3.0 and blockchain-based solutions in your business? | A general understanding of how this specific company utilizes the blockchain technology to support its business activities should be created. |
| Which problems do you want to be solved?<br><br>What are the solutions you offer to solve the problems? | Achieve a more in-depth insight into how this company identifies problems and related solutions.<br><br>Collect information regarding specific business model patterns this company utilizes. |
| How, in your opinion, businesses can benefit from such technologies? | After collecting information about the specific company and its areas of application in terms of the blockchain technology, the aim here is to utilize the expert's knowledge to collect a broader range of information about the relationship between the technology and businesses in general. |

*Table 4. Interview questions*

This guideline serves to ensure a communication process relevant to this study. Still, after every question listed above, follow-up questions are possible if relevant, to find out more specific information about the ideas the interviewee may have mentioned. This process called probing will be used by the scholar to dig deeper into given information, if either some points of the questions have not been covered, or if important information regarding the research question has been brought up, which was not initially included in the guideline of the interview but could be relevant for answering the research question.

## 3.4 Data analysis

After collecting the information through semi-structured interviews, elaborated data will be analyzed through the following framework. First, this thesis aims to identify how Web. 3.0 businesses create and capture value, intense processes, as well as their roles inside a business model, will be elaborated. With that, a general understanding as well as key elements of how Web. 3.0 businesses create and capture value will be demonstrated. In addition to that, specific business model patterns will be identified inside a category of token types. These patterns are elaborated as follows: First, as discussed in section 2.2.2, a business model pattern describes

the core of a solution for reoccurring problems. With that in mind, the information presented in the literature review has been analyzed in terms of problems, which can be solved through blockchain technology, and are then displayed in the form of a business model pattern and assigned to the respective token type. Secondly, as seen in table 4, question 2, the interviewees have been directly asked about what problems must be solved and what solutions are offered for that. Specific answers, which correspond to the categories of a business model pattern are then displayed as such and assigned to the respective token type. With that, the processes of how blockchain- and token-based businesses create and capture value are demonstrated through specific business model patterns. For the demonstration of business model patterns, not only the categorization of token types but also an assignment to one of the categories presented in the Business Model Canvas has been chosen to demonstrate even further, through which area of business model this specific pattern is creating and/or capturing value. Due to the fact, that the business model patterns are primarily categorized by the token types and not a specific company, the Business Model Canvas category the pattern fits in, can be more than one, as the allocation of the pattern towards a specific Business Model Canvas category varies from business to business.

# 4 Results

## 4.1 Payment token

The value creation of payment tokens can be summarized by providing a global and decentralized payment network. The subjective value for the user results from his/her economic, political, or social situation. Even though citizens of industrial states might find it hard to imagine, “in several countries, lots of people don’t even have access to a banking or financial system” (PM). Here, the blockchain technology offers a solution for that problem through a decentralized global network in which every citizen in independence can execute transactions with nothing more than a mobile phone. Through this, payment tokens in combination with a wallet enable access to the financial system for people who are not able to or are not allowed to participate in it beforehand. Another area of application is seen in the remittance market, where immigrants working or living in an industrial state to send money back home to their families. “Talking about cross border transactions, the market is dominated by a few big companies” (PM). Those companies demand percentage fees in the number of double digits.

"As a blockchain needs little to no maintenance work as soon as it is established" (PM), companies offering the network as well as its native token to execute transactions can drastically lower the fees for their service in comparison to existing large companies. "In addition to that, payment tokens such as stablecoins can be used as value storage in countries with a high risk or history of strong inflation" (PM). Here, fiat currency (national currency) can be switched into a stablecoin which is strictly equated to the US Dollar for example. In conclusion, value is created by providing a global and decentralized financial network, which can be used by anyone independent of ethnicity, financial, political, or geographical restrictions. "With the use of the blockchain technology the need for a third party gets removed" (PM) leading to reduced fees in global transactions. Those fees, charged for using the service or platform are the company's way to capture value. In addition to the economic value created and captured, "the transparent network for payments [also passively] combats financial crime" (CoF). With the information from the analyzed papers as well as what has been spoken about during the interview, the following business model patterns of companies working with payment tokens can be identified.

