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Decentralized Finance: A Configurational Perspective on UTAUT

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Research Paper

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Abstract

Blockchain-based decentralized finance (DeFi) enables financial transactions without intermediaries. Among its most diffused applications is DeFi borrowing, which allows users to borrow money from other users. DeFi borrowing relies on sufficient users requesting money, making it essential for blockchain technology platform providers to understand why users intend to use DeFi borrowing. To explain this, we turn to the unified theory of acceptance and use of technology (UTAUT). Given that existing studies differ in how the beliefs of UTAUT influence use intention, we explain previous findings by suggesting that multiple beliefs together, so-called configurations, lead to high and low use intention. Following a configurational approach on potential users of DeFi borrowing, we reveal three configurations resulting in high use intention and two configurations resulting in low use intention. We contribute by explaining DeFi borrowing use intention and resolving previous differing findings on UTAUT by taking a configurational perspective.

Keywords: Decentralized Finance, Blockchain, UTAUT, fuzzy set qualitative comparative analysis (fsQCA).

1 Introduction

Blockchain-based decentralized finance (DeFi) has rapidly proliferated in recent years, increasing twenty-fold from US$4 billion in cryptocurrencies in 2018 to US$93 billion in 2021 (Zhang, 2021). DeFi is an umbrella term for applications that enable decentralized financial transactions between users without the need for intermediaries such as banks (Zetzsche et al., 2020). The most diffused DeFi application with a volume of US$48 billion is DeFi borrowing (Chalmers, 2021), which allows users to borrow money from other users (Jagati, 2021). To use DeFi borrowing, users need to possess cryptocurrencies that they can deposit as collateral, which are automatically liquidated for compensation if they do not repay their debts (Tabora, 2021). DeFi borrowing applications require sufficient users to borrow money, which makes it appealing to others to lend their money and allows optimal matchmaking between borrowers and lenders. A nuanced understanding of why users intend to use DeFi borrowing helps blockchain technology platform providers to attract new users and so establish their DeFi borrowing applications for the long term.

A small body of initial research on DeFi finds that different beliefs influence the intention to use DeFi (Lockl and Stoetzer, 2021). One of those beliefs is relative benefit, which reflects how users evaluate DeFi applications compared to traditional banks. Notably, this provides the important insight that users use DeFi applications if they assess them as superior to traditional financial services from banks. However, relative benefit is rather superficial, so that it offers scant insights for blockchain technology platform providers on how to attract new users. We, therefore, suggest studying how more detailed beliefs shape the intention to use DeFi borrowing.

With DeFi borrowing involving monetary expenses in terms of interests and fees, we turn to the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003) to understand technology use in this context. The latest extension of UTAUT integrates, among others, price value and cost (Blut et al., 2022), allowing us to capture users' evaluation of the monetary expenses of DeFi borrowing. While UTAUT is valuable in explaining technology use across several contexts, e.g., cloud services (Hsu and Tsai, 2017) and document management systems (Ayaz and Yanartaş, 2020), studies reveal differences in which beliefs guide users' intentions. For instance, some studies show that social influence (Dasgupta and Gupta, 2019) and facilitating conditions (Alamin et al., 2015) increase the use intention, while others find they do not influence the use intention (Jang and Byon, 2020; Karimzadeh et al., 2017).

We aim to explain those differences by arguing that equifinal possibilities exist that foster use intention. For instance, a high social influence together with the perception of high performance expectancy might lead to high use intention, despite low facilitating conditions. Contrary, a low social influence might still bring users to high use intention when they simultaneously perceive high performance expectancy and high facilitating conditions. While we acknowledge that there are more theoretical lenses to explain technology use (Ahuja and Thatcher, 2005; Davis, 1989; Rogers, 1995), we deem UTAUT especially useful to study previous differing findings, as recent research theoretically discusses the possibility of interplaying beliefs (Blut et al., 2022), pointing to multiple beliefs together influencing use intention in the form of configurations. Following this argumentation, we suggest that configurations of beliefs influence the intention to use DeFi borrowing. We ask the following research question:

What configurations of beliefs influence high and low intention to use DeFi borrowing?

