Value creation of decentralized metaverse platforms for platform economy

A case study

As a part of the assumed new era of internet, more commonly referred to as web3, includes the idea of a metaverse. Metaverse as a concept is multifaceted and is not limited to a single description. One form of this metaverse is one that exists as an environment, that is not directly controlled autonomously by a centralized entity. Decentralized metaverse in the form of digital platforms facilitate and give meaning to applicability of cryptocurrencies by enabling more ways to apply these into action. But what meaning does this have from the perspective of value creation? With the applicability to blockchain and other decentralized technologies, provides an understanding that the technology enabling the existence of decentralized metaverse is here to stay and the freedom of open-source technologies help to maintain this flexibly.

In this research, we attempt to create a purposeful view on the value creational aspects of the decentralized metaverse. The research objectives focused on existing value creation ramifications that the cases of this research were identified to possess based on the theoretical framework presented in the chapter 2.4.

This research was performed as a case study, along with theoretical framework based on a mapping review based on the contents of 4 literature reviews regarding platform economy value creation and their identified principles. The framework was defined for the purpose of the qualitative study for which 2 decentralized metaverse platforms were studied based on this. For the sake of limiting the concept of value, was this restricted to the concepts of value success categories (VSCs).

The core conclusions from the performance of the value creation regarding each studied metaverse platform were that the decentralized metaverse platforms were found to be variable depending on how the metaverse platform architecture was built to support value creation, being both external and internal reasons regarding the platform. For example, the distinction by extended reality for the sake of digital platforms was not identified to have been beneficial for the value creation of decentralized metaverse platforms.

Pro gradu -tutkielma

Osana oletettua internetin seuraavaa vaihetta, tuttavallisemmin Web3, sisältyy ajatus metaversumista. Konseptina metaversumi on monisäikeinen, ja ei ole selitettävissä nykyisellään vain yhden selitteen kautta. Yksi selite metaversumille on, että se toimisi hajautettuna ympäristönä vapaana keskitetystä hallinnosta. Hajautettu metaversumi digitaalisina alustoina pohjaa ja antaa merkitystä erityisesti kryptovaluuttojen hyötykäyttöön, mutta mikä tarkoitus tällä hyötykäytöllä on konkreettisen arvonluonnin näkökulmasta? Lohkoketjujen ja muiden hajautettujen teknologioiden myötä on yhä selvempää, että hajautetut metaversumit ja niiden mahdollistaman teknologian luoma pohja ovat tulleet jäädäkseen. Tästä muodostuvat avoimeen lähdekoodiin perustuvat sovellukset auttavat pitämään tätä joustavasti yllä.

Tässä tutkimuksessa pyrittiin luomaan tarkoituksenmukainen kuva hajautetun metaversumin arvonluonnillisista menetelmistä. Tutkimus keskittyi kvalitatiiviseen tulkintaan, joka perustui olemassa oleviin arvonluontimekanismeihin, joita tapaustutkimuskohteina olleet hajautetut metaversumialustat nähtiin sisältävän tutkimusta varten luodun kehyksen mukaisesti.

Tutkimus toteutettiin kvalitatiivisena tapaustutkimuksena perustuen teoreettiseen viitekehykseen kirjallisuuskatsauksen pohjalta, joka koostui neljästä kirjallisuuskatsauksesta ja niiden tunnistettujen ydinasioiden kartoituksesta perustuen alustatalouteen liittyvistä ja tutkituista arvonluontimekanismeista. Viitekehys tulkittiin kategorisesti. Kategorioilla mitattiin tutkittujen hajautettujen metaversumialustojen suorituskykyä arvonluonnissa kappaleessa 4. Arvonluonnin käsitteen selkiyttämistä varten tässä tutkimuksessa keskityttiin pelkästään teoreettiseen viitekehykseen.

Tutkimuksen pääasialliset johtopäätökset liittyen tutkittujen metaversumialustojen suorituskykyyn vaihtelivat alustojen välillä riippuen niiden arvonluontia varten muodostetusta teknisestä arkkitehtuurista, jossa syyt olivat niin ulkoisia kuin sisäisiä liittyen tutkittuihin metaversumialustoihin. Esimerkiksi lisätyn todellisuusteknologian käyttöä digitaalisten alustojen kanssa ei suositella tämän tutkimuksen perusteella käytettäväksi hajautettujen metaversumialustojen kanssa niiden arvonluonnin parantamista varten.

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1   Introduction

With a structure designed based on the concept of a network, the generalization of internet has enabled digital platforms to prosper with impact on the methodology of digital business and subsequently as far as general consumption- and social habits go, commonly understood as platform economy. Platform economy is also a constantly evolving concept, where it is a comprehensive way of describing the sphere of the content that it hosts as well as its target audience. As a part of this unconcentrated trend, platform economy has begun to surface in the recent past, known better as in the form of metaverse. Metaverse, on the other hand, is a matter that has been considered to incorporate a complex definition that is flexible to accommodate.

To this day, there is no one specific terminology for metaverse (p. 4214-4216) (Park & Kim, 2021), yet the word is generally used to describe a next generation of internet, known as web3. Platform economy and metaverse can be considered as relateable concepts especially when it comes to decentralization and cryptocurrencies. Whilst the objective of a centralized metaverse is to have organization and/or institutes competing each other to create, govern and manage the most successful metaverse platforms of closed environment (p. 486) (Mystakidis, 2022) the idea and primary objective of decentralized metaverse is to bring metaverse as a concept towards the state of being open for anyone with the help of open-source technology.

To understand the actual contribution of decentralized metaverse towards platform economy, this research focuses specifically on the value creation principles of metaverse as a platform that is not controlled by an autonomous, central entity. In this research, the value creation mechanism of a metaverse-platform, that enables the opportunity for anyone to transfer this opportunity of value into reality is interpreted and investigated in order to have an understanding of how well it generates value and what are the things that make it happen and could make it happen.

1.1   Definition and history

Metaverse has its definition originate from the Greek language, which is to define the existence that goes "beyond" the natural universe. Consequently, the term metaverse has become a synonym to imply the existence of universes parallel to each other (Merriam-Webster, 2021). To get an understanding of what the main concept of this thesis, the decentralized metaverse, means and what is the general consensus regarding

its existence we need to look back to its origin and identify the main aspects leading to the concept. Because of this, we look into its history in terms of how its past development has accumulated to what we consider to be the metaverse of today. It is a common acknowledgement, that the concept of metaverse was first presented in Neil Stephenson's fictional novel from 1992, titled Snow Crash, which is considered to be the first official occurrence of the term "metaverse" and the concept has been generally agreed to have been originated from this novel.

Since its introduction, metaverse as a concept has been slowly gaining ground along with the development of IT. Metaverse is not unambiguous, when it comes to its many manifestations that contributes to the concept. At its current state, metaverse is considered far from its final manifestation, if at all possible to develop into such state. In fact, metaverse could already be seen being synonymous to any virtual environment due to this ambiguity, resulting from increased diversity of metaverse-based concepts.

Metaverse as an integration between natural- and virtual worlds has been part of the general assumptions towards the primary purposes of metaverse since its coining in 1992. It involves the idea of emulating universe as a digital environment, where anyone could establish him- and herself in terms of spending time with tasks delegated from the natural world. Another known fictional depiction of this is famously known to be a virtual world known as "OASIS", from the novel Ready Player One by Ernest Cline (Mystakidis, 2022).

This research will be structured per to the following principle: This chapter introduces the primary concept of the research briefly along with presenting the research objectives and a question. The second chapter explains the research scope, core concepts and prepares the research for the research work. The research is conducted during the third chapter, followed by the analysis during the fourth chapter. Fifth and sixth chapter will conclude this research and the thesis.

