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DECISION RIGHTS DECENTRALIZATION IN DEFI

Research Paper

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Abstract

The Ethereum blockchain is hosting the next generation of financial services platforms, which require novel governance approaches to organize and engage platform participants. In this paper, we explore how the choice of decentralized finance (DeFi) platforms to distribute decision rights to their participants in the form of tokens impacts the roles of these participants before and after platform launch. Relying on insights from seven of the largest DeFi platforms and utilizing a grounded theory approach, we find that the roles of all platform participants significantly change post-launch. Users become platform owners, third-party complementors contribute more actively to the platform's success, and the initial platform owners give up ownership in exchange for a healthier platform ecosystem and ideological fulfillment. Based on our analysis, we seek to extend our understanding of governance on blockchain-based platforms by emphasizing the changing roles of platform participants over time and the distribution of power from owners to users.

Keywords: Blockchain Governance, De-Fi Platforms, Decision rights, Decentralization.

1 Introduction

Without most people noticing, a paradigm shift took place in the way consumers and institutions interacted with one another on public blockchains in 2020 (Ethereum, n.d.-a.; Mohan, 2020). Suddenly, new types of platforms, referred to as decentralized finance (DeFi) platforms, started to facilitate the lending, borrowing, and trading of cryptocurrencies between parties without a middleman (Ethereum, n.d.-a.; Mohan, 2020). Of the 270 billion US dollars that flowed through public blockchain applications in 2020, 95% were captured by the Ethereum blockchain and 87% of that volume flowed through DeFi platforms built upon it (Salter, 2021; Dappradar, 2020).

Unlike conventional digital platforms, DeFi platforms host and process their users' data on the Ethereum network, which is a public, permissionless blockchain (Ethereum, 2021a; De Filippi and Wright, 2018; Perscheid et al., 2020; Schmeiss et al., 2019). A public blockchain is a distributed database that is maintained by a peer-to-peer network and relies on a consensus mechanism to validate transactions between distributed, anonymous stakeholders (De Filippi and Wright, 2018). Public blockchains like Bitcoin and Ethereum depend on the existing internet infrastructure to allow networks of users to interact with each other. In the academic literature, the distinction between blockchain as a platform and as an infrastructure is debated and inconclusive to date (Rossi and Sørensen, 2019). This paper follows De Filippi and Wright's (2018) argumentation that blockchain is an infrastructure relying on existing TCP/IP internet technologies and lies in-between the TCP/IP layer and the application layer of the internet. These platforms build their core services on the blockchain layer and add user interfaces on the TCP/IP layer, in order to make their platforms accessible to regular users (Qasse et al., 2020).

Similar to the distributed and permissionless blockchain infrastructure that they are built upon, DeFi platforms adopt a decentralized governance. In the context of platforms, governance focuses on how power is distributed among participants in order for valuable interactions to be generated (Tiwana, 2014). Platform governance has been commonly categorized along 4 dimensions: decision rights, accessibility, incentives, and pricing (Schreieck et al., 2016; Tiwana, 2014). For the purposes of our research, we focus solely on the decision rights within blockchain-based platforms, since this dimension and its effects on platform participants has not received enough attention in previous research. Although Beck et al. (2018) and Perscheid et al. (2020) found that blockchain-based platforms often decentralize their decision rights by distributing tokens to their participants, we still lack research that investigates how the distribution of these decision rights impacts the role of platform participants before and after this distribution. Thus, we pose the following research question:

How does the decentralization of blockchain-based platforms' decision rights affect the roles of its participants?

This research question is particularly relevant from both academic and practice perspectives, as previous research has focused primarily on the impact of blockchain technology on governance and the use of new governance mechanisms such as token voting and forking (Andhov, 2020; Beck et al., 2018; De Filippi and Loveluck, 2016, Pereira et al., 2019). Equally interesting for platform owners, although far less researched, however, is understanding the changing roles of platform participants. Platform owners need to be aware of the consequences and changing power dynamics between platform participants when they distribute decision rights. The importance of nurturing a healthy community consisting of users, complementors and platform owners becomes essential for the platform's success.

To set the stage, we first provide insights into public blockchains and explain the Bitcoin network as a foundational public blockchain, and subsequently present Ethereum as an evolution of the Bitcoin blockchain (Ethereum, n.d.; Antonopoulos, 2017). We then elucidate the academic field on platform governance by presenting a set of governance dimensions and outline participants' roles in relation to governance. We then provide a review of the existing literature on governance mechanisms within blockchain-based platforms. To answer our research question, we rely on interviews with seven representatives of DeFi platforms on Ethereum and subsequently engage in a grounded theory approach to uncover the impact that the decentralized governance of blockchain-based platforms has on the participants' roles (Wiesche et al., 2017). As part of our analysis, we map the participants' roles and their changing responsibilities before and after decentralization. Finally, we relate our findings to existing literature and discuss how the participants' roles change on DeFi platforms. We also identify several avenues for future research and provide practical implications for creators of blockchain-based platforms.