| Name | BMC category | Problem | Solution | Example | Source |
|---|---|---|---|---|---|
| Verification of transactions | Key activities<br>Key partners<br>Cost structure | Trusting a third entity.<br><br>Costs for verification service. | Details of transactions are verified by the blockchains` consensus mechanism.<br>No third party is needed. | The verification process of transactions using Bitcoin is executed through its proof of work consensus and recorded permanently in a block of the distributed ledger technology. | Lee, 2019<br>Vranken, 2017<br>Rennock, Cohn & Butcher, 2018 |
| Security and reliability | Value proposition | Possible double bookings. (Double spending)<br><br>Human mistakes (third party). | Through the blockchain network, once a wallet executes a transaction, it will be received by the target wallet. | A peer-to-peer network will directly transfer any kind of cryptocurrency from one address to another. The verification process of Bitcoin for example eliminates the need of a third party and with the need for a trusting entity and human mistakes. | Nakamoto, 2008<br>Zhang & Wen, 2017 |

| | | | | | |
|---|---|---|---|---|---|
| Decentralization | Value proposition<br>Cost structure | Humans lose control over the value of their money through national politics and currencies and are dependent on third parties (e.g. inflation).<br><br>Bank only pays interest, lends money, or pays out money if they are liquid. | Transaction network provided without the need for a third party.<br><br>The user takes over full responsibility.<br><br>No third party is needed (low costs transactions). | Bitcoin is a peer-to-peer network without central servers or central storage of data. The network is run by the miners and users of it. | Nakamoto, 2008<br>Zhang & Wen 2017 |
| Unified means of payment | Key partners<br>Key activities<br>Revenue streams<br>Cost structure<br>Value proposition | Globally operating companies face the obstacle of dissimilar currencies in different countries. | Payment tokens with a fixed maximum amount can demonstrate a fixed value worldwide. | Recognizing a bitcoin as one of 21 million Bitcoins and independent of national currencies, this currency can function as a universal and global currency. | Chen & Bellavitis, 2020 |
| Security and financial fraud | Cost structure | If transactions are handled by humans, there is always a possibility of financial fraud. | When executing transactions through a blockchain or smart contracts, there is no risk of financial fraud in the transaction itself. | When adding a transaction to a block in the blockchain, every node must accept the validity. With that, manipulating the network is impossible at the current state of technology and therefor financial fraud can not take place through a blockchain-based transaction. | Zhang & Wen, 2017<br>CoF - Interviewee |
| Access to the financial system | Value proposition | Many people still have no access to the financial system. | With providing a blockchain-based transaction network, people all over the world can participate with nothing more than a mobile phone. | Especially in developing countries, cryptocurrencies such as Bitcoin offer people the opportunity to participate in a financial system. | PM - Interviewee |
| Cross border transactions | Value proposition | Global transactions are connected to high fees due to a few companies | With a decentralized global payment platform, no third party and no maintenance | Any cryptocurrency can be sent peer-to-peer, independent from geographical | PM - Interviewee |

| | | | | | |
|---|---|---|---|---|---|
| | | claiming high prices for offering that service. | work are needed, leading to lower fees. | distance and without administration work, or conversion fees of national currencies. | |
| Service fees | Revenue stream | Especially fees for international transactions are high. | Blockchain-based payment network does not need human intervention or maintenance work.<br><br>Charging low fees is possible. | The fees for a transaction on the Bitcoin blockchain transaction are around approximately 0.30 USD. A transaction fee on the Bitcoin Lightning network can be as low as 0.01 USD. | PM - Interviewee |

*Table 5. Business model patterns - Payment token*

## 4.2 Utility token

The utility attributed to utility tokens highly depends on the economic sector in which they are distributed. The foundation for Web 3.0 businesses are so-called Layer 1 blockchains such as Ethereum (ETH), Cardano (ADA), or Solana (SOL), just to name a few. “Ethereum for example operates as a non-profit organization and offers its decentralized network based on its proof of stake consensus” (BM). Many businesses in Web 3.0 operate as Decentralized Apps, which are built on one of those Layer 1 networks. Several areas of application can be identified. In the supply chain management utility tokens can be used to track products and processes while ensuring that sensitive information is only accessible to predefined parties and persons. “Looking at the food industry and reoccurring scandals of procurement methods, exact tracking of products gets even more important, as the customer wants to know what exactly has been bought in the supermarket” (CoF). “The supply chain sector can be currently seen as one of the biggest areas of application for the blockchain-technology” (CoF). “In terms of data storage, companies like Filecoin (FILE) offer services for blockchain-based cooperative digital storage” (BM) and data retrieval methods. As seen further down this thesis, asset tokens are a big part of Web 3.0 and real-life use case. For that, “companies to facilitate the transfer of tamper-proof data from sources outside the blockchain to smart contracts within the blockchain are needed” (BM). An existing example of that is Chainlink (LINK). As the DApps mentioned above are service-based products, the value is captured through fees for claiming those services.