To study how configurations of the ten beliefs of UTAUT influence the intention to use DeFi borrowing, we applied a fuzzy set qualitative comparative analysis (fsQCA) on data of 142 potential users following an inductive approach (Park et al., 2020; Mattke et al., 2021b). fsQCA established as the dominant method among configurational approaches in IS research (Maier et al., 2021), allowing us to analyze how configurations of conditions (e.g., ten beliefs of UTAUT) influence an outcome (e.g., high and low intention to use DeFi borrowing). Our results show that high price value is a necessary condition for a high intention to use DeFi borrowing. We identified three sufficient configurations resulting in high use intention and two sufficient configurations resulting in low use intention. We contribute to research on DeFi by explaining why users intend to use DeFi borrowing and advance existing research by revealing which beliefs are relevant in the context of DeFi. We advance research on UTAUT by explaining previous differing findings with a causal complex relationship between beliefs and use intention.

Next, we discuss related research on DeFi and present UTAUT as the theoretical lens of this study. We then outline our methodological approach embracing a fsQCA. After presenting our results, we discuss the theoretical and practical implications and conclude by outlining the limitations and future research.

2 Theoretical Background

We next provide an overview of research on DeFi, present UTAUT as the theoretical lens of this study, and review its latest research.

2.1 Decentralized Finance (DeFi)

DeFi describes a concept for financial services between users without the need for central intermediaries (Zetzsche et al., 2020). While conventional financial transactions rely on trusted intermediaries, such as banks, DeFi applications operate on decentralized blockchains (Lockl and Stoetzer, 2021), meaning that a distributed consensus mechanism secures the transactions (Kowalski et al., 2021).

One of the most diffused DeFi applications, also known as *DeFi borrowing*, allows users to borrow money in the form of cryptocurrencies from other users (Bartoletti et al., 2021b). Users need to own cryptocurrencies (e.g., Ether) to use DeFi borrowing, which they deposit as collateral. Such loans are typically overcollateralized, which means that the collateral's monetary value surpasses the loan value (Jagati, 2021). In return, users can borrow money in the form of other cryptocurrencies, which typically possess a lower degree of volatility and can be liquidated to fiat currencies (e.g., US Dollar) (Brennecke

et al., 2022; Sandner, 2021). Suppose the collateral value reaches a threshold beyond which it would no longer be sufficient to secure the loan, e.g., because of accumulated interest rates for the loan or volatility of the collateral. In that case, liquidation is automatically initiated to repay the debt (Nikola, 2020). Compared to traditional bank loans, DeFi borrowing often provides lower interest rates (Locke, 2021).

Previous IS research studies different ways of using technology for borrowing money, e.g., online peer-to-peer lending (De Liu et al., 2015) or lending-based crowdfunding (Jiang et al., 2020). In contrast, DeFi borrowing depicts an IS governed technology. The transactions between users are conducted and validated by a blockchain application without an intermediary (Mattke et al., 2021a), distinguishing DeFi borrowing from previously studied technologies used for borrowing money.

Research on DeFi outlines the benefits and challenges of DeFi (Chen and Bellavitis, 2020) and provides recommendations for design characteristics of DeFi lending pools (Bartoletti et al., 2021a). Initial work shows that social influence and relative benefits of DeFi compared to traditional banks increase the intention to use DeFi and outlines that users are not influenced by distrust in banks (Lockl and Stoetzer, 2021). While this evidence is helpful to understand that individuals consider using DeFi applications instead of financial services from banks when they evaluate it as beneficial, it offers limited insights for blockchain technology platform providers of DeFi applications into how to attract new users. We take the opportunity to zoom in on relative benefits by studying how more detailed beliefs shape the intention to use DeFi borrowing. To understand technology use, we turn to the revised UTAUT (Blut et al., 2022).