2 Blockchain and Decentralized Platforms

Blockchain technology (BCT), also referred to as distributed ledger technology, first emerged as the technical infrastructure behind the cryptocurrency Bitcoin (Nakamoto, 2008). At its core, a blockchain is a database that is hosted redundantly in a peer-to-peer system and whose new entries are validated through a consensus mechanism (Lacity, 2019). The blockchain's consensus mechanism is a set of community-defined rules (i.e. a protocol) by which data shared between computers in the distributed network is confirmed to be valid (Lacity, 2019; Nakamoto, 2008). In the case of Bitcoin, participants generate and share transaction data. The data is verified by the "Proof of Work" consensus protocol, which is a cryptographic transaction verification procedure that involves the Bitcoin network participants generating hash signatures for blocks of transactions (Nakamoto, 2008). The node in the network that generates a hash below a certain target space, by choosing the right nonce to hash with the set of latest transactions, has the right to propagate its block of transactions to all other nodes. All other nodes can easily verify that this is the next block of transactions to be rightfully added to the blockchain by hashing the information themselves.

The success of Bitcoin's participant structure and community design has led to the development of several other cryptocurrency projects that are trying to improve upon Bitcoin's consensus protocol and its value proposition (Tschorsch and Scheuermann, 2016, Treiblmaier et al., 2021). One such project is Ethereum. Ethereum was conceptualized by Vitalik Buterin, a young Canadian/Russian software engineer, who had the idea of adding a Turing-complete programming language, called Solidity, to Bitcoin's consensus protocol (Tapscott and Tapscott, 2016; Ethereum, 2021a). Through the introduction of an account-based transaction processing system and the delineation of externally owned and contract accounts, Ethereum allows for new types of applications to be developed on the blockchain (Antonopoulos, 2017; Ethereum, 2021a).

This paper takes the stance that blockchains are a type of infrastructure similar to the internet and its protocols, on which platforms can be built upon (Constantinides et al., 2018; De Filippi and Wright, 2018). The emerging blockchain-based platforms on Ethereum, namely the decentralized finance (DeFi) platforms (Ethereum, n.d.-a) are an example of this. These platforms promise open access to financial services for all global users connected via the internet (Ethereum, n.d.-a). Smart contracts, which are public addresses that host executable code, enable the quasi-autonomous alteration of the global state and the storage of data on the Ethereum blockchain (Schmeiss et al., 2019; Perscheid et al., 2020). External accounts are held by users that are interacting with smart contracts (or contract accounts) and other external accounts (Antonopoulos, 2017; Ethereum, 2021a). Thus, due to the smart contracts facilitating the financial services, no centralized authority can block payments or deny access (Ethereum, n.d.-a). The decentralized nature of their code execution has given these Ethereum applications the name "dapps" (i.e. decentralized applications). Popular DeFi platforms are token exchanges, loan providers, insurance underwriters, and portfolio management applications (Ethereum, n.d.-a).

3 Blockchain-Based Platform Governance

Blockchain-based platforms rely on smart contracts to enable platform services, as well as to deliver platform governance (Schmeiss et al., 2019, Pereira et al., 2019). Platform governance comprises the set of rules that define who can access the platform and what (inter)actions participants can perform on the platform (Tiwana, 2014; Perscheid et al., 2020). Platform governance is meant to distribute the power over the platform to participants and ensure the proper enactment of it (Tiwana, 2014). Governance dimensions delineate the categories of participant interactions that the platform governance is meant to regulate, in order to prevent negative interactions and generate value for all participants (Perscheid et al., 2020). These categories include decision rights, accessibility, incentives, and pricing (Schmeiss et al., 2019). Further, governance mechanisms are the measures that a platform takes to shape a governance dimension towards its desired goals (Hein et al, 2016). The goal of a governance mechanism is not only to keep adherence to the rules that the platform owners specify but also, more importantly, to shape platform participant's behavior in a way that is beneficial to platform growth (Constantinides et al., 2018; De Filippi et al., 2020). This paper focuses on governance mechanisms impacting decision rights as a specific governance dimension since past research has shown that these mechanisms are used to decentralize platform control and alter platform participant roles in relation to decision rights distribution (Beck et al., 2018).

There are four different participant types that interact with each other on digital platforms. The platform is offered by a platform provider and a platform sponsor (owner), who often are the same entity in conventional, digital platforms (Eisenmann et al., 2009). The platform provider builds the platform's initial architecture and serves as the primary point of contact for platform participants (Eisenmann et al., 2009). The provider's motivation is to offer the platform's core architecture as an intermediary service that connects supply-side (e.g. third-party developers) and demand-side users (Tiwana, 2014). The platform sponsor does not have direct contact with users but designs the platform components and the governance rules (Eisenmann et al., 2009). The platform sponsor holds the IP rights and determines who can participate in the platform as a complementor or user. Demand-side users are looking to either

transact monetary amounts or relinquish permission to their data in return for high-quality content or entertainment (Eisenmann et al., 2009). Third-party developers are enticed by profit-seeking motives and want to build complementary services on top of the platform provider’s core architecture to service demand-side users. We use the term platform owner in the context of the core developer teams initially since they build the core platform before relinquishing parts of their ownership to the community (see Beck et al., 2018; Hein et al., 2016; Schrieck et al., 2016).