“Decentralized finance is another sector in which tokens create utility for its user. Through decentralized networks, tokens can be lent or borrowed, and interest rates can be earned” (CoF). Specific NFTs can also be identified as utility tokens. “Especially in the gaming sector, NFTs can have several utilities” (CoF) like upgrading the in-game character or the character itself to play the game in the first place, just to name a few. Here the value that is created is the gaming experience and the value is captured through the sale of NFTs. With the information from the analyzed papers as well as what has been spoken about during the interview, the following business model patterns of companies working with utility tokens can be identified.

| Name | BMC category | Problem | Solution | Example | Source |
|---|---|---|---|---|---|
| Decentralization | Value proposition | Need for a third party to execute contracts. | Smart contracts automatically execute as soon as predefined conditions are met. | Ethereum offers a smart contract functionality based on an open source blockchain. | Buterin, 2014 Reyna et al., 2018 |
| Interoperability of blockchains | Key partners Value proposition | More than one blockchain exists, due to personal preference or economic use cases different blockchains are used and can not communicate. | Trusted-free interchain transactability inside a set of independent chains. | With Polkadot and its native token DOT, blockchains can link to the so-called “Relay Chain” and improve interaction and communication between them. | Wood, 2014, p.3 |
| User privacy and freedom | Value proposition | Using any kind of centralized service, product, or platform, censorship and the interference of the centralized authority are omnipresent. | Decentralized applications in which users interact, earn and pay based on the user's preferences. | While creators on YouTube need to follow the rules and regulations of a central entity, at the platform DTube any platform-related activity is set through every single user and the collective. | Frankenfield, 2022 |
| Customer segmentation | Customer segmentation | How to address a specific target group? | With transparent data on the blockchain, holders of a specific NFT collection can be identified, and based on the NFT | With an exclusive offer for the holders of an NFT collection called “Cryptopunks”, the company Tiffany & Co directly addressed a | CSO - Interviewee |

| | | | | | |
|---|---|---|---|---|---|
| | | | collection conclusions can be drawn about the characteristics of the person. | supposedly wealthy target group and sold out 250 pieces for 50.000$ each. | |
| Airdrops | Customer relationship | How to retain customers? | Customer loyalty can be achieved by sending gifts to the holder of an initial NFT collection. | The group Yuga labs, which is responsible for the creation of the NFT collection BAYC launched their own cryptocurrency and airdropped it to holders of BAYC.<br>As this currency is the only way to participate in a sale of valuable digital land, the group retains customers and makes the possession of holding a BAYC NFT even more valuable. | CSO - Interviewee |
| Decentralized authority | Customer relationship | Organizations are managed by a centralized entity. | Manage organizations through protocols that are encoded and enforced via smart contracts (DAO). | By holding UNI token, the native token of a popular exchange (Uniswap), users gain voting rights about how the organization is run and administered. | Murray et al. 2021 |
| Interoperability of partners | Key partners<br>Key activities<br>Channels<br>Key resources<br>Cost structure | Production processes and communication between partners must run continuously and require human intervention. | Network nodes can provide the same or better results with minimum human intervention. | Specific data sharing and data access control systems allow precise control over who has access to certain information, at what time and for how long. With that, the interoperability of partners inside a field of sensitive | Saberi et al. 2019<br>Marikyn et al. 2022<br>Beck et al., 2016<br>Morkunas, Paschen & Boon, 2019<br>Bauer et al., 2019 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | information can be improved. | |
| Tracking | Value proposition<br>Customer relationship<br>Key activities | People want transparency. | Tokenization of products provides full transparency. | With existing blockchain-based projects such as Vechain (VET), products can be identified, tokenized, and tracked at any time for predetermined parties. | CoF - Interviewee |
| Data storage | Value proposition<br>Key activities<br>Key resources | The amount of data that has to be stored steadily increases. Data is a target for crime. | Blockchain technology not only offers storage but especially security. | With Filecoin, the data storage shifts from a centralized server to a decentralized network of multiple hubs. With that, access for unauthorized persons is made immensely more difficult. | BM - Interviewee |
| Transfer | Value proposition<br>Key activities | Transfers between real-life sources outside to smart contracts inside the blockchain are needed. | So-called "oracles" are used to execute such transfers | Chainlink is currently the most popular Dapp for "translating" real-life information into data that can be used by blockchain-based applications. | BM - Interviewee |
| Capturing value | Revenue stream | Lots of areas of application can be improved through certain blockchain-based applications. | Offering blockchain-based solutions for a specific request of the company in a specific economic sector. | Cryptocurrencies mentioned in this table which are mainly decentralized applications (Vechain, Filecoin, Chainlink) built on a layer 1 blockchain (Ethereum) capture value through selling a requested service. | BM – Interviewee<br>CoF – Interviewee<br>PM - Interviewee |