2.2 Unified Theory of Acceptance and Use of Technology

UTAUT describes an unified approach to explain technology use (Venkatesh et al., 2003). The original UTAUT uses the beliefs *performance expectancy*, *effort expectancy*, *social influence*, and *facilitating conditions* to explain technology use in organizational contexts (Venkatesh et al., 2003). In an extension of this model, the beliefs *hedonic motivation*, *price value*, and *habit* were supplemented to explain technology use in the private (Venkatesh et al., 2012). A recent meta-analysis of UTAUT studies finds that adding *compatibility*, *personal innovativeness in information technology (PIIT)*, and *cost* helps explain technology use more comprehensively (Blut et al., 2022).

Context	Significant influence	No influence	Outcome	Reference
Accounting IS	Effort expectancy, facilitating conditions	Performance expectancy	Use intention	Alamin et al. (2015)
Cloud services	Performance expectancy, effort expectancy, social influence	/	Use intention	Hsu and Tsai (2017)
Contact tracing apps	Performance expectancy, effort expectancy, social influence	/	Use intention	Fortagne et al. (2021)
	Performance expectancy, effort expectancy, social influence	/	Use intention	Reith et al. (2021)
Document management systems	Performance expectancy, social influence	Effort expectancy	Use intention	Ayaz and Yanartaş (2020)
Esports	Effort expectancy, hedonic motivation, price value, habit	Social influence	Gameplay intention	Jang and Byon (2020)
Interactive whiteboards	Social influence, hedonic motivation, price value, habit	Performance expectancy, effort expectancy, facilitating conditions	Use intention	Karimzadeh et al. (2017)
Internet	Performance expectancy, social influence	Effort expectancy, facilitating conditions	Use intention	Dasgupta and Gupta (2019)
Web-based classroom IS	Performance expectancy, effort expectancy, social influence	Facilitating conditions	Continuous use intention	Barnett et al. (2015)

Table 1. Representative studies using UTAUT.

UTAUT is used in numerous studies investigating technology use in different contexts, e.g., contact tracing apps (Reith et al., 2021), document management systems (Ayaz and Yanartaş, 2020), or internet

(Dasgupta and Gupta, 2019) (see Table 1). While some of the studies agree on the influence of the model's beliefs on technology use, others find that certain beliefs such as social influence and facilitating conditions do not influence the use of technology (see Table 1). We suggest that these differences among previous findings stem from the fact that equifinal ways lead to technology use. For instance, the technology use of some users might be driven by high social influence, high performance expectation, and low facilitating conditions. On the contrary, others might use a specific technology because of low social influence, high performance expectation, and high facilitating conditions. We suggest the findings of previous studies differ because they did not capture the causal complex relationship between beliefs and use intention. We use this as an opportunity to contextualize UTAUT to the context of DeFi borrowing and use a configurational approach. We provide definitions of the beliefs adapted to the context of DeFi borrowing in Table 2.

Belief	Definition adapted to the context of using DeFi borrowing	Illustrative example
Performance expectancy (adapted from Venkatesh et al. (2003))	The degree to which users perceive using DeFi borrowing as useful for borrowing money.	Jesse believes that using DeFi borrowing is useful for borrowing money.
Effort expectancy (adapted from Venkatesh et al. (2003))	The degree to which users perceive DeFi borrowing as easy to use.	Jesse believes that DeFi borrowing is intuitive to use.
Social influence (adapted from Venkatesh et al. (2003))	The degree to which users perceive that essential others believe that they should use DeFi borrowing.	Jesse's friends shared their experiences with DeFi borrowing and suggested using it when in need of a loan.
Facilitating conditions (adapted from Venkatesh et al. (2003))	The degree to which users believe that the resources and support to use DeFi borrowing are available.	Jesse is knowledgeable about DeFi applications and knows that it is possible to contact technical support if questions arise about DeFi borrowing.
Hedonic motivation (adapted from Venkatesh et al. (2012))	The degree to which users believe that using DeFi borrowing is fun or pleasurable.	Jesse believes that it is fun to use DeFi borrowing.
Price value (adapted from Dodds et al. (1991))	The cognitive tradeoff between the perceived benefits of using DeFi borrowing and the monetary cost for using it.	Jesse believes the advantages of DeFi borrowing are worth paying the accruing interest and fees.
Habit (adapted from Venkatesh et al. (2012))	The degree to which users tend to use cryptocurrencies for DeFi applications automatically because of learning.	Jesse is familiar with using various DeFi applications with cryptocurrencies but has no experience with DeFi borrowing.
Compatibility (adapted from Moore and Benbasat (1991))	The degree to which using DeFi borrowing is perceived as consistent with users' way of handling finances.	Jesse believes that using DeFi borrowing fits well with how she handles her financial practices.
Personal innovativeness in IT (adapted from Agarwal and Karahanna (2000))	Represents the individual characteristic reflecting the willingness to try out new technology.	Jesse likes to experiment with new technologies such as DeFi borrowing.
Cost (adapted from Brown and Venkatesh (2005))	The degree to which users perceive that using DeFi borrowing is expensive (e.g., interest rates, fees).	Jesse believes that the accruing interest and fees of DeFi borrowing are expensive.