Decision rights determine the degree to which any of the participants can influence the direction of platform development and take responsibility for the outcome (Beck et al., 2018; Tiwana, 2014). In most digital platforms, the decision rights belong to the platform owner. Following the work of Perscheid et al. (2020), blockchain-based platforms can take the form of centralized, decentralized, and autonomous organizations. Plenty of literature exists that espouses the impact of using permissionless, public blockchains (e.g. Ethereum) to host a platform (De Filippi and Wright, 2018, De Filippi and Loveluck, 2016; Pereira et al., 2019; Perscheid et al., 2020). When researching blockchain-based platforms, authors tend to apply the participant roles that were originally conceived for centralized platforms (that is, the owner holds the rights). However, recently, existing research has identified a few new governance mechanisms in blockchain-based platforms such as granting decision rights through token distributions or guiding platform participants actions via smart contracts. In the blockchain context, tokens are ownership rights to a digital asset, which are tracked through the use of a contract account, which holds a ledger that matches public external account addresses to balances (Ethereum-a, n.d.). However, there is a lack of research that investigates how the roles of platform participants change after new governance mechanisms related to decision rights are introduced to the platform. Particularly, the changing role of the platform owner, who creates the platform and transfers power to the community (Kondova and Barba, 2019; Schmeiss et al., 2020; Werner and Zarnekow, 2021), has been neglected. Rather, authors tend to describe the functions of the various governance mechanisms they identify, an overview of which we provide in Table 1.

Governance Mechanism	Function	Source
Token Voting	Participatory decision making via tokens from token holders	Andhov, 2020; Beck et al., 2018; Pereira et al., 2019
Token Exchanges	Platform participants can buy platform tokens at exchanges and use them to vote on proposals issued by the platform owner	Andhov, 2020; Beck et al., 2018; Lipusch et al, 2019; Perscheid et al., 2020
Vote delegation	Token holders can delegate their votes to other users, who can collect votes and make collective decisions	Werner and Zarnekow, 2020
Proposal Voting	A platform’s participants can express their approval or disapproval concerning the proposal up for debate	Andhov, 2020; Beck et al., 2018; Perscheid et al., 2020
DAO	A set of smart contracts on Ethereum that can execute code autonomously without the involvement of a trusted third-party	Chohan, 2017; Kondova and Barba, 2019; Beck et al., 2018
Forking	If the platform owners resist the change voted on by the community, participants can fork the platform code, which involves copying the code and creating an alternative version of the platform.	De Filippi and Loveluck, 2016

Table 1. *Representative overview of decision-making blockchain governance mechanisms*

4 Method

In this paper, we perform a multiple case study and subsequently adopt a grounded theory approach to uncover the impact that the decentralized governance of blockchain-based platforms has on the roles of its participants (Wiesche et al., 2017; Yin, 2003). We choose grounded theory as a research method due to its frequent use in IS research when studying novel technological innovations and the processes that enable them (Birks and Mills, 2011; Wiesche et al., 2017). This approach to exploratory research fits the paper's focus on DeFi platforms on the Ethereum blockchain, which constitute a novel phenomenon in IS research (Ammori, 2021; Saunders et al., 2012). Grounded theory is further used to generate novel theoretical insights that are based on data collected through the systematic analysis of a social phenomenon (Strauss and Corbin, 1990; Punch, 1998). Thus, this approach is appropriate for our study, which seeks to develop a framework that describes the changing roles of platform participants when the platform embraces a decentralized governance model.

4.1 Cases Selection and Sampling

This study relies on a sample of seven DeFi platforms from the token exchange and token lending segments in the DeFi industry. We choose these two segments as they feature the greatest number of users interacting with their smart contracts in 2020 (Dappradar, 2021). Utilizing the theoretical sampling approach, we first contacted the top 20 Ethereum-based DeFi platforms compiled by Dappradar (2020) based upon the total value locked (TVL) within them. TVL describes the total market value of all cryptocurrency assets that are committed by users and temporarily locked inside the respective DeFi platforms, in order to be lent out to others or to facilitate trading (Mohan, 2020). Eight platform representatives from seven platforms responded: Uniswap, MakerDao, Compound, Aave, Kyber, 1Inch, and Balancer (Table 3). These DeFi platforms accounted for approx. 58% of the TVL in DeFi on Ethereum at the time of the theoretical sampling in April 2021 (DeFiPulse, 2021). Thus, the selected seven platforms form a significant part of the DeFi ecosystem and constitute a representative sample that can be used to draw conclusions about the entire industry (Saunders et al., 2012). All seven blockchain-based platforms chosen as part of this multiple case study are active on a global scale. Despite being able to interview only eight representatives, covering 7 out of the 20 DeFi platforms, the answers to the interview questions showed a level of repetition that indicated data saturation. Thus, we do not believe that interviewing more platform representatives will change significantly our findings.