*Table 6. Business model patterns - Utility token*

## 4.3 Asset token

The existence of asset tokens is justified through a "very high standard of security, reliability, transparency, and a concept called proof of ownership" (BM). With that, "any kind of real-world assets such as real estate, loans, bonds, insurances and more, can be tokenized and managed through smart contracts" (PM). As the proof of ownership concept is part of the blockchain technology and there is little to no maintenance work needed as soon as the interface is created, there is no need for a trusting or controlling entity and the service fees charged can be lower than asset management fees in traditional ways. "Asset tokens create value through transparent, secure, and decentralized ways of proofing ownership of an asset in form of a token" (PM). The value captured for companies offering such a service is through fees, which are lower than what customers pay doing it the traditional way. "Traditional shares for example can be distributed as tokens as well" (PM). Here the investor buys shares of a certain company, whereas the ownership is proven through the blockchain technology, and the "company increases its capital" (PM). As gaming equipment in terms of NFTs can be seen as utility tokens, NFTs can also represent digital Art, which then falls under the category of asset tokens. Here the publisher of a certain NFT or NFT collection offers his pieces of Art, in return, he/she "captures value through a process called minting [in which the art is finally created] and a [so-called] royalty fee" (BM), where the artist or the person who minted the NFT (depends on the conditions of the smart contract) "earns a fee for every transaction made with this NFT" (BM). With the information from the analyzed papers as well as what has been spoken about during the interview, the following business model patterns of companies working with asset tokens can be identified.

| Name | BMC category | Problem | Solution | Example | Source |
|---|---|---|---|---|---|
| Transaction management | Revenue streams<br>Cost structure | The issuance, allocation of value, and management of any type of assets are associated with administrative processes, which are carried out by a third party. | Transactions are managed through the usage of smart contracts. | While talking about assets like digital real estate, art, or anything similar, the transactions take place through a decentralized digital marketplace like Opensea. Tokenized bonds for example are issued by | Sunyaev et al., 2021<br>Marikyan et al., 2022 |

| | | | | | |
|---|---|---|---|---|---|
| | | | | providers such as Mt Pelerin. | |
| Proof of ownership | Revenue streams Value proposition | High costs through third parties (e.g. notary) having to confirm or control proof of ownership for specific assets. | Tokenization of assets simplifies proof of ownership through smart contracts. | The contribution of the asset is proven by the uniqueness of the asset, which is assigned only to the personal wallet | BM – Interviewee PM - Interviewee |
| Distribution | Channels | A lot of paperwork for distributing any kind of asset. | Tokenized assets are managed through smart contracts. | The distribution of an asset takes place through a direct transfer of the asset to the personal wallet. | PM – Interviewee BM - Interviewee |
| Minting | Channels Revenue stream | Overproduction of assets/products. | The process called minting is a condition of a smart contract in which the asset gets created only when the user/customer pays the price. | The mint of a BAYC NFT for example directly creates and distributes an NFT out of the collection in the personal wallet. | PM - Interviewee |
| Royalty fee | Revenue streams | In the example of digital art. Revenue can only be created once when an item is sold. | With the concept of a royalty fee, based on a smart contract, the artist can gain revenue through the initial sale and every time this piece is resold. | When selling an NFT of a BAYC for example on a platform like Opensea, the seller and/or the developer earn a predefined percentage of the selling price. | BM – Interviewee |

*Table 7. Business model patterns - Asset token*

## 4.4 Blockchain-based services and products

Besides companies offering blockchain-based services or products, with the rapid growth of the technology, several areas of application to utilize the technology appear. In terms of participating or investing in any blockchain-based project, “there is a need for an exchange or swap platform through which a certain currency or coin can be switched to another” (BM). Here the value is created through the service of exchanging values and the value is captured through charging fees for that service. Another need in terms of being able to participate is either a hot wallet or a cold wallet. “A hot wallet can be seen as a digital wallet, which is connected to the internet all the time” (CoF). Companies offer such digital wallets for their customers to withdraw their coins from the exchange into their wallets. Since exchanges can be hacked, hot

wallets are said to have greater security. Here companies capture value through their native coin, which is being sold to customers to generate benefits such as lower fees for transactions, or through fees themselves, charged for withdrawals or deposits. “Cold wallets on the other hand are disconnected from the internet and are seen as the most secure solution to hold cryptocurrencies” (CoF). Cold wallets can be plugged in and unplugged from a computer and therefore are not accessible to hackers. The value creation here is through offering a secure way to store currencies, whereas the process of capturing value for the company is by selling those physical products. As there is a seed phrase (password) needed to have access to a cold wallet, “companies offer several products to manage this phrase as well as the cold wallet as secure as possible” (PM). Here again, the value is created through an even higher level of safety and captured by selling the physical product.

Value creation can also take place indirectly through the data on the blockchain, such as holding a piece of an NFT collection, where that “information can be used as a tool for customer-relationship-management or customer loyalty” (CSO). Through the transparency of data and specific customer characteristics based on the NFT he/she holds in his/her Wallet, “companies can target holders of specific collections, segment by wallet addresses and therefore reach a specific target group” (CSO). Here Value is created through the “concept of digital ownership and therefore concrete addressability” (CSO).