Table 2. Beliefs of UTAUT adapted to the context of DeFi.

3 Methodology

We next describe the data collection and measurement items, the measurement model, and the data analysis using fsQCA.

3.1 Data Collection and Measurement Items

We conducted an online survey of potential users on Amazon Mechanical Turk (MTurk), who are familiar with DeFi borrowing but have not yet used it. MTurk is well-established for collecting data in IS research (Baum et al., 2019). It enables the identification of suitable survey participants aligned with a specific sampling strategy, e.g., potential users of DeFi borrowing. We ensured our data quality by following methodological guidelines for using MTurk (Lowry et al., 2016). We filtered for participants that resided in the United States and used the built-in features of MTurk to exclude workers who often finish tasks very fast based on their approval rate and their overall number of approved tasks. We also included attention checks such as "Please choose 'Somewhat agree'" to ensure the accuracy of the responses. We ensured to survey users who are familiar with DeFi borrowing by integrating screening questions such as "I have never had any cryptocurrencies", "DeFi borrowing is managed by a bank that decides whether an applicant gets a loan", and "In what year have you acquired your first cryptocurrency". We only included participants in our sample if they answered the first question with "No", the second question with "No", and the third question with a year between 2009 and 2021. We paid each participant US$1.25, which is above the US minimum wage.

In total, 153 participants passed the screening questions and attention checks. We removed eight participants that completed the survey below two minutes, which is an unrealistic short timeframe. We also removed three more participants who skipped more than two questions so that our final sample consisted of 142 participants. The sample size requirements for fsQCA suggest that the ratio of observations to conditions needs to be lower than 0.20 (Marx, 2010). Since we analyze ten beliefs with 142 observations, the ratio is 0.07, which shows that our sample size is sufficient. We report the demographics of the sample in Table 3.

Age (in percent)		**Biological sex** (in percent)		**Year of first cryptocurrency acquisition** (in percent)	
<30	35.92	Male	64.79	2009-2014	8.45
30-39	37.32	Female	34.51	2015-2016	17.61
40-49	19.72	Other	0.70	2017-2018	19.01
50-59	4.93			2019-2020	42.96
>59	2.11			2021	11.97

Table 3. Demographics of 142 survey participants.

We report the measures in Table 6 (see Appendix). We adapted all used measures from previous research and measured them with a seven-point Likert scale from one ("Strongly disagree") to seven ("Strongly agree"). We referenced DeFi borrowing in the measures wherever possible to adapt them to our context. We measured *performance expectancy* with three items, *effort expectancy* with four items, *social influence* with three items, *facilitating conditions* with four items, *hedonic motivation* with three items, and *price value* with three items (Venkatesh et al., 2012). For *habit*, we adapted three items (Limayem et al., 2007), for *compatibility*, we used four items (Moore and Benbasat, 1991), for *PIIT*, we used four items (Agarwal and Karahanna, 2000), and for *cost*, we adapted three items (Brown and Venkatesh, 2005). We measured *use intention* with three items (Martins et al., 2014).