ID	Case Company	Interviewee Position	Interview Duration
R1	MakerDao	Business Manager	1:00:36
R2	1Inch Network	Business Manager	40:53
R3	Aave	Engineering Manager	58:35
R4	Compound Finance	Business Lead	41:39
R5a	Kyber Network	CxO	1:10:24
R5b	Kyber Network	Engineering Manager	1:10:24
R6	Uniswap	Business Manager	27:47
R7	Balancer	CxO	45:31

Table 3. *Case companies & representative roles*

4.2 Data Collection

We interviewed eight high-ranking members of the management and engineering teams of the sampled DeFi platforms (Table 3). Interviewing the platform owner(s) is a commonly chosen approach within blockchain-based platform research, particularly when analyzing the platform governance design

(Schrieck et al., 2020; Deilen and Wiesche, 2021). To ensure comparability with other studies, the authors follow the same approach. All interviewees preferred to stay anonymous.

To collect our data, we engaged in semi-structured interviews with salaried employees of all seven DeFi platforms (Saunders et al., 2012). These interviews, each of which lasted between 30-70 minutes, constitute the primary source of our research. To avoid biases and stay grounded, we took turns interviewing subjects. We had no prior personal relations to the interview subjects and reached out to each subject individually through LinkedIn using the “Recruiter” premium subscription. We also utilized secondary sources such as blog posts on the platform’s public websites, developer documentation, press releases, strategy documents, and community forums to provide additional insights and corroborate the information shared by the interviewees. These resources allowed us to create rich case descriptions and gain a better understanding of the industry context in which each case platform operates (Saunders et al., 2012). The open question format of the interviews allowed for the interviewees to share their thoughts in a free-flowing manner and us to delve deeper into relevant topics as they were mentioned. The preliminary analysis of the initial interviews fed into the theoretical sampling process and into the selection of the next interview candidates (Glaser and Strauss, 1967). After the seventh interview, the similarity of interviewees’ answers indicated that theoretical saturation had been reached as we could not reveal any substantially new insights (Glaser and Strauss, 1967; Khan, 2014).

4.3 Data Analysis

We followed the “Straussian” approach to grounded theory due to its less rigid view of reality as an objective state being analyzed (Corbin and Strauss, 2008; Khan, 2014). Further, it is also the most widely used approach to grounded theory in the IS literature (Wiesche et al., 2017). None of the papers on blockchain-based governance that we reviewed used a grounded theory approach, which increased the potential of our study to reveal new theoretical knowledge. Following the “Straussian” grounded theory methodology, we organize the coding of the interview transcripts into open, axial, and selective coding (Khan, 2014; Corbin and Strauss, 2008). Open coding is the process of initially coding the interview transcripts line by line and defining initial codes, which can subsequently be combined into categories (Glaser, 1978). This is followed by axial coding, where the researchers identify one core category within their codes to focus on (Strauss and Corbin, 1990; Strauss, 1987). Finally, in selective coding, the researchers build up a theory to explain the relationships between the main code category and the remaining code categories (Glaser, 1978). Through this process, a grounded theory emerges.

The transcripts were transcribed and stored in the research software MAXQDA. The first two authors then coded each transcript independently using open coding, which reduced bias in their analysis. After the initial codes were prepared, the authors met and discussed their codes in order to arrive at an unbiased list of codes and categories. As a result of the comparison, a total of 32 codes (concepts) and 4 categories were created during the open coding stage. Although we focus on decision rights, one category was allocated to each of the governance dimensions (i.e. decision rights, accessibility, incentives, pricing) in order to separate the impact of different governance decisions on platform participants' interactions.

The next step included the use of axial coding to choose one main code category to focus theory-building upon (Strauss, 1987). We chose the participant roles as the main code category as the paper’s research question investigated the impact of decentralized governance on it. Thus, in the next step, which involved selective coding, we built a framework to outline how platform participants’ roles change before and after the decentralization of a blockchain-based platform.

5 Results

From our interviews, three groups of participants emerged that interact on DeFi platforms: users, complementors, and core developers. These groups roughly match the platform participants of centralized platforms identified by Tiwana (2014) and Eisenmann et al. (2009). Beck (2018) and

Perscheid et al. (2019) had used the platform participants in centralized platforms as well when describing participants on decentralized blockchains. We categorize the roles of the platform participants according to two stages: before platform decentralization (that is, before the distribution of tokens) and after decentralization. With the distribution of tokens with voting rights, participants can join the decision-making processes with regard to the further platform development. Often, a smart contract is implemented in parallel with the token distribution, which formalizes the new decision-making process.