“Education is a big sector of the Web 3.0 space as well” (CoF). Companies try to educate interested parties and “distribute NFTs, which prove the attendance as well as a certain degree of knowledge” (CoF). With that digital profiles can be created. Not only in the aspect of education but also “in terms of medical or personal matters digital profiles can have a good reason to exist” (CoF). As personal data on the blockchain can not be manipulated and smart contracts can execute predefined conditions, an individual profile on “the blockchain can simplify traditional processes in health care or increase security regarding alarm systems of real estate for example” (CoF). In areas of application like that, “German politics are concerned with the private data, which is eternally saved on the blockchain, as the “right of being forgotten” exists” (BM). “Political limitations like that currently hinder the development of blockchain technology used in certain applications” (BM).

# 5 Discussion and Conclusion

## 5.1 Findings

First, it can be identified that the blockchain technology is provided by Layer 1 projects such as Ethereum (ETH). In this specific case, Ethereum is registered as a non-profit organization and offers an open-source network for companies to work with. Hence, concerning how companies create and capture value, the results suggest the importance of decentralized applications built on layer 1 projects. The main finding is that most of the companies offer service-based products in which the blockchain technology is used to increase security, transparency, and reliability in a specific economic sector without the need for a third party. This mirrors the vision of Buterin (2014) and Nakamoto (2008), as well as the statements in the existing literature by Vranken (2017), Murray, Kim, & Combs (2022), and Reyna et al. (2018). In terms of payment tokens, the value is captured through the fees of users using the transaction network. The value created is secure global transactions without the need for a third party, giving people access to a financial system or protection options against inflation in endangered areas. In terms of utility tokens, it is important to mention, that even though the technology is backed by rapid development, its adoption is still in the beginning. Hence lots of projects work on making use of that technology in specific sectors of the economy, experimenting with possible values in certain areas, and dealing with political restrictions. Four fields in which the technology is successfully established in terms of utility tokens are data storage, administration, gaming, and logistics. The service of data storage using the blockchain technology offers secure ways for companies to store data. On a personal level for example in terms of medical or educational profiles, the right of being forgotten is a political obstacle this area of application, especially in Germany, is facing. In the service of data storage, the value is captured through fees charged for the service. The same goes for administration, where smart contracts remove the necessity for a notary or a third party in general. In terms of gaming, the blockchain technology creates something like an own ecosystem inside a game, in which the player can play, increase, or customize the player's experience and sometimes even play to earn the native token of the ecosystem, which then can be reinvested in the game or transferred to other cryptocurrencies or fiat money. The most common way to capture value when talking about the gaming sector is the sale of NFTs which allow the user to play the game, earn the native token by playing, increase the amount which can be earned or increase the user’s experience. The most established sector for utility tokens and tokenization currently is the field of the supply

chain. Through the tokenization of products, the production, transport, and sales mechanisms can be tracked by the company or customer, which is becoming more and more important. In addition, smart contracts allow interacting parties to securely gain access to sensitive information, which was also examined by Morkunas, Paschen, & Boon (2019) and can be applied to every economic sector regarding the improvement of intra- and interoperability of internal or external parties, leading to a more effective way of doing business and therefore increasing the economic value. This experience increases customers' trust and satisfaction as well as improves methods of operation between interacting companies and captures value through the sale of these services to logistics companies or improving company-related activities. The asset tokens can be seen as a digital representation of traditional assets. With that, conditions are set without the need for a third entity such as a bank or a notary. The value is created and captured through the traditional ways of the tokenized asset. To link back to the research question, value creation highly depends on the economic sector in the blockchain technology is used. Most of the time the service offered improves traditional operations or decreases costs through the possibility of actions without a trusting entity. The value created for Web 3.0, blockchain- and token-based businesses can be seen in Tables 5, 6, and 7. As most of the business models are service-based, the value is created through fees charged for that service. In terms of artists or NFTs in general the value is captured through the minting process as well as royalty fees.

## 5.2 Theoretical contributions

As the current literature about cryptocurrencies is mainly about the technology as well as how it can be used, this thesis focuses on the ways how companies, which offer blockchain-based services, work and how they create and capture value. Similar findings to already existing literature are the dominance of the supply chain management in terms of the adoption of blockchain technology, improvements in intra- and interoperability in terms of internal and external activities, as well as the explanation and areas of application of the technology and decentralized applications. Still, for a technology to be sustainable in the economic sector, it must have certain characteristics, which improve or innovate existing processes for the better and finally create economic value in any kind of way. Hence, this thesis aims to reveal possible areas of application as well as how to monetize them. From a business perspective, a technology to be used must be profitable or at least help the company to be more competitive. Furthermore,

the researched information is categorized into three token types such as payment, utility, and asset token to be able to assign certain characteristics and identify possible differences. In addition to that, every pattern is referred to at least one category of the Business Model Canvas to better relate the pattern to a business model. Overall as well as in those specific categories this thesis provides information about how the technology is currently used from a company's perspective under the consideration of business models and business model patterns and how this usage creates and captures value.