1.2   Research objectives and -question

In order to find meaning not only generally but also to specified groups with potential interest, this research attempts to understand the value creation of decentralization in the context of digital metaverse platforms. With value, this research implies only those identified from literature. The rationale for this research is to understand, how platform economy and decentralized metaverse currently are connected, and how this relation could be better understood for bringing closer the value creation mechanisms of digital

platforms as well as the ones already present with decentralized metaverse platforms. The following research question encapsulates the structure and rationale of the research, as follows:

Research Question (RQ): How do the value creation mechanisms of studied platforms against each other correlate with the research framework for the purpose of value creation performance?

2 Defining the scope

Defining the scope for this research is based on the current state and -manifestations of decentralized metaverse platforms. Along with this setup, the aim of this chapter is to provide a conception for identifying the value creation ecosystems of these platforms. To narrow down into detail, the chapter provides an overview of platform economy, as well its their beneficial and disadvantageous association with technologies that are relevant for decentralized metaverse platforms. This association is measured with the theoretical framework, that is used to generate performance indicators for the beneficial and disadvantageous factors of value creation based on a mapping review.

2.1 Platform economy

Platform economy refers to the utilization of digital platforms for the sake of providing a virtual environment for two or more user groups to perform transactions with each other, while benefitting from each others' presence (Xue et al, 2020). Platform economy can also be considered as an enabler for transactions between two or more users to occur within the same medium (p. 169) (Wu et al, 2021) and it has also been considered as a synonym for "sharing economy" (p. 569) (Lehdonvirta et al, 2019). Many different types of business models have been generated around this logic. To name some common examples, business models related to search engines, interaction, trading, shopping, gaming and sharing are present (p. 454). (Wirtz et al, 2019).

For reaching out to the origins of platform economy, a look is taken to the history of a more comprehensive concept of digital business, where digital platforms have established themselves. The introduction and development of digital business is considered as an apparition of an even more comprehensive concept of digital transformation. Digital transformation is considered mostly as the movement of business towards digitalization. Platform economy is generally considered to be most operable for value creation when it is bound with business modelling involved with the concept of a network. Networking allows business to grow based on need, as each customer reciprocally contributes to the business model by being involved with it. This kind of flexible and highly scaleable method of performing business digitally is more familiarly known as a network effect, where the amount of customers contribute to value creation within the economy (p. 1) (Katsamakas, 2022).

Digital platforms are the primary entities in the field of platform economy. These platforms have fostered the development and rise of digital business into the point where nearly every industry is performing in a form or another. The reasons for the prosperity of platform economy and digital platforms over time have been coupled with the niche of digital platforms acting as intermediaries for the purpose of business (p. 11) (Gawer, 2021). Suggestions regarding the prosperity in a practical sense have involved the development of internet and end devices as well as the ways of how data could more effectively and autonomously be analysed for interpreting the usage of a platform (Wirtz et al, 2022).

2.1.1 Value creation and platform economy

It is important to provide a distinctive description between value creation and platform economy in order to more specifically focus on the questions and objectives of this thesis. To make a clarifying distinction, we also need to focus on the difference between terms value creation and -capture from the perspective of platform economy. In this research, value creation is considered as the means of how a digital platform could benefit its users and vice versa.

Value creation is seen as a major alternative for the mass production supply chains of organizations (p. 2) (Gawer, 2021), including P2P (abstract) (Wirtz et al, 2022). Platform economy and digital platforms are also considered as major drivers of digital revolution, when included with the context of value creation. With them, the methods for interacting with customers throughout the timeline of this revolution have become supportive of intermediaries with the help of interacting and networking with customers, but especially by harvesting information from data.

A key enabler of the value creation in platform economy has been linked to the value of data and the technologies improving the interpretation of it, such as with the help of artificial intelligence (p. 453) (Wirtz et al, 2022). The users of the platform are those, who often create the value for the platform business by conducting their own business within the network of the platform (p. 4) (Gawer, 2021). The significance of digital platforms is bound to the structural design of the internet as a network, as network effect. Digital platforms utilize this effect by design for their advantage over other business models with the help of how internet was designed to operate as a network of theoretically limitless amount of nodes or end devices. As an extending network of end devices reaching out to a digital platform, each device and user accounts

to the benefit of the platform. In the research of Wirtz et al (2022) this alternative is referred as a "same-side" network effect in motion. A functioning network effect can also be "cross-side", which means that the network benefits not from the amount of users but the increasing diversity of different user groups that reciprocally provide benefits to each other within the platform (p. 456-457).

2.2   Metaverse platforms and decentralization

The development of metaverse during its most recent history, has been heavily aimed towards its utilization as a digital platform. Because metaverse is an incomplete term, it has become a subject to attempts for finalizing its complete definition regarding what it consists of. Based on Gilbert (2022), decentralized metaverse consists primarily of "NFTs, blockchain, smart contracts and cryptocurrencies" (p. 9). From a technological viewpoint, extended reality (XR) as a set of virtual (VR), augmented (AR) and mixed (MR) reality technologies has been considered ingenuous to metaverse since its coining in 1992. These technologies are each distinguishable, when it comes to involving its user with the artificial reality as a layer within the actual reality. VR essentially involves a full simulative separation from that reality, where the artificial reality has spatially replaced the boundaries of actual world. AR and MR on the other hand, utilize actual reality to modify and boost it for the benefit of the artificial reality, so much so that it enables its user the possibility to interact with the artificial environment with anthropological functions (p. 486-488) (Mystakidis, 2022).

2.2.1 Blockchain

Blockchain is a Distributed Ledger Technology (DLT) that works as a foundational technology for peer-to-peer (P2P) networking. According to Coinbase, Blockchain is at its most basic definition, a ledger, that records transactions and shows these publicly for anyone to see (What is a blockchain?) (Coinbase, 2022). Because decentralized metaverse platform is an opposite approach to what a centralized metaverse platform would operate, which consists of the idea of a completely open form of metaverse by design. To have a decentralized metaverse platform, building it on the foundation of blockchain technology becomes an option that is difficult to turn away from. It is practically impossible to find a decentralized metaverse platform, that is not based on this technology.

Metaverse-platforms, the decentralized ones, are distinctive digital platforms for multiple reasons. This sort of platforms utilize blockchain as the core of their digital infrastructure. Ownership over this infrastructure can be enforced by the means of smart contracts, which are algorithms for specifying the owner of a specific digital asset(s) (p. 1) (Buterin, 2014). Smart contracts enable automated validation for the transactions within the financial ecosystem of a blockchain platform and is therefore a cornerstone for enabling the legitimacy and trust of the platform users to perform economical activity within the platform (p. 6) (Gadekallu et al, 2022). Part of the blockchain's security-by-design approach is the so called "consensus protocol" (p. 3) (Gadekallu et al, 2022), or "consensus algorithm", which is known generally as the algorithm of PoW (Proof of Work). A PoW is essentially a successful calculation of a new block based on a hash of the previous block by a node that is first able to do so, originating from the previous block hash that the miner of the block has been able to solve successfully in relevant time with the help of resource-heavy IT infrastructure for computational power (p. 2-3) (Yan, 2021). These algorithms enable the smart contracts to validate decentralized transactions within the network, consequently creating a decentralized financial environment (what is proof-of-work or proof-of-stake) (Coinbase, 2022).

To exemplify, Ethereum is one of dozens of blockchains that have gained its momentum with the help of many lessons learned from predecessor blockchains, including Satoshi Nakamoto's blockchain genesis project in the form of bitcoin (p. 4). Ethereum-blockchain has adapted itself to the foundation to that of bitcoin's blockchain, but it has applied some modifications to this based on existing scripts, protocols and their features. Together, the approach aims to enable supporting the economical and transactional capabilities of a cryptocurrency (p.34). By this, Ethereum-blockchain aims to be more transparent, scaleable and functional than Bitcoin (p. 13-18), with the help of solutions such as APIs in order to couple Ethereum with coded applications (p. 34) (Buterin, 2014).