5.1 Roles before token distribution

5.1.1 User

The interviews show that most DeFi platforms are initially designed and developed by a core team of developers, who are funded by external investors (R6, interview, 2021). The core developers are not only motivated by the prospect of financial gain, but are often driven by an intrinsic motivation to create a more inclusive, unbiased financial system (R1, interview, 2021). The funding for the core development team’s work stems from either a venture capital investment or an initial coin offering (R4, interview, 2021; R1, interview, 2021). Thus, the core developers are usually the majority or wholly owners of the platforms at launch. The core developers either organize themselves as a for-profit company or a non-profit foundation, depending upon the type of investment they receive (R1, interview, 2021). The core developer team designs the roles and functions on the platform, which shape its core (R5a, interview, 2021). This platform core is a set of smart contracts on Ethereum, which is often called the “protocol smart contract” (R3, interview, 2021). The role of the core developer team is to deploy the protocol smart contract and build an interface for users to interact with it in a convenient manner (R4, interview, 2021; R5a, interview, 2021). After the contracts are deployed, the platform can be considered launched, since anyone can interact with its Ethereum smart contracts without the help of the core development team (Schär, 2020; Ethereum, 2021a). To facilitate this launch, the core development team assumes full power in relation to initial platform design and governance.

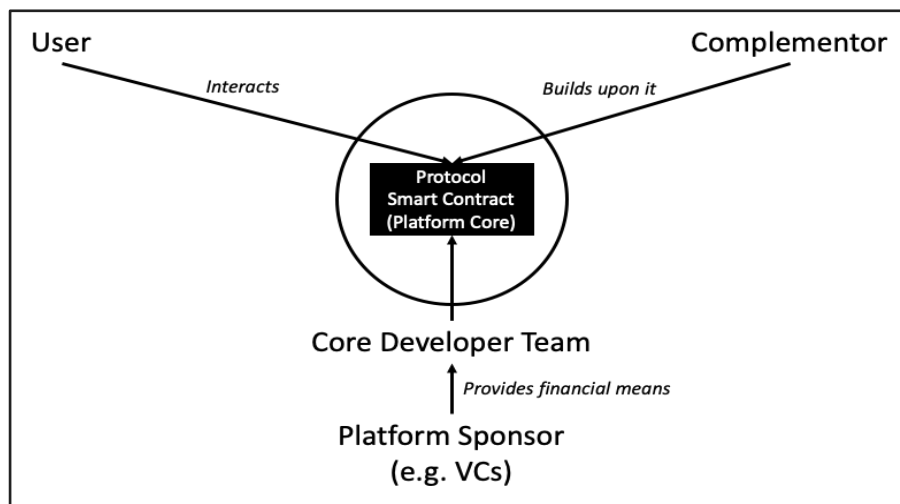


Figure 1. Roles upon platform launch and before decentralization

5.1.2 Complementor

Anybody who is knowledgeable in Solidity can build applications upon a DeFi platform. At the time of the platform's launch and prior decentralization, complementors can build applications that use the DeFi platform's main smart contracts to offer users alternative services or new types of user interfaces (R4, interview, 2021; Kyber Network, 2020a). Applications by complementors can be built either on- or off-

chain. An on-chain application could be a smart contract that adds additional, more granular execution possibilities to a decentralized exchange's swap function (e.g. limit orders) (Unilayer, n.d.). An off-chain application could be a web page that provides valuable information about the protocol contract's operations (e.g. Makerburn.com) (R1, interview, 2021). The complementors are incentivized through pecuniary and non-pecuniary means, provided by the core developer team.

5.1.3 User

At the time of platform launch, users of DeFi platforms, who consume services that facilitate lending, trading, or other financial transactions, are similar to users of any other conventional platform. In our cases, the only prerequisite for users is a working internet connection and an Ethereum wallet to interact with the services since the services are built on the public Ethereum Blockchain (R1, interview, 2021; R4, interview, 2021). Users are pseudo-anonymous when interacting with the platforms and the use of a platform's smart contract's functions cannot be restricted (R1, interview, 2021). As a result, users cannot be easily discriminated against by other participants or the core developers (R2, interview, 2021).

5.2 Roles after decentralization

5.2.1 Core Developer Team

After platform launch, the core developer team decides whether and to what degree they will decentralize their platform. The act of platform decentralization does not yield any immediate benefits. In fact, it may even slow decision making and make the platform less able to react quickly to market opportunities, since a consensus needs to be formed among the community (R4, interview, 2021). However, core developers can give up their sole decision rights in order to adhere to the ideology of the DeFi movement, which stipulates that centralized control is a weakness, waiting to be exploited and that the platform should be owned by the community (R5b, interview, 2021; R4, interview, 2021; Ammori, 2021). To transfer control, the core developer team creates a fixed quantity of Ethereum-based governance tokens, which convey one vote per token to the token holder (R6, interview, 2021). The developers then proceed to distribute these tokens amongst their community, themselves, and reserve part of the tokens for the future development of the platform (Buterin, 2021). The core developers also reap financial gain from distributing the ownership of their platform, since the governance tokens issued to the community further the creation of liquid secondary markets on third-party platforms (Uniswap, 2020). The core developers can use these markets to sell part of their own ownership stakes with far greater liquidity. Tokens are distributed to the community by means of airdrops (i.e. freely dropping them into users wallets), selling them in private sales, listing them on exchanges, financing complementors' projects, and providing them as an incentive for platform usage (Uniswap, 2020; Compound, n.d.; Balancer, n.d.; MakerDao, n.d.; Muyask, 2020; Bachmann, 2020). The tokens provide decision rights to the community by giving it a direct vote in decisions that affect the platform's future (R6, interview, 2021).