## 5.3 Managerial implications

This thesis aims to provide general knowledge about Web 3.0, cryptocurrencies, and the blockchain technology, but more importantly, it is addressed to business owners and strategists to showcase how an existing business model could adapt to the blockchain technology through, first: a general overview of how value can be created and captured and secondly: through the precise assignment of identified patterns to a token type and a category of the Business Model Canvas. Moreover, entrepreneurs either using the blockchain technology to gain a competitive advantage right from the beginning or offering blockchain-based services or products can benefit from the information provided as well. Finally, as investing in a project is also an investment in the technology behind it, investment banking companies as well as private individuals should be able to better understand what value the technology delivers in certain areas of the economy, at the current state of development and adoption. In terms of theoretical implications, grasping the possibilities, the technology can have regarding the adaption of a business model to improve economic value, is difficult. Every sector of the economy is experimenting and assigning certain areas of application to a specific category of a business model is elusive. Hence, by not only demonstrating how Web 3.0, blockchain- and token-based businesses create and capture value but also categorizing tokens into three different types and classifying certain business model patterns as a category of the Business Model Canvas, this approach could be the standard of allocating areas of application of the technology inside a specific economic sector to certain parts of a business model, but at least a basis of broadly diversified information that is as comprehensible as possible and with which further research can be carried out.

## 5.4 Research limitations and future directions

There are several limitations to this research that are worth mentioning. First, only 10% of the experts, founders, and employees that have been reached out to have declared their willingness to participate in an interview. Accordingly, when considering the results, it must be kept in mind that the information, in addition to that from existing literature, is only the knowledge of four interviewees. The greatest limitation however was the processing period of only three months, but more importantly a maximum limit of 13000 words for the preparation of this work. With that, one had to explain complex technology and its areas of application without any details but in a way, that a supposedly inexperienced reader can follow. Moreover, to work on the economic area of Web 3.0 and Blockchain in a set period and with a maximum number of words impairs the depth in terms of special properties of market-specific application areas. But even without time or word limitations, when further researching value creation processes and how Web 3.0, blockchain- and token-based businesses capture value, a research approach focusing on a specific economic area, a specific application or tool like NFT´s or the Internet of Things, or a specific token type or even a single company or project could be advantageous to explore specific patterns and concrete areas of business models to adapt. After the experience gained from this research, future studies in form of a bottom-up instead of a top-down approach are recommended.

# Bibliography


Abbas, Y., Martinetti, A., Moerman, J. J., Hamberg, T., & van Dongen, L. A. (2020). Do you have confidence in how your rolling stock has been maintained? A blockchain-led knowledge-sharing platform for building trust between stakeholders. *International journal of information management*, *55*, 102228.

Alexander, C, S Ishikawa and M Silverstein (1977). A Pattern Language: Towns, Buildings, Construction. New York, USA: Oxford University Press.

Bauer, I., Zavolokina, L., Leisibach, F., & Schwabe, G. (2019). Exploring blockchain value creation: the case of the car ecosystem. In *Proceedings of the 52nd Hawaii International Conference on System Sciences*.

Beck, R., Czepluch, J. S., Lollike, N., & Malone, S. (2016). Blockchain–the gateway to trust-free cryptographic transactions. In *Twenty-Fourth European Conference on Information Systems (ECIS), İstanbul, Turkey, 2016* (pp. 1-14). Springer Publishing Company.

Behnke, K., & Janssen, M. F. W. H. A. (2020). Boundary conditions for traceability in food supply chains using blockchain technology. *International Journal of Information Management*, *52*, 101969.

Bohnsack, R., TEDx Talks, (2019). Revolutionizing Entrepreneurship w/ Business Model Patterns | René Bohnsack | TEDxCatólicaLisbonSBE. "Video". Available at: https://www.youtube.com/watch?v=F_kMa5NkPd8

Buterin, V. (2014). Ethereum Whitepaper.

Cantrell, L. J., & Linder, J. (2000). Changing business models: Surveying the landscape. *Accenture Institute for Strategic Change*, *15*(1), 142-149.

Caro, M. P., Ali, M. S., Vecchio, M., & Giaffreda, R. (2018). Blockchain-based traceability in Agri-Food supply chain management: A practical implementation. In *2018 IoT Vertical and Topical Summit on Agriculture-Tuscany (IOT Tuscany)* (pp. 1-4). IEEE.