2.2.2 Tokenomics

Another reason, one that has also made possible with blockchain and thus by design incorporated with their systems and idea of operating of decentralized metaverses, is the concept of token economics (or tokenomics). Tokenomics regards the type of economy which is based on cryptocurrency (or a token) that a digital platform bound to a blockchain, issues for distribution. Aramonte et al (2021) identified a total of 3

alternative methods of activities in tokenomics, which were: trading, lending and investing (p. 23).

Because decentralized metaverse platforms are bound to the technology of blockchain, it can generate these tokens in ways presented in research such as Grassi et al (2021) (p. 324-325), known as "DeFi apps". This refers to applications with financial system, where no singular entity is in charge and the governance over it is established merely with smart contracts. Governance is distributed initially by DeFi service providers, who issue tokens for exchange with power over a voting system established in the DeFi apps (p. 338). The autonomous nature of smart contracts has been considered capable of even replacing the conventional governmental aspects of organizations, paving way for organizations with decentralized governance, better known as "Decentralized autonomous organizations" or "DAO"s (Campbell-Verduyn et al, 2018, p. 10, 157).

DAOs can be considered as a system built on smart contracts (p. 1) (Buterin, 2014). With the introduction of DAOs, the governance over metaverses of decentral nature has become freely accessible by anyone with an internet connection, based on the power of a community (p. 1) (Corelli, 2018). The World Economic Forum describes the governance enabled to DAOs with the help of using the smart contract functionality and token verification of blockchain. As such, it establishes a voting system that is bound to the tokens owned by the user, representing the voting power for the proposals that is input to the DAO for implementation. The votes then determine, what proposals the DAO implements to the decentralized metaverse (Jesuthasan & Zarkadakis, 2022).

A cryptocurrency is considered as "native" when it is indigenous to a specific platform. This cryptocurrency represents the token of a digital platform (p. 1113). Difference to a centralized platform economy is the way how transactions work within decentralized platforms. In a tokenized economy, transactions are based on exchanging these tokens (p. 1113). Tokenomics take account on how financial value is generated for these. Whereas in an economy without tokens, the object of transaction is dependent on revenues and costs, token economy binds this into the act of transaction (s.1106) (Cong et al, 2020).

Non-fungible tokens (NFTs) are the monetary objects of exchange which are traded in the environment of blockchain. NFTs are one kind of certificates for the digital assets that are contained in blockchains. Thanks to blockchain, all NFT's are original, unique and tradeable. Common examples of NFTs are considered to be digital

abstractions such as art or game objects (s. 2, 6) (Mazur, 2021). NFTs are digital commodities that hold intrinsic economic value due to each NFT being unique and unduplicable (p. 6) (Gadekallu et al, 2022). This value is considered as decentralized intellectual capital.

Going back to Ethereum, its token standards (ERC) which is designed to ensure a cohesive technical level of operation of tokenomics along with smart contracts are especially important. The token standards are established for the purpose of making the Ethereum-compatible cryptocurrencies, compatible with the applications or objects built around Ethereum (Wackerow, 2022) The token standards are also valuable for the purpose of issuing tokens in the Ethereum network with the "Ethereum Request of Commitment" (ERC)-protocol (Jeon et al, 2021)

2.3   Considerations for the use of research data

The considerations around the research data to be used in the following research work are aimed to be configured based on the aspects of appropriate research ethics. To set forth the idea of comparing the success factors in platform economy, based distinctively on decentralized metaverse platforms, a few guidelines are set in order to ensure as unbiased evaluation as possible. The purpose for the research ethics in this thesis are to ensure as transparent, unbiased and secure use of research data as possible, with respect to research case study platform service providers and their related needs and requirements related to their terms for intellectual property. An outline for the research is to utilize data for where use is by default granted based on the open access policy, including data that is stated to be free for redistribution, such as with Fair use-doctrine exclusively in the United States and Creative Commons. Copyright-protected and/or confidential data is excluded from this research work, if not included with explicit permission to use or refer. Personal data is left out of the scope this research.

2.4   Preparing the research work

Before going into the matter of selecting the cases to be examined during the following chapter, we emphasize the selection process before proceeding to the actual research work. The factors, that are considered as the contributors of success and value for digital platform businesses, are identified and selected based on literature. To set forth the predefined success factors that have been identified as a part of the success for platform

businesses based on literature, this research focuses on a limited set of these in order to emphasize few of the most significant ones. These are considered as the value success factors (VSFs) for the value creation models of the studied platforms.

2.4.1 Research methodology

This thesis hosts a qualitative research, intended to work as a case study. The research is based on the methodology of abductive reasoning, by the research of Claudio Delrieux (2004), who specifies the methodology by the means that the research is intended to end up into a pragmatic conclusion by first observing specific notions based on e.g. a theoretical framework and then coming up with an explanation based on the concepts that were identified (p. 412).

Due to the existence of literature reviews based on the value creation principles of platform economy, the framework will focus on these as long as the access policy of these reviews comply to the research ethics of chapter 2.3. From a total of 4 different literature reviews, the most prevalent notions about value creation with digital platforms have been collected into tables 1 and 2, where the former table provides metadata for the evaluation framework in the latter table. Thus the figures provide the official input, for the purposes of the RQ. The value creation principles that are prioritized during this research are referred to based on the conclusions of these selected literature reviews. They are condensed into a summary, which are then collected into figure 1 and 2. Out of these summaries, we identify and map their agreements on what results into a successful value creation in platform economy. These will then be transformed into the final product of this framework, which are 2 key performance indicator maps presented in figures 1 and 2 as well as table 2 for evaluating the benefits of the generated value creation models for platform economy.

2.4.2 Framework for qualitative research

In order to get started with the research work and the examination of selected metaverse-platforms, we begin by forming a foundation for the value success factors that are to be formed eventually out of a mapping review, which this sub-chapter focuses on. To give this foundation a purpose, an understanding is sought to be gained from what it means to do and sustain a prospering platform economy sustainably. For

this foundation, we refer to the selected literature reviews for the basis of the framework. Due to the challenge of gathering data for measuring value creational performance via quantification into hard figures, we instead are bound to select a more directive approach that assesses platform economy success from previous findings. The value success factors were formed out from the conclusive findings of the literature reviews for platform economy value creation, based on the reciprocal relationship between a digital platform and its users. A mapping review, according to Grant & Booth (2009), is a research method that focuses on the search of niches from literature and categorizing these by mapping them for the purposes of further research (p. 94).

To illustrate this, figures 1 and 2 present a multidimensional network. In the core of this network is the concept of value creation in platform economy. We attempt to extend the network from the core to branch out the network with the key notion of "is able to" for specifying the logic of how the network can be extended. To extend the network, platform economy is evaluated based on the findings from the literature review to identify the traits how platform economy is considered to support its users. This constitutes the foundation for the Platform-to-User VSFs. The roles are then swapped for the building for the second VSFs, where the users become the core of the network. This time, the identification focuses on methods of how users are considered to support digital platforms, constitutes the foundation for User-to-Platform VSFs.

The findings are collected as a collective result from the scientific literature reviews presented in Table 1, which were selected based on their focus on network effect. A finding is added to the research framework based on the aspects of network effect that were identified to support value creation within platform economy, from the particular review. The rationale for selecting the literature reviews were based on the applicability and added value to platform economy value creation research. Accuracy of the interpretation was considered during the building of the consensus, but further interpretation was given room for further research as the number of branches in the network was limited to 4 per to the amount of literature reviews selected for this review of reviews. The subsequent findings of the research are hence consituted by the principle of network effect and abductive reasoning.