The decision to hand over the decision rights to the platform's community of users and complementors is difficult for the core developers. In order to allow for true community ownership, the developers must relinquish control of the protocol smart contract by designating the governance smart contract as the only Ethereum account that can call its administrator functions (R1, interview, 2021). Once the governance smart contract owns the protocol smart contract, the platform can be considered a decentralized autonomous organization (DAO), since the protocol smart contract continues to run autonomously and is controlled by a decentralized community of platform participants (Uniswap, 2020, December 31; Compound Finance, n.d.; Aave, n.d.; Kyber Network, 2021). The platform's core smart contracts have built-in functions that allow for the changing of core operational parameters, such as the platform's fees and liquidity ratios (R1, interview, 2021). Only the owner of the platform core's smart contract, which is the governance smart contract, can call its functions and change its governance (R3,

interview, 2021). Thus, the community can change the platform core’s governance by proposing and voting on proposals to execute code, which is called by the governance smart contract to change the protocol smart contract’s mode of operation (R2, interviews, 2021). R3 explains that Aave’s platform is “owned by the governance of Aave. And for that there is a token and with the token, you can vote on anything that will change the protocol” (R3, interview, 2021).

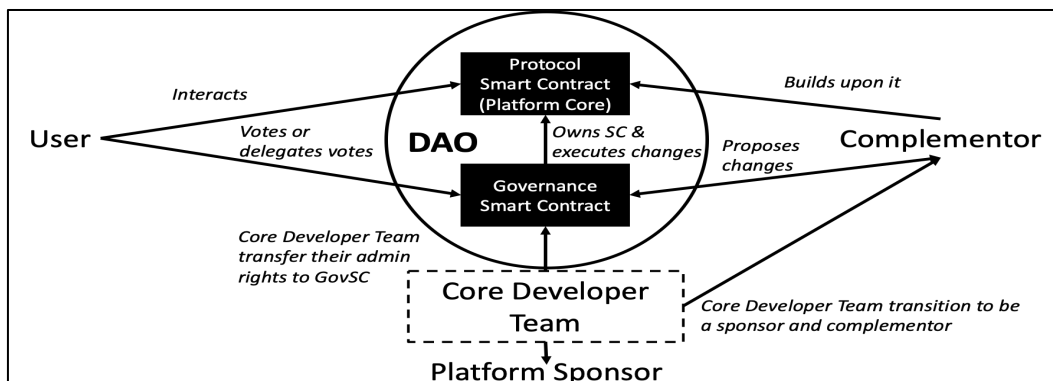


Figure 2. Roles after decentralization

However, some of the core development teams on the DeFi platforms we studied chose to retain some form of control. One reason to retain control is that community governance approaches can be imperfect. For example, Uniswap fell victim to the high hurdle rate it had initially set for proposals to pass (R6, interview, 2021). Ironically, the proposal to change the minimum number of votes required to pass a proposal was unsuccessful, missing the required hurdle rate by 100.000 votes (Haig, 2020). Even though all interviewed platforms had a token voting system in place, certain platforms did not have a decentralized autonomous organization (DAO). Uniswap, MakerDao, Compound, Aave, and Kyber all have DAOs comprised of a governance smart contract, a timelock smart contract, and a protocol smart contract (Uniswap, 2020; Compound Finance, n.d.; Aave, n.d.; Kyber Network, 2021). Stakeholders of these platforms submit proposals to the governance smart contract. These proposals are subsequently voted upon and, if passed, locked into the timelock contract before they are executed and change the protocol smart contract or pass a symbolic vote.

In contrast, 1Inch takes a different approach. 1Inch allows liquidity providers (i.e. users depositing tokens into a pool to allow others to swap tokens) to vote on the fees and other parameters of the pool through a voting mechanism on a pool-by-pool basis. Larger governance decisions are submitted via a proposal to a governance contract. 1Inch token holders then cast their vote on these symbolic proposals that determine the governance (R2 Network, 2021). Interestingly, Balancer does not yet have a DAO at all and proposes issues for the community to vote on through a third-party tool (R7, interview, 2021). The Balancer token holders voice their governance rights through a community polling solution called Snapshot (0xLucas, 2020; R7, interview, 2021). Snapshot records the current state of the blockchain and allows token holders to connect their wallet to its website and vote on community proposals without needing to broadcast Ethereum transactions to the blockchain (Snapshot, n.d.). The proposals with the most votes win and are implemented.