We applied Harman's single factor test that shows the proportion of data explained by one factor to test for common methods bias (CMB) (Podsakoff and Organ, 1986). Harman's single factor test indicated that 46.65 percent of the variance is explained by a single factor, which is below the recommended threshold of 50 percent. We then examined the correlation matrix and found that all correlations were below the threshold of 0.90 (Pavlou et al., 2007). The marker variable test ("I prefer tea over coffee") shows that the highest bivariate correlation is 0.16, so that the test also shows that CMB is not an issue in this study (Lindell and Whitney, 2001).

3.2 Measurement Model

We tested the used measures for indicator reliability, construct reliability, and discriminant validity (Mattke et al., Forthcoming). In line with recommendations (Carmines and Zeller, 2008), we dropped one item of PIIT because the loading was lower than 0.707. The loadings of the remaining items exceed 0.707, so that *indicator reliability* is given (Carmines and Zeller, 2008) (see Table 6 in the Appendix). The composite reliability (CR) of all measures exceeds 0.70, and the average variance extracted (AVE) exceeds 0.50, so that we confirm *construct reliability* (see Table 4). The square root of the AVE of all measures is greater than the corresponding construct correlations so that we confirm *discriminant validity* (Fornell and Larcker, 1981). We also used the heterotrait-monotrait (HTMT) ratio test (Henseler et al., 2014). We used the $HTMT_{0.85}$ threshold and found that the highest value was 0.84 between hedonic motivation and compatibility, which shows again that discriminant validity is not an issue. We, therefore, state that our measurement model is valid and reliable so that we can proceed with the fsQCA.

		M	SD	CA	CR	AVE	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1)	Performance expectancy	4.29	1.52	0.89	0.93	0.83	0.91										
(2)	Effort expectancy	4.69	1.29	0.92	0.94	0.80	0.61	0.90									
(3)	Social influence	3.93	1.66	0.96	0.97	0.93	0.67	0.60	0.96								
(4)	Facilitating conditions	4.62	1.28	0.84	0.89	0.68	0.57	0.64	0.55	0.82							
(5)	Hedonic motivation	4.29	1.46	0.94	0.96	0.89	0.75	0.59	0.74	0.61	0.94						
(6)	Price value	4.78	1.23	0.91	0.94	0.84	0.70	0.65	0.57	0.61	0.69	0.92					
(7)	Habit	4.57	1.44	0.90	0.94	0.83	0.44	0.46	0.49	0.43	0.45	0.44	0.91				
(8)	Compatibility	4.43	1.50	0.95	0.96	0.87	0.70	0.66	0.74	0.70	0.80	0.72	0.62	0.93			
(9)	PIIT	5.19	1.08	0.75	0.85	0.65	0.37	0.53	0.34	0.55	0.49	0.42	0.55	0.50	0.81		
(10)	Cost	4.15	1.30	0.93	0.94	0.85	0.04	-0.00	0.11	-0.05	0.05	-0.08	0.09	0.00	-0.12	0.92	
(11)	Use intention	4.11	1.76	0.95	0.97	0.91	0.73	0.52	0.66	0.52	0.61	0.54	0.31	0.60	0.34	-0.11	0.95

Note: M = mean, SD = standard deviation, CA = Cronbach's Alpha, CR = composite reliability, AVE = Average variance extracted, square root of AVE is listed on the diagonal of bivariate correlations.

Table 4. Descriptive statistics and discriminant validity.

3.3 Data Analysis Using fsQCA

We used fsQCA to analyze necessary conditions, which describe conditions that always need to be high or low for users to show high or low use intention. For example, if high effort expectancy is a necessary condition for high use intention, all users with high use intention show high effort expectancy. Despite that, a necessary condition is not sufficient to always lead to an outcome. We also analyzed for sufficient configurations for high and low use intention, which describe conditions that need to be high or low for users to show high or low use intention.

fsQCA works with fuzzy set memberships, which means that the conditions and outcomes are expressed in values that range from zero to one. A fuzzy set membership of zero indicates that a user does not perceive a condition, while a fuzzy set membership of one indicates that a user perceives a condition. For instance, a membership of zero for effort expectancy shows that a user does not perceive that DeFi borrowing is easy to use, a membership of 0.30 shows that a user rather does not perceive that it is easy to use, a membership of 0.70 shows that a user perceives it as rather easy to use, and a membership of

one shows that a user perceives it as very easy to use. In the following, we describe the three steps of fsQCA in terms of calibration, analysis for necessary conditions, and analysis for sufficient configurations.