Table 1. Review foundations

Index	Literature review
1	Fu, X., Avenyo, E., & Ghauri, P. (2021). Digital platforms and development: a survey of the literature. Innovation and Development, 11(2-3), 303-321. doi:https://doi.org/10.1080/2157930X.2021.1975361
2	Bonina, C., Koskinen, K., Eaton, B., & Gawer, A. (2021). Digital platforms for development: Foundations and research agenda. Information Systems Journal, 31, 869–902. doi:https://doi.org/10.1111/isj.12326
3	Mishra, S., & Tripathi, A. R. (2020). Literature review on business prototypes for digital platform. Journal of Innovation and Entrepreneurship, 9(23), 1-19. doi:https://doi.org/10.1186/s13731-020-00126-4
4	Rietveldt, J., & Schilling, M. A. (2020). Platform Competition: A Systematic and Interdisciplinary Review of the Literature. Journal of Management, 47(6), 1528–1563. doi:https://doi.org/10.1177/0149206320969791

Fu et al (2021) studied the impact of digital platforms to the forces of economy regarding how it has thus far impacted social movements, ways of working and the creation of value whilst still being flexible to a number of different use cases (p. 304-305) The research was constructed as a thematic analysis from a systematic literature review of 25 scientific articles from a total of 678, divided into 3 categories per to the focus of the impact from which 5 were allocated for value creation (p. 306, 321). For creating value, the research identified the economical benefit result from the multi-sided network effect of platforms enabling the exchange of goods and services as well as personalization to result into value creation as intermediaries (p. 306). Network effect was regarded as a system of value creation that enables reciprocal value creation, directly from the increasing amount of users and/or user groups. To protect the reciprocal value creation created from this, while copyrighting was seen important to mitigate the possibility of copying a way of creating value, it was not seen to impact the capabilities of developing innovative solutions for digital platforms (s. 307). Other important notions regarding the elements contributing to the digital platform value creation were low threshold of use, scalability, flexibility as well as the spreading movement of value (p. 308).

Bonina et al (2021) studied the developmental implications of digital platforms for notions going beyond the benefits of boosting economic growth towards the benefits of sustainable development. The research regarded digital platforms as either the type of platforms for the purpose of exchanging good and services or for the purpose of collaborative development. The research was constructed by creating a broad literature review of the notions of the objectives and hindrances impacting the development of digital platforms. For creating value, the research identified the former platform type were considered to originate from matching together the users of the platform as well as enhancing the flow of making the matching as effective as possible. In practice, this was regarded as enabling access to the platform via subscription plans or collecting provisions. Additionally, data was seen as a source of value originating from the consumption habits of the platform, albeit with consideration to the privacy and safety of the platform users (p. 872, 874) For the latter, the principles were seen to originate from the accessibility and support to the necessities of the platform users for being able to develop new services. In practice, the access to the resources required to develop these services for developers as well as offering these services for their users were seen as the keys for creating value, along with advertisement revenues (p. 872, 877).

Mishra & Tripathi (2020) studied different types of business models that were involved with digital businesses concentrating on a digital platform (abstract) The research was constructed as a broad literature review where multiple business models from digital businesses were identified and studied. For creating value, the research set out an illustration of the existing roles and relationships that function within and outside of a common platform ecosystem. Within the ecosystem were the platform owners governing the use of the platform as well as the complementors providing the resources and support for creating the platform ecosystem. Outside of this ecosystem were identified to be the user groups of the platform, both content creators and content consumers. As an important factor of a functioning ecosystem was seen the communication about value- and data related topics with the inside and outside roles of the platform.

Finally, Rietveldt & Schilling (2020) studied the nature of the research done for the existing competition within platform economy via 3 different research objectives. The first objective was to identify the traits of digital platform competition based on literature. The second objective was to gain clarification to the impact of network effect on organizational strategies where platforms are used. The third objective was to give

room for future research regarding the first objective of the research (abstract) The research was constructed by creating a vast systematic literature review out of 333 scientific articles, where the researchers identified notions such as the methodologies, contexts and themes surrounding the digital platform competition research (p. 1531-1536). For creating value, the research identified it to originate in one of the themes found as a result of the research, which regarded organizing the ecosystem and governance around the digital platform as most impactful regarding the focus of platform. Here, the owner(s) and supporter(s) of the platform were seen helpful for the platform value creation as an influential force, when creating a strategy how to organize these two successfully. For example, a rewarding system for a long-term contribution to the platform and directing the platform based on the market around whilst keeping these both up to date were seen to have a positive effect on the influence (p. 1535, 1544-1545).
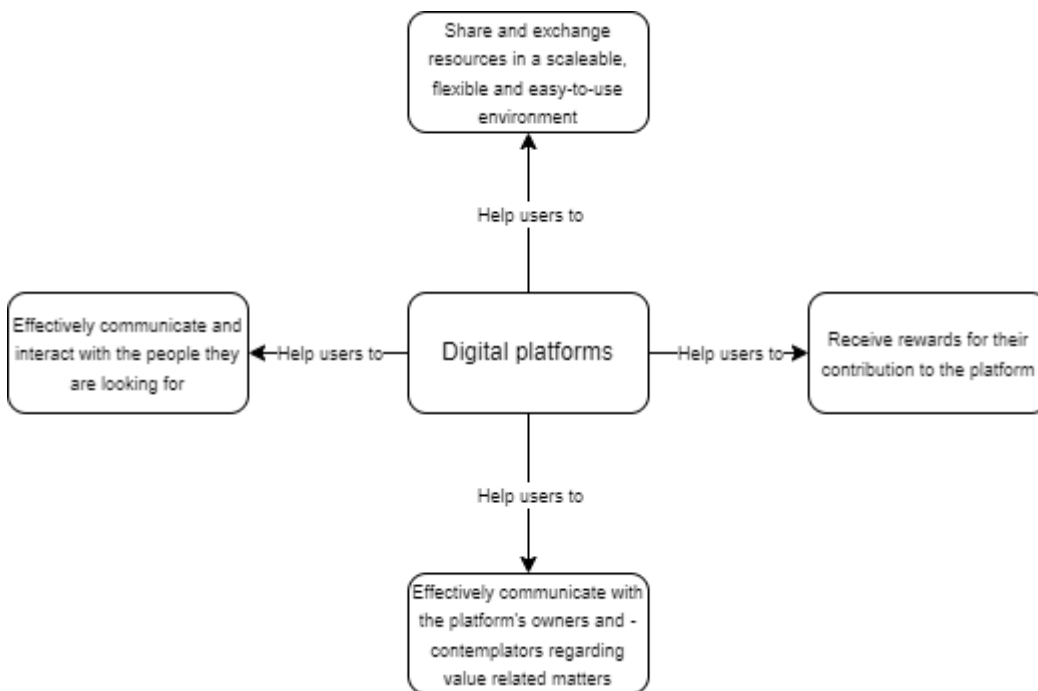
Figure 1. Map for Platform-to-User VSFs
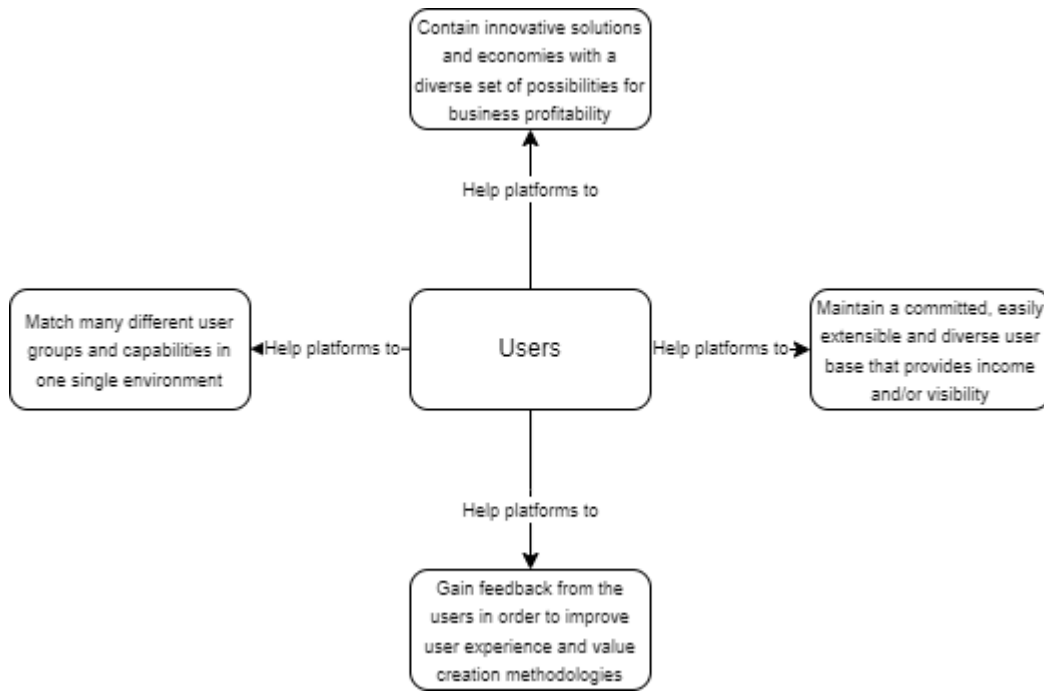
Figure 2. Map for User-to-Platform VSFs