Once the governance smart contract is in place, the initial core developer team gives up its unilateral power over the platform’s trajectory (R3, interview, 2021). The core developers tend to take on a sponsor role at this point (R1, interview, 2021). The team then either works for the DAO as community members or stays incorporated as a separate company with the purpose to provide valuable resources for the platform (R1, interview, 2021). The representative from Kyber Network refers to their role in the initial platform before the introduction of the DAO as a “benevolent dictator” that arranges the launch and bootstraps adoption (R5a, interview, 2021). R4 describes the core developers role as “kind of being like shepherds of sort of, like transferring ownership” (R4, interview 2021). Even though the teams do not have special rights, they often still hold IP rights for parts of the platform (R1, interview, 2021). The

core developers also have a financial incentive to keep working on the platform, since the DAO also serves as a funding vehicle for salaries and community projects that add value to the platform in the participants' view (R3, interview, 2021). As the interviewee from MakerDao succinctly describes it, a DAO is a structure that can autonomously live on without its founding team (R1, interview, 2021). The DAO generates revenues by charging fees through its protocol smart contract and the community decides how the revenues should be used through the governance smart contract (R1, interview, 2021).

This massive revenue generation potential also makes the DAO an attractive target for exploitation. Therefore, a few core development teams try to keep a safety measure in place, which allows them to intervene in the doings of the governance smart contract, if a malicious proposal is being passed (R1, interview, 2021; R3, interview, 2021). R1 explains that in emergencies “*you need to be able to have the community and minority vote that can go and shut it down*” (R1, interview, 2021). MakerDao has a safety mechanism called the emergency protocol shutdown, which is triggered if a minority of token holders decides to deposit 50,000 Maker tokens into a special smart contract address (R1, interview, 2021). The contract shuts down the platform and returns the money of all depositors to its users (MakerDao, 2019). Thereafter, the platform must be restarted by redeploying all protocol smart contracts and connecting them to the web interfaces (MakerDao, 2019). This makes the shutdown a very costly mechanism and reintroduces a need for the core developers to come in and relaunch the project, due to their tacit knowledge of the platform. An alternative solution is used by Aave in emergencies, whereby a multi-signature wallet holds the rights to a guardian smart contract, which can cancel proposals by the community, if the parties controlling the multi-signature wallet deem the proposal as malicious (R3, interview, 2021). However, this governance mechanism does present an obstacle to true community decision rights ownership, since a minority of participants, who hold the keys to the multi-signature wallet, can cancel proposals.

5.2.2 Complementor

After decentralization of decision rights, complementors can choose between contributing applications to the platform's protocol smart contract or to the improvement of its governance process (R4, interview, 2021; Kyber Network, 2020a). By building applications that enhance the user experience of the voting process, complementors can increase the voter turnout in platform decisions (R4, interview, 2021). For instance, complementors can build custom interfaces for the DeFi platform governance, which display the current active proposals and the distribution of votes that have been cast by the community. Kyber and Compound reported that complementors built web applications that enabled their users to easily delegate governance votes to trusted platform participants (R4, interview, 2021; R5b, interview, 2021). The interfaces connect to the platform user's wallet (e.g. Metamask) and allow them to sign a transaction to the token contract of the DeFi protocol, which calls a function to delegate their wallet's token rights to a chosen third party (Bavosa, 2020a).

5.2.3 User

In all of the studied DeFi platforms, the role of the users changes dramatically after the introduction of governance tokens as they now can acquire governance tokens by actively participating in community activities, consuming platform services, or buying the tokens on an exchange. The governance tokens act as a pecuniary incentive for new users to start consuming financial services on the DeFi platform, since the governance tokens have speculative value and can be sold on marketplaces for other currencies (R3, interview, 2021). Thus, users can participate in the financial success of the platform. On the other hand, users that decide to keep their governance tokens and can use them to vote on proposals put forth by core developers or other platform participants (R3, interview, 2021). The users that keep their governance tokens wield a responsibility to take part in the platform's decision-making process and hold the core developers accountable. Certain governance mechanisms can be used in the case of the core developers disregarding a governance vote. Since the entire code of the DAO and platform core is open source and publicly hosted online, the community can fork the code in case of the core developers misbehaving (R3, interview, 2021). This is, however, a last resort, since it will inevitably lead to a hostile

split in the community and a depreciation of the governance token's monetary value on exchanges (R1, interview, 2021).

6 Discussion

Based on our analysis of seven prominent DeFi platforms, we outline the changing nature of the roles of blockchain-based platform participants before and after platform decentralization. In particular, we argue that upon their launch, most DeFi platforms tend to be centralized with core developer teams acting as platform owners in order to facilitate the actual platform launch. Following their intrinsic motivation, later core development teams relinquish their control, which has implications for the roles of platform participants as the DeFi platform evolves from centralized, to decentralized, and partially autonomous governance (Perscheid et al., 2020). With the distribution of governance tokens by the core developer team, users can participate in the decision-making process, which is in line with De Filippi and Wright's (2015) explanation of users' role in a decentralized platform. Accordingly, the users can be understood as *consumer-owners* of the investigated DeFi platforms (Table 2). Compared to previous research this paper takes the understanding of this participatory process a step further with its description of the DAO construct, its two main smart contracts, and the respective platform participant interactions.