Casadesus-Masanell, R., & Ricart, J. E. (2010). From strategy to business models and on to tactics. *Long range planning*, *43*(2-3), 195-215.

Chalmers, D., Fisch, C., Matthews, R., Quinn, W., & Recker, J. (2022). Beyond the bubble: Will NFTs and digital proof of ownership empower creative industry entrepreneurs? *Journal of Business Venturing Insights*, *17*, e00309.

Chatsko, M. (2018). Can Cardano replace bitcoin and Ethereum? The Motley Fool. Available at: https://www.fool.com/investing/2018/02/19/can-cardano-replace-bitcoinand-ethereum.aspx

Chen, Y., & Bellavitis, C. (2020). Blockchain disruption and decentralized finance: The rise of decentralized business models. *Journal of Business Venturing Insights*, *13*, e00151.

Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and corporate change*, *11*(3), 529-555.

Chesbrough, H. (2007). Business model innovation: it's not just about technology anymore. *Strategy & leadership*.

Chong, A. Y. L., Lim, E. T., Hua, X., Zheng, S., & Tan, C. W. (2019). Business on chain: A comparative case study of five blockchain-inspired business models. *Journal of the Association for Information Systems*, *20*(9), 9.

Creswell, J. W. (1998). Qualitative Inquiry and Research Design: Choosing among Five Approaches, California: Thousand Oaks.

Daly, L. (2022). How Many Cryptocurrencies Are There? Available at: https://www.fool.com/investing/stock-market/market-sectors/financials/cryptocurrency-stocks/how-many-cryptocurrencies-are-there

Demary, M., & Demary, V. (2021). *A growing niche: German blockchain companies* (No. 8/2021). IW-Kurzbericht.

Dossa, A., Moore, G., Lancaster, J. Buchanan, M., & Ruiz, P. (2021). Polymesh Whitepaper v1.1.

Evans, S., Gregory, M., Ryan, C., Bergendahl, M. N., & Tan, A. (2009). *Towards a sustainable industrial system: With recommendations for education, research, industry and policy*. University of Cambridge, Institute for Manufacturing.

Frankenberger, K., Weiblen, T., Csik, M., & Gassmann, O. (2013). The 4I-framework of business model innovation: A structured view on process phases and challenges. *International journal of product development*, *18*(3/4), 249-273.

Frankenfield, J. (2022). Decentralized Applications (dApps): Definition, Uses, Pros & Cons. Available at https://www.investopedia.com/terms/d/decentralized-applications-dapps.asp

Frizzo-Barker, J., Chow-White, P. A., Adams, P. R., Mentanko, J., Ha, D., & Green, S. (2020). Blockchain as a disruptive technology for business: A systematic review. *International Journal of Information Management*, *51*, 102029.

Gassmann, O., Frankenberger, K., & Csik, M. (2014). Revolutionizing the business model. In *Management of the fuzzy front end of innovation* (pp. 89-97). Springer, Cham.

Hamel, G. (2000). Leading the revolution. 2000. *Boston: Harvard Business School*.

Häfner, S. (2021). Utility Token Design. Retrieved January 3, 2023 from https://research.web3.foundation/en/latest/polkadot/economics/5-utilitytokendesign.html

He, Q., Meadows, M., Angwin, D., Gomes, E., & Child, J. (2020). Strategic alliance research in the era of digital transformation: Perspectives on future research. *British Journal of Management*, *31*(3), 589-617.

Jensen, A. B. (2013). Do we need one business model definition? *Journal of Business Models*, *1*(1).

Juntunen, M., Ahokangas, P., & Nguyen, H. (2018). Business model scalability in the cloud business context. *Journal of Business Models*, *6*(1), 19-39.

Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of advanced nursing*, *72*(12), 2954-2965.

Klopper, H. (2008). The qualitative research proposal. *Curationis*, *31*(4), 62-72.

Kowalski, M., Lee, Z. W., & Chan, T. K. (2021). Blockchain technology and trust relationships in trade finance. *Technological Forecasting and Social Change*, *166*, 120641.

Lambert, T., Liebau, D., & Roosenboom, P. (2022). Security token offerings. *Small Business Economics*, *59*(1), 299-325.

Lau, Y. (2016). Cryptocurrencies hit market cap of $3 trillion for the first time as Bitcoin and Ether reach record highs. Retrieved January 3, 2023 from https://fortune.com/2021/11/09/cryptocurrency-market-cap-3-trillion-bitcion-ether-shiba-inu/

Lee, J. Y. (2019). A decentralized token economy: How blockchain and cryptocurrency can revolutionize business. *Business Horizons*, *62*(6), 773-784.

Levis, D., Fontana, F., & Ughetto, E. (2021). A look into the future of blockchain technology. *Plos one*, *16*(11), e0258995.