From the results of Figure 1 and 2, our selection for measuring the beneficial principles of the value creation regarding the decentralized metaverse-platforms to be examined during the empirical research work were presented. Below in Table 2, are 4 distinct value success categories (VSCs) based on VSFs, shown as a table. The purpose of this table is to present 4 different VSCs based on the reciprocal logic of value being gained by the platform and its users.

Table 2. Value Success Factors (VSFs) and Value Success Categories (VSCs)

Platform-to-User VSFs	User-to-Platform VSFs	Framework article	VSCs
Helps users to - Share and exchange resources in a scalable, flexible and easy-to-use environment	Helps platforms to - Contain innovative solutions and economies with a diverse set of possibilities for business profitability	Bonina et al (2021)	**Resources**
Helps users to - Effectively communicate and interact with the people they are looking for	Helps platforms to - Match many different user groups and capabilities in one single environment	Fu et al (2021)	**Matchmaking**
Helps users to - Effectively communicate with the platform's owners and - contemplators regarding value related matters	Helps platforms to - Gain feedback from the users in order to improve user experience and value creation methodologies	Mishra & Tripathi (2020)	**Communication**
Helps users to - Receive rewards for their contribution to the platform	Helps platforms to - Maintain a committed, easily extensible and diverse user base that provides income and/or visibility	Rietveldt & Schilling (2020)	**Compensation**

The VSCs presented in Table 2 will be the main focus in the sub-chapters upcoming in the following chapter 3. The rationale of these choices for the network branches was based on one core conclusion presented by the literature reviews selected for the framework for the context of platform economy value creation. Each branch is intended to represent one literature review each.

3   Research work

This chapter presents the research which consists of the openly available literature and other documentation of the platforms and related material that are being studied. The research focuses on the value creation mechanisms of decentralized metaverse platforms, based on the research framework. During this chapter, the main source of information regarding the description of these platforms comes from the platforms themselves with the content that has been published from them thus far. The following 3 platforms have been selected primarily based on their adherence to the principle of representing metaverse as open and decentralized system. During this chapter, we first review these platforms briefly based on their intended purpose as well as technical- and tokenomic foundation for the sake of giving both case studies a comparable introduction. After this, we compare the platforms to the VSFs of the established semantic framework from chapter 2.4.1 later in chapter 4.

3.1   Over – "The reality bender"

Over is a decentralized metaverse-platform, with the purpose of hosting a metaverse based foremost on AR. In order take part in the Over-metaverse, the users are required to have a mobile- or smart device with AR compatibility for full experience but can operate the activity from a user interface of a browser. Over is an open-source platform, where it makes possible to invest and trade digital assets native to the platform (Executive Summary) (Over, 2022).

The Over platform architecture consists from total of 3 layers of technologies, consisting of AR, geolocation and SDK for 3D development. These technologies enable the players to interact and transact with OVRLands in the real world environment (Over Platform) (Over, 2022). Over is built around the blockchains of Ethereum, Polygon L2 and the IPFS system (OVRLands) (Over, 2022). Polygon is a modular framework blockchain, that is designed to be adapted to the blockchain of Ethereum. Its purpose is to provide more scaleable, sovereign, interoperable and secure operation than mere Ethereum and to provide tools to customize a digital environment for the purpose of optimizing it for its interoperability with Ethereum blockchain (p. 3, 5) (Polygon, 2021). In the metaverse of Over, Ethereum and Polygon are used for example, keeping track of

OVRLands and their ownership (OVRLands) (Over, 2022) as well as OVR Tokens (Over Nodes) (Over, 2022).

As an addition to the technical architecture of Over, it includes Interplanetary File System (IPFS) which is a decentralized peer-to-peer system. It enables the possibility to store content in an uniquely identifiable way, for which it utilizes content addressing, direct acyclic graphs (DAGs) and distributed hash tables (DHTs) (how IPFS works) (IPFS Docs, 2022). Over utilizes IPFS for the purpose of storing the assets (Over Experience) of Over between all the nodes within the blockchain network of Over (IPFS and Over Node) (Over Nodes) (Over, 2022).

3.1.1 Platform-to-User VSFs

Resources – Over: The financial ecosystem of Over is based on the cryptocurrencies of OVRToken and OVRLand. OVRToken functions as the object of transaction that enables the transaction of OVRLand which in turn is the object of purchase, which represents the actual world form the view of the platform as a grid of hexagons, one hexagon, divisible up to 7 smaller hexagons, represents one OVRLand and being the size of 300 m^2 whilst leveraging the XR of Over-platform. OVRLands are the object of exchange within the platform in the blockchain of Polygon but being operated via Ethereum (OVRLands) (Over, 2022). According to the usage statistics presented by the platform, there are roughly 30k users that own land from the Over-metaverse, mostly from United States (Marketplace) (Over, 2022). Per to decentralized operation of blockchains, Over handles the transactions performed within its marketplace via smart contracts (Marketplace) (Over, 2022). According to the usage statistics by 16th of October, 2022, a total of 7,4 million OVRTokens have been spent and 860k OVRLand have been auctioned. According to the details presented in Coinbase, the value of OVR in comparison to 1 Euro in the beginning of September 2022 was 70% while being nearly 300% last year at its best (Coinbase OVR, 2022).

Matchmaking – Over: Over considers its main user groups to be "end users, digital asset investors, digital media agencies, advetisers, digital artists and shopkeepers." (addressing market needs) (Over, 2022). For each, Over provides a set of commonly understood needs and solutions to these based on assumed roles for these user groups. For example, Over considers the end users and their needs more related to matters such as service quality and user experience, whereas for digital media agencies,

advertisers or digital artists it considers the needs to be more related to reaching out new customers and networking opportunities (addressing market needs) (Over, 2022). The main intention of Over's ownership is to bring the ownership of the platform as close as possible to the users (Over Holding Srl, 2022). This is described as the philosophy around open-source by Over (Executive summary) (Over, 2022).

Communication – Over: Over's privacy policy states, that it essentially refrains to collect any data outside from the automatically sent data. This data includes details such as technical information from the node that is connected to Over, software used along with Over and user activity. Over utilizes the gathered data for studying the user behaviour and site performance, anonymously. Over also uses the its data from its users to authenticate and communicate with the users (Over Privacy Policy, 2022). For communication, the platform is present in the social platforms of Reddit, YouTube, Instagram, Twitter, Medium, GitHub, Discord, Telegram and Facebook (Over Holding Srl, 2022).