Role	Before Decentralization	After Decentralization
User	Consumes platform services (consumer)	Owns part of the platform with its governance tokens; can vote or delegate its votes (consumer-owner)
Complementor	Builds upon the platform (producer)	Proposes changes in form of governance proposals (producer-governance influencer)
Platform Owner (Core Developer Team)	Owns IPR and builds the platform (provider and sponsor)	Gives admin rights to the governance smart contract; owns parts of the platform beyond governance tokens (e.g. IPR) (sponsor)

Table 4. Change of roles in the course of DeFi platform decentralization

The role of complementors as revealed in our interviews partially coincided with those outlined in existing literature. In the conventional (that is, non-blockchain related) platform research, complementors build modular applications based on the existing functions provided by the platform core (Tiwana, 2014). In the investigated blockchain-based platforms, we observe that the complementor's role changes from a simple *producer* to that of a *producer-governance influencer* (Table 2). Complementors are given a choice between building complementary products upon either of the two sides of the platform: the publicly accessible functions of the platform's protocol smart contract or governance smart contract. Thus, complementors play a greater role in platform governance than in conventional platform models, since they can directly aid in the facilitation of decision making and can create platform derivatives that spur further adoption. This makes it very important for the core developer team to attract talented complementors to their platforms.

The core developer teams across the seven DeFi platforms we studied act as the platform owners at launch. Acting as a platform owners, they decided upon the initial platform architecture and the first set of rules, as well as hold all IPR before platform launch. Thus, their role coincides with the owner's role as outlined in platforms with centralized governance (cf. Perscheid et al., 2020). After the launch of the governance smart contract, the core developer team changes their role to *sponsors* (Table 2) as they still hold IPR and continue to actively shape the design and rules of the platform on an equal footing with the other participants (R1, interview, 2021). However, contrary to the definition of the platform sponsor (Eisenmann et al., 2009), the core developer teams have direct contact with other users as active members of the community. Similar to research performed by Thapa et al. (2021) on the decision rights

of core developers in the Bitcoin project, the platform sponsors in DeFi platforms may become political influencers after the DAO launch. In this role, the sponsor communicates new ideas in a politically neutral manner, advances participative approaches to decision making, and undertakes community shepherding. This active involvement by the founders leads to the re-centralization of platform decision rights (Thapa et al., 2021). Despite this, they do not have the power anymore to determine who can use the platform or participate in the governance process (R1, interview, 2021).

As decision power can be distributed across all participants, it is fair to conclude that all roles described are partly platform owners. Through their voting, platform participants influence the rules, architecture and future strategic directions of the DeFi platform, thus becoming more invested in platform success. This finding corresponds with existing research's distribution of decision rights in decentralized platforms (Lipusch et al., 2019; Perscheid et al., 2020). However, the individual degree of decentralization of each DeFi platform can vary greatly with the distribution of governance tokens, the use of the governance smart contract, and the involvement of the core developers after the DAO launch, as we outlined in our findings (see above). In summary, the decentralization of blockchain-based platforms leads to shared ownership, value co-creation, and decision rights for users, complementors and core developer teams that has not been described in this depth before in existing literature. Unlike conventional digital platforms, interactions between the three different participants on the blockchain-based platform occur at two levels: 1) while managing the platform, and 2) while producing and consuming platform resources, which is a novel finding as prior literature does not offer such distinction.

7 Conclusion

In this paper, we seek to outline how the participants' roles on a blockchain-based platform change before and after its decentralization. To this end, we study seven prominent DeFi platforms to outline how the roles of their core development team, complementors, and users change after the decentralization of decision rights (Figure 2 and Table 1).

While existing research merely outlines different participant roles in blockchain-based platforms (often relying on centralized platform governance models), we extend existing research by demonstrating how the roles of the platform participants change after the launch of the governance smart contract. In particular, we outline how users, complementors, and core developers can be seen as collective platform owners that participate on the protocol and governance sides of the blockchain platform to guarantee its success. Consumers become consumer-owners, producers become producer-governance influencers, and owners give up part of their ownership to become sponsors in blockchain-based platforms. This community of participants should receive further attention by academics, due to the implications that community ownership has on the principal-agent problems occurring in many conventional platforms.

Our findings also provide valuable guidance for practitioners. Before decentralizing the decision rights of their platform and changing the roles of platform participants, core developers must evaluate whether they have built a community that can tackle the challenges that stem from distributed platform governance. In order to reflect the differing responsibilities of participants in blockchain platforms from those in conventional platforms, practitioners should consider adopting the roles we outlined in this paper (Table 2). Providing educational materials to both complementors and users, in an effort to explain the changing platform governance (becoming a DAO), is essential in order to prepare the platform participants for their new roles and tasks. Moreover, the core team must guarantee the longevity of their platform by coming up with incentive mechanisms that bind participants to their community.

Finally, our study is not without limitations. While we argue that the case studies we select are representative, we urge other scholars to investigate other less popular DeFi platforms in order to corroborate or extend our findings. Additionally, we only interviewed core developers and can therefore only provide limited insights regarding users and complementors. Further, we decided to focus on investigating solely decision rights as one of the platform governance dimensions, which, although important, provides limited understanding of the complex governance regime on decentralized

blockchain-based platforms. Thus, future research can address how the decentralization of decision rights affects the platform's future evolution and interplay with the other governance dimensions.

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