Lindgardt, Z., Reeves, M., Stalk, G., & Deimler, M. S. (2009). Business model innovation. *When the Game Gets Tough, Change the Game, The Boston Consulting Group, Boston, MA*, *118*.

Lindgardt, Z., Reeves, M., Stalk, Jr, G., & Deimler, M. (2012). Business model innovation: When the game gets tough, change the game. *Own the future: 50 ways to win from The Boston Consulting Group*, 291-298.

Lumineau, F., Wang, W., & Schilke, O. (2021). Blockchain governance—A new way of organizing collaborations? *Organization Science*, *32*(2), 500-521.

Magretta, J. (2002). Why business models matter.

Marikyan, D., Papagiannidis, S., Rana, O. F., & Ranjan, R. (2022). Blockchain: A business model innovation analysis. *Digital Business*, *2*(2), 100033.

Massa, L., & Tucci, C. L. (2013). Business model innovation. *The Oxford handbook of innovation management*, *20*(18), 420-441.

Michael, J., Cohn, A. L. A. N., & Butcher, J. R. (2018). Blockchain technology. *The Journal*, *1*(7).

Morkunas, V. J., Paschen, J., & Boon, E. (2019). How blockchain technologies impact your business model. *Business Horizons*, *62*(3), 295-306.

Murray, A., Kim, D., & Combs, J. (2022). The promise of a decentralized Internet: What is web 3.0 and HOW can firms prepare? *Business Horizons*.

Murray, A., Kuban, S., Josefy, M., & Anderson, J. (2021). Contracting in the smart era: The implications of blockchain and decentralized autonomous organizations for contracting and corporate governance. *Academy of Management Perspectives*, *35*(4), 622-641.

Mystakidis, S. (2022). Metaverse. *Encyclopedia*, *2*(1), 486-497.

Nakamoto, S. (2008). Bitcoin: A Peer-to-Peer Electronic Cash System. Retrieved January 3, 2023 from https://bitcoin.org/bitcoin.pdf

Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers* (Vol. 1). Hoboken, NJ: John Wiley & Sons.

Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying business models: Origins, present, and future of the concept. *Communications of the association for Information Systems*, *16*(1), 1.

Patton, M. Q. 2014. Qualitative research and evaluation methods (4 Ed.). California, USA: Thousand Oaks.

Pazaitis, A., De Filippi, P., & Kostakis, V. (2017). Blockchain and value systems in the sharing economy: The illustrative case of Backfeed. *Technological Forecasting and Social Change*, *125*, 105-115.

Remane, G., Hanelt, A., Tesch, J. F., & Kolbe, L. M. (2017). The business model pattern database—a tool for systematic business model innovation. *International Journal of Innovation Management*, *21*(01), 1750004.

Reyna, A., Martín, C., Chen, J., Soler, E., & Díaz, M. (2018). On blockchain and its integration with IoT. Challenges and opportunities. *Future generation computer systems*, *88*, 173-190.

Rose, K., Eldridge, S., & Chapin, L. (2015). The internet of things: An overview. *The internet society (ISOC)*, *80*, 1-50.

Rudman, R., & Bruwer, R. (2016). Defining Web 3.0: opportunities and challenges. *The Electronic Library*.

Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International Journal of Production Research*, *57*(7), 2117-2135.

Silverman, D. (2000). Doing qualitative research: a practical handbook, London: Sage.

Sunyaev, A., Kannengießer, N., Beck, R., Treiblmaier, H., Lacity, M., Kranz, J., ... & Luckow, A. (2021). Token economy. *Business & Information Systems Engineering*, *63*(4), 457-478.

Teece, D. J. (2010). Business models, business strategy and innovation. *Long range planning*, *43*(2-3), 172-194.

Upadhyay, N. (2020). Demystifying blockchain: A critical analysis of challenges, applications and opportunities. *International Journal of Information Management*, *54*, 102120.

Vranken, H. (2017). Sustainability of bitcoin and blockchains. *Current opinion in environmental sustainability*, *28*, 1-9.

Wirtz, B. W., Pistoia, A., Ullrich, S., & Göttel, V. (2016). Business models: Origin, development and future research perspectives. *Long range planning*, *49*(1), 36-54.

Wood, G. (2014). Polkadot: Vision for a heterogeneous multi-chain framework.

Zhang, Y., & Wildemuth, B. M. (2009). Unstructured interviews. *Applications of social research methods to questions in information and library science*, 222-231.

Zhang, Y., & Wen, J. (2017). The IoT electric business model: Using blockchain technology for the internet of things. *Peer-to-Peer Networking and Applications*, *10*(4), 983-994.

Zott, C., Amit, R., & Massa, L. (2011). The business model: recent developments and future research. *Journal of Management*, *37*(4), 1019-1042.