Compensation – Over: Over specifies particular roles for each node within the sphere of Over for the purpose of maintaining its architecture, which are: Over Owner, Over Creator, OVR Miner, OVR User, OVR Publisher and OVR Staker. The complete network of these nodes add up to the overall performance of the Over architecture, for which Over includes an "incentive system" to maintain the network's and Over's system performance at a sufficient level, that is focused on the OVR Staker user group. Over's system grants support for OVR Stakers for the first 3 years of operation of Over Nodes (Over Nodes) (Over, 2022).

3.1.2 User-to-Platform VSFs

Resources – Over: Because Over utilizes the natural world for the purpose of its AR functionality the capabilities of users are limited to approximately 1,7 trillion OVRLands of the size of 300 m^2, equivalent to the land of earth in the natural world OVRLands are handed to users claiming ownership of one or more OVRLand. This activity is hosted by the Private Utility Layer of Over (OVRLands) (Over, 2022). OVRLands are available to be bought and sold from Over's Marketplace as P2P transactions. Additionally, OVRLands can also be rented (OVRLands: Buy, Sell, Rent) (Over, 2022). Thanks to the Over SDK layer, the Over users are able to develop unique AR experiences in Over, which are known generally known as OVRExperiences (OVRExperience: Buy and Sell).

Matchmaking – Over: Going back to Over's distinctive roles for the purpose of maintaining its architecture: Over Owners are those who possess OVR, purchases OVRLands and hosts experiences for the purchased land in the AR space, developed by Over Creators. OVR Miners are those who enable the function of OVR Nodes (Over Community), which are the endpoints that store the digital assets of Over decentrally via the IPFS technology (IPFS and Over Node). These endpoints are the focus of a stake for the purpose of maintaining a seamless operation of the Over system and particulariy the Over Nodes that are connected to the IPFS decentralization system (Over Nodes). OVR Stakers are the ones who stake their tokens for the purpose of being able to operate the Over Nodes. OVR Users are then those who user these AR experiences as they are. Lastly, OVR Publihers utilize their OVR for the purpose of promoting their mission on OVRLands (Over Community). The core point of interaction in the sphere of Over is the Over Marketplace, where Over's users are able to place bids to purchase OVRLands with OVRTokens (Two tokens, one ecosystem) (Over, 2022).

Communication – Over: Over consists of two different markets that are divided between the Ethereum and Polygon blockchain. Ethereum taking responsibility of hosting the primary market for the OVRLand not yet purchased and Polygon hosting the secondary market for those OVRLands already purchased (Over Holding Srl, 2022). Any user of Over is able to participate in the marketplace and to place bids for purchasing OVRLand.

Compensation – Over: The governance of the transactions of and consumption of users within Over is enabled by the Aragon Network DAO (Token Emission) (Over, 2022). Aragon Network is a DAO that contains 4 modular sub-DAOs within its domain, which are Executive Sub-DAO, Compliance Sub-DAO, Tech Committee and Aragon Court. The main DAO module of Aragon controls the political tokens of ANT for the purpose of specifying the assets that are the focus of interest of ANT holders as well as the ruleset within all of the DAO sphere. The purpose of the Executive Sub-DAO is to set forth the strategic decisions regarding the Aragon Network. The Compliance Sub-DAO is responsible of sustaining the morality and humane respect within the Aragon Network. Tech Committee focuses on auditing and accepting the code to be added as modules for the Aragon Network infrastructure. Finally, the Aragon Court is the law enforcement entity of Aragon Network, protecting the rights of it (Aragon Association, 2022).

3.2 Decentraland – "The early adopter"

Decentraland is a decentralized metaverse platform that was established in 2015 with the purpose of hosting a virtual world where the players themselves govern and are accountable for the ownership of digital property and the value gained from it (p. 4) with the options that Decentraland provides for the players to perform interactions and transactions in P2P.

Decentraland is based on the blockchain of Ethereum, that enables the smart contract functionality for Decentraland (What is the DAO) (Decentraland Docs, 2022). Additionally, Decentraland utilizes IPFS to store information related to the DAO governance of Decentraland (What is the DAO) (Decentraland Docs, 2022) as well as the digital asset ownership details (p. 8) (Ordano et al, 2022).

3.2.1 Platform-to-User VSFs

Resources – Decentraland: The financial ecosystem of Decentraland is based on the cryptocurrencies of LAND and MANA (p. 9), which like in Over, are both noted to be compliant with ERC (p. 12). MANA is the object that enables the transactions with LAND, which represents the land owned by players within the Decentraland-platform application (p. 12-13). These transactions are powered by the smart contract-functionality of Ethereum. According to user statistics published by Decentraland, by 16th of October, 2022, a total of 178k NFTs have been sold in the primary and secondary markets and 352 million MANA has been used for transactions, where the DAO of Decentraland has collected roughly 2%. According to the information on Coinbase in the beginning of September 2022, the value of MANA in comparison to 1 Euro was close to 80%, while being around 400% at best last year (Coinbase MANA, 2022).

Matchmaking – Decentraland: Decentraland aims to provide its users a platform where they can perform their own business. Decentraland does however support entrepreneurship by financially supporting those interested in developing the platform and creating content for the users based on the idea of setting up a shop at Decentraland (s. 13) (Ordano et al, 2022).

Communication – Decnetraland: Decentraland's privacy policy states, that Decentraland collects specific type of user information from its users. This includes details such as technical information from the node that is connected to Decentraland,

email addresses, software used along with Decentraland and user activity, which is further transferred for Google as a third party. Decentraland utilizes this information for the purpose of identifying trends as well as improving the platform's performance and user experience (Decentraland-Privacy Policy, 2022). According to the front page of Decentraland, the platform is present in social platforms of Twitter, Discord, Reddit and GitHub (Decentraland Foundation, 2022) for communication.

Compensation – Decentraland: Decentraland rewards its users for contributing their purchased land for the purpose of its token economy in case they are founding a shop within the acquired land. Decentraland has additionally set milestones for the purpose of fostering competition between its user base by contesting them. Decentraland also supports new users by subsidizing them from when they begin to use the platform (p. 13) (Ordano et al, 2022).

3.2.2 User-to-Platform VSFs

Resources – Decentraland: Decentraland specifies 3 important ingredients for enabling successful economy within its platform, which are "currency, goods and services" (p. 6) (Ordano et al, 2022). Due to the specified and practically limitless use cases of Decentraland, the users can flexibly group up for the purpose of fostering one or multiple use case. In terms of how users are grouping up are therefore left up for the responsibility of users themselves (p. 7-8) (Ordano et al, 2022).

Matchmaking – Decentraland: Decentraland's also utilizes its Ethereum-blockchain for the purpose of identifying its users. Decentraland's users deliver information of their identity according to the LAND owned by them (p. 6, 11-12) (Ordano et al, 2022). Players of Decentraland have the opportunity to create avatars in order to represent their identity whilst being able to explore the platform freely (p. 2, 8) (Ordano et al, 2022).

Communication – Decentraland: Decentraland aims to maintain a platform, where its users could benefit by developing application-based business. Decentraland also notes that this poses some challenges alongside. (p. 13-14). The proposition for value however is bound to the transactions within Decentraland, which are bound to "currency, goods and services" within the game (p. 6) (Ordano et al, 2022).

Compensation – Decentraland: The governance of the transaction of and consumption of users within Decentraland is performed with the capabilities of Decentraland DAO. In its possession are the core smart contracts that hold the protocols

for governing many important assets of the metaverse. This includes initially all real estate and LAND of Decentraland, included with significant amount of MANA as a subsidy for those to be given (Decentraland DAO, 2022). The governance architecture of Decentraland is divided to 3 different layers of technology. These layers are named as: Consensus layer, Land content layer and Real-time layer. Consensus layer is responsible of governing the ownership of LAND within Decentraland. Land content layer is responsible for governing and forming the infrastructure for the digital environment of Decentraland. Lastly, the Real-time layer is responsible for handling the server-based P2P activity of Decentraland. (p. 8-10) (Ordano et al, 2022).

4   Analysis of the results

From what has been learned from chapter 3, we surface the measurable factors from this that either positively or negatively impact the value creation of these metaverse platforms in the context of platform economy via the corresponding framework built around this in chapter 2.4 from the results of chapter 3. The focus of this chapter is to identify the main benefits of the studied metaverse platforms for the value creation in terms of each 4 VSCs of the research framework created prior to chapter 3, which were: resources, matchmaking, communication and compensation.

VSFs – Resources – Over: As the table 2 presented, with pre-defined roles for the purpose of the incentive system around Over, gives idea of the level of dependency to this structure that Over has regarding its user base for it to remain a feasible platform. This dependency is likely to increase pressure for the users to negotiate with the adapatation that the users are to be bound for maintaining the value of the core functions of the platform, such as the value of tokens, where the value of OVR seems comparable with most fiat-currencies. Over supports the findings of Bonina et al (2021) by allowing itself to maintain a business-friendly environment but mostly to the extent of the role setting.

VSFs – Matchmaking – Over: While Over's matchmaking of its user roles is enforced, the matchmaking of Over is significant especially because it is also designed to maintain the infrastructure of Over alongside its use, from which Over subsidizes users automatically based on how the roles are defined. The role system of Over is bound to bring some form of rigidity to the matchmaking in the platform as a hierarchical solution, but perhaps also a motive for the users to seek ways to reach towards being profitable within the platform. However, the matchmaking focus in Over seems to be more focused on around the activity of trading only and not as much to networking, due to the extensive focus towards the geolocational aspect of users being bound to the environment correspondingly to the real-life proximity when interacting with the owned digital land within Over's user interface. This supports the findings of Fu et al (2021) more by the Platform-to-User VSFs than User-to-Platform VSFs.

VSFs – Communication – Over: Based on the study, Over's communication can be considered open and customer-focused when it comes to social media. The provision and maintenance of the social media channels as well as the activity of the original developers ensure that the users have options to reach out for help and to stay

up to date. Over's compliance to its privacy policy can be considered as one that helps to sustain value creation in communicational aspects. This supports the findings of Mishra & Tripathi (2020) by enabling ways of communication based on Platform-to-User VSFs. The impact based on User-to-Platform VSFs was not reliably identified.

VSFs – Compensation – Over: The intended way of how the users of Over can benefit from the platform is bound to buying and selling artificially built land around the Earth, built from adjacent hexagons to OVRLands, each hexagon owner representing the LAND owner or a group of these owners in the metaverse of Over. Over's compensation structure is bound to the dependency of having its users maintain the decentralized storage system of Over, IPFS. The significance of IPFS is great in Over's blockchain architecture due to the existence of its incentive system for maintaining the Over's connenction with IPFS as a core part of the architectural foundations. The type of network effect Over utilizes is related to a same-side network effect. Users of Over are most often dealing with the platform for the sake of buying, selling and renting OVRLands in P2P transactions, according to the findings of the empirical study. This supports the findings of Rietveldt & Schilling (2020) in terms of Platform-to-User VSFs, but the capabilities of Over matching User-to-Platform VSFs is not as clear.

VSFs – Resources – Decentraland: Based on the results of the empirical research of Decentraland in terms of the 4 VSCs, beginning from resources, the financial ecosystem of Decentraland seems to prefer those who are active for the sake of establishing an area of land in its digital premises. The idea of openness for the sake of establishing virtual land seems to exist for the purpose of increasing presence within the platform, which is why it provides a lot of opportunities for the purpose of profitable activity and for MANA to be more bound to liquidity yet higher rate of changes in value. MANA can be considered a comparable currency to many fiat-currencies based on the empirical study. This supports the findings of Bonina et al (2021) by Decentraland being a reciprocally beneficial platform for business.

VSFs – Matchmaking – Decentraland: Decentraland's matchmaking can be considered fully in the discretion of its users depending on what Decentraland offers in its premises. Decentraland does not specify especially, what types of users or user groups it seeks to attract. Instead of having specified roles for its users, Decentraland mentions different kinds of use cases for the platform (p. 7) (Ordano et al, 2022). Decentraland promotes a more liberal approach to the interaction between users. Hence the matchmaking of the platform can take various forms and is not necessarily bound to

the act of business only. This can be seen as an effort to maximize the availability of the platform and therefore increasing the conspiciousness depending on customer satisfaction. This supports the findings of Fu et al (2021) actively by User-to-Platform VSFs but passively by Platform-to-User VSFs.

VSFs – Communication – Decentraland: It was interpreted from the study focusing on Decentraland that it considers one of its prior focus in value creation as communication. Decentraland's communication is open due to it promoting its presence in social media. The trustworthiness and value of Decentraland's communication can be expected to depend on how it collects data and how much it values privacy of its users and general regulations on the matter. Ordano et al (2022) in their whitepaper of Decentraland imply the necessity of a communication layer for experiences of its players. Decentraland is commonly considered as the first metaverse-platform with full decentralization, from which Decentraland has also claimed the achievement themselves (s.1) (Ordano et al, 2022). This supports the findings of Mishra & Tripathi (2020) by enabling communication. The impact on User-to-Platform VSFs was not identified from the research data.

VSFs – Compensation – Decentraland: Decentraland's compensation structure depends on the activity of its players. The players of Decentraland are able to profit from Decentraland by utilizing the platform beneficially to their business. The users of Decentraland are, practically speaking, running a business as if they would in the real world, where the users can trade with each other and enforce these with smart contracts. The cost of the LAND owned in Decentraland is another factor which will have to be managed in order for the business to be profitable. The type of network effect Decentraland utilizes for value creation is related to cross-side network effect. This is because while the same-side network effect occurs between the users of Decentraland and Decentraland itself in order to increase the availability to market, the value is often created as long as the demand of one group of users providing tradeable content are matched by another group of users, who have tokens to trade. This supports the findings of Rietveldt & Schilling (2020) to User-to-Platform VSFs and Platform-to-User VSFs by leaving the latter to the responsibility of the users.

5 Discussion

As has been done prior to this closing chapter of the research, we have identified few essential points of conclusion regarding value creation and decentralized metaverse. For Platform-to-User VSFs, the focus was on how digital platforms enable value to be created for its users. Most diverse answers to these statements were identified from what kind of users the platforms intend to attract and how the platform rewards its users from contributing to the platform. For User-to-Platform VSFs, the focus was turned around and this time regarding how the users of a digital platform enable value to be created for the platform.

For Resources, the case of Over was distinguishable especially due to its use of AR technology. This was not identified to have any significant improvement to the resourcefulness of Over compared to Decentraland, because Decentraland's currencies were identified to have been even more valuable over time, during the peak as well as during the latest information collected. In terms of the RQ, the results of the research correlates with the idea of freedom within the platform, based on the slight upper hand of the financial cryptocurrency value of Decentraland against Over. However, the limitation of area can benefit the value of OVRLand over LAND if the viewpoint of how rare a resource is for exchange. Hence the potential of value creation of Resources VSC can be considered as better for Over.

For Matchmaking, the cases were identified as more of the responsibility of User-to-Platform than Platform-to-User performance. This is because the common theme between the two cases were that both platforms have been built on the idea of scaleability and discretion of the users. The foundational effect of the platforms directly impact the User-to-Platform performance and hence in terms of the RQ, Decentraland has the upper hand in terms of the possibilities and scaleability of technology for the purpose of Matchmaking, where Over is limited by the area of Earth where Decentraland is spatially unlimited with the exception of adjacency.

For Communication, the cases were identified to have been highly similar in terms of their strategies and approaches towards communication. Social media was highly emphasized in this and hence they were represented as the main element of enabling Platform-to-User performance. While the User-to-Platform performance is dependent on the user feedback, data regarding this was out of reach for the purpose of this research. However, the scaleability of the social media for both cases can be expected to enable

diverse User-to-Platform performance. Because the User-to-Platform performance could not be reliably measured based on the vague understanding of this, the perfomance could be seen as equal between Over and Decentraland in terms of the Communication VSC.

For Compensation, the cases were identified to have bee quite different but mostly similar in terms of the dependency of the activity of the users in the platform. The impact on compensation VSFs were identified as indirect, because the compensation was occurring between the users, not user and platform or vice versa. This indirect compensation is tied to the factor of how much the platform benefits from its users in Platform-to-User VSF and how much users benefit from the platform in User-to-Platform VSF. The benefit in the latter one of these was identified to have been bound to network effect and how the amount of users benefit the platform based on this. In this sense Over utilizes the same-side network effect and Decentraland utilizes the cross-side network effect, where these two can be seen as different approaches and not necessarily as different kind of performance. The former however decides the comparison based on the network effect performance. Due to the competition of limited amount of OVRLand between users on the secondary market of Over, the same-side network effect can be seen as less functioning. Due to Decentraland's cross-side network effect being supported by the theoretically endless scaleability, we could say that Decentraland performs its network effect strategy better than Over.

Table 3. Summary of the research results

VSC	Winner	Rationale
Resources	Over	The limitation of purchaseable area that the platform consists of can potentially increase the value of OVRLand token of Over more so than the LAND token of Decentraland
Matchmaking	Decentraland	The scaleability of the area within Decentraland's virtual platform allows more opportunities for different user groups to match.
Communication	Tie	Similar approach to communication means and privacy policy means. It enables possibilities for users to reach out to the platform development equally well.
Compensation	Decentraland	The network effect was put into practice with Decentraland by the functioning cross-side effect agains the less functioning same-side effect of Over.

From the results of the research, we will make the core conclusions of these VSCs in chapter 5.1.1. These results reflect the 4 VSCs in general, being condensed into 3 different conclusive findings based on the conducted research. The research results are based on the VSFs that built the framework for the chapter 4 analysis. The chapter 4 collected the VSFs into VSC analysis which categorized the value creation performance into 4 categories. The results of that are presented in Table 3.

6 Conclusion

The results of the research indicated that the decentralization of metaverse into platforms comes potentially with the aspect of different strentghts and weaknesses. The VSCs of the research were designed to function as reference points to the comparison of performance as well as identifying the contributing factors of value creation. To get an understanding of the contributing factors leveraging the value creation performance, 3 distinct points of interest can be noted from the research which are: Ethereum as a common factor, extended reality as a distinctive factor and blockchain as a foundational factor.

Ethereum is a blockchain, that is utilized by both of the use cases and the performance of the platforms were hence equally enabled by the blockchain and standards of Ethereum. Overall, this can be traced to the dependency of blockchain, which is essential for the utilization of cryptocurrencies. Meanwhile, Over as a decentralized platform was identified to deviate distinctively from Decentraland in the form of utilizing AR as a part of the platform software architecture. Thus it could be concluded that extended reality is especially beneficial for the Resources VSC and comparable to Communication VSC.

However, the distinction by virtual reality, which is commonly associated with metaverse, was not identified to result into better value creation performance and hence could be better of without it in terms of decentralized metaverse. Considering that decentralized metaverse is highly dependable on cryptocurrencies in terms of creating value, we could say that the parties most involved with cryptocurrencies would also be most benefited from the decentralized metaverse.

Every digital platform have the ability of network effect when connected to the internet, which is why they have become to lack a distinctive value by acting only as a fosterer of interaction. Thus creating that additional value in platform economy is often considered more complex than what has been traditionally considered and thus become more context-based.

From a technical viewpoint the decentralized metaverses, regardless of how well they enable value to its users, are here to stay. The open-source technologies enabling decentralization are taking form especially in the form of a blockchain, due to their ability to decentrally store data that are bound to more to the control of the user (p. 7) (Swan, 2017). With blockchain comes the impact of cryptocurrencies alongside. Due to the open-

source technology and blockchain, the responsibility of acting within the decentralized metaverse becomes difficult to regulate and hence can be contrasted to the availability of the e.g. Tor-network. Due to the transparency of the studied platforms in this research, it is fair to assume that the platforms are so far handling the responsibility of this availability feasibly.

From Gadekallu et al (2022), the main focus of that research was to find out how important blockchain has become for the prosperity of metaverse thus far. The research identified 5 main features why and how blockchain and metaverse should carry on in co-operation. These features were all coupled with the utilization of data. They included the blockchain's ability to ensure private and secure collection of data, artificially and automatically supported data validation, secure and efficient data sharing, usability of data between related applications as well as the high integrity of data (p. 5).

The reason for the existence of decentralized financial ecosystem have also been disputed. For example, Daniel Weber (2022) considers the decentralized metaverse to lack a common agreement on the standardization and method of organizing a decentralized economy into operation (p. 8). Going back to the research of Gadekallu et al (2022), the consideration was focused on the applicability of cryptocurrencies as potentially incompatible with the installed base of other systems than the native one, as well as the assurance of legislative and decent ethical compliance (p. 2).

Campbell-Verduyn et al (2018) noted that blockchain and cryptocurrencies exist in a grey area of governance, meaning that if left unnoticed, could find itself in a situation that would weigh the governance of technology on a large scale (p. 96). Per to Schlegel et al (2018) this could also include parties that are also interested in independent decisionmaking, given that they accept the rules and regulations that are enforced within the smart contracts (p. 3478).

7 Future research

Due to the uncertain future regarding how metaverse would take shape within platform economy, studies assessing this have begun to increasingly emerge in the recent past with focus on public opinion over the nature of metaverse.

For example, Aburbeian et al (2022) conducted a survey that aimed to assess the endorsement and expectations of metaverse from a total of 302 volunteers (Abstract). The volunteers were classified based on their gender, age and level of education (p. 291). The study set out 15 questions and 12 hypotheses for the survey, that considered the usability, social acceptability, enjoyability, cost-efficiency, and intention of use (p. 292). The study found out, that enjoyability enhanced the considered usefulness of metaverse, which was then boosted by social acceptability. The cost was noted to be disadvantageous for the considered usefulness the less it was aligned with the intention of use. The best expectations demographically were noted to be held by males under 20 years old (p. 299). The demographics of the decentralized metaverse is interesting in terms of the demographics of open-source technologies and in this sense the demographical aspect of decentralized metaverse is a potential research scope for future research.

Gawer (2021) in her study of digital platforms noted, that digital platforms have enabled business completely without the need of resources, other than the platform itself (p. 2). More so, they enable the control of resources within the network that it extends to, without the platform possessor needing to own these resources. When the network is controlled, it allows the platform's possessor also to monitor the activity of the users of the platform via traces that are scattered in the network (p. 3). Decentralized metaverse platforms at their current state do not possess similar kind of control due to their decentralization, as the ownership and hence the control of the platform is scattered in the plaform's blockchain that it is connected to. When coupled with the activity of working with the platform, it could be considered closer to the work of a freelancer or an entrepreneur than an employee for the platform (p. 64). Because the platforms are considered as intermediaries and not employers, the users are often considered accordingly (p. 66). Regarding what parties the benefits of decentralized metaverse are intended for, is not specific. Practically everyone can benefit from decentralized metaverse if it is correctly and feasibly put into action. Whether some parties may benefit from decentralized metaverse more than other parties depending on the

platform's capabilities for the sake of supporting a specific business model or a token, is a potential scope for future research.

Research scope of this thesis included considerable constraints. The foundation and the results of the research is limited based on the author's viewpoint of value creation on the research framework. The amount of data collected for this research was limited and hence another analysis based on similar data could clarify the accuracy of the conclusions that have been presented in this research. The research data and the interpretations of it were presented accordingly with the description of chapter 2.3.

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