Calibration. We first computed the mean of each construct and used the direct calibration function to calculate the mean values to fuzzy set memberships (Ragin and Davey, 2016), which is in line with previous IS research (Mattke et al., Forthcoming). As calibration anchors, we used the value two of the seven-point Likert scale for full-non-membership, the mean value four for the cross-over point, and the value six for full membership. We applied this calibration to the ten beliefs and the intention to use DeFi borrowing.

Analysis for necessary conditions. We used fsQCA to perform the analysis for necessary conditions. For a condition to be defined as necessary, it needs to exceed the consistency threshold of 0.90, the coverage threshold of 0.60, and the relevance of necessity (RoN) threshold of 0.60 (Thomann et al., 2018). Consistency describes the degree to which users with the same condition share the same outcome. The coverage describes the degree of the sample covered by a condition. The RoN shows how relevant a condition is as a necessary condition. A low RoN shows that a condition is rather trivial, while a high RoN shows that a condition is highly relevant. Considering the thresholds for coverage and RoN, we avoid trivial necessary conditions (type 1 error) (Ragin, 2006).

Analysis for sufficient configurations. We also used fsQCA to analyze sufficient configurations. As we analyzed both high and low use intention, we performed the following steps for each outcome. We first created a truth table consisting of 2^{10} logical possible configurations, as we analyzed ten beliefs. To reduce the truth table, we applied a frequency threshold of three, which helps us avoid distortion of the results due to very rare configurations and is frequently used in IS research (Meier et al., Forthcoming; Pflügner et al., 2020). We also applied a consistency threshold of 0.85 (Ragin, 2008), which sets a minimum degree of how consistent the configurations lead to an investigated outcome. We then applied a proportional reduction of inconsistency threshold of 0.75 (Mattke et al., Forthcoming) to avoid configurations that lead to a high and low outcome at the same time. We simplified the remaining truth table with the Quine McCluskey algorithm, leading to sufficient configurations that explain the outcome. Using this simplification algorithm, "Don't care situations" can emerge, which means that a condition can be high or low in a specific sufficient configuration and is not relevant for the outcome in this scenario.

4 Results

We next present the results of the analyses for necessary conditions and sufficient configurations and validate the robustness of our solution.

4.1 Necessary Conditions and Sufficient Configurations

We identified *high price value* as a necessary condition for high intention to use DeFi borrowing (consistency = 0.92, coverage = 0.73, RoN = 0.62) and indicate this by using a black star in Figure 1. We identified no necessary condition for low intention to use DeFi borrowing. We revealed three sufficient configurations for high use intention (*CH1, CH2, CH3*) and two sufficient configurations for low use intention (*CL1*, *CL2)* (see Figure 1).

High Intention to Use DeFi borrowing. The first sufficient configuration (*CH1*) explaining high intention to use DeFi borrowing depicts users who perceive all beliefs to a high degree, except hedonic motivation, which is not relevant to their high intention to use DeFi borrowing. The second sufficient configuration (*CH2*) describes users who perceive all beliefs to a high degree except facilitating conditions, which is not relevant because they can be high or low. With the third sufficient configuration (*CH3*), we explain users who perceive all beliefs to a high degree except social influence, which is not relevant in this configuration, and cost, which they perceive to a low degree.

Low Intention to Use DeFi borrowing. The first sufficient configuration (*CL1*) describes users who perceive all beliefs to a low degree, except habit and PIIT that are perceived to a high degree and cost

that is not relevant in this configuration. This sufficient configuration explains why certain users have only a low intention to use DeFi borrowing. The second sufficient configuration (*CL2*) explains users who perceive all beliefs to a low degree, except cost, which is not relevant for low intention to use DeFi borrowing in this configuration.

We assessed the overall quality of our solutions based on their consistency and coverage (Ragin, 2006). The solution consistency of high use intention is 0.89, and the solution coverage is 0.66. For low use intention, the consistency is 0.95, and coverage is 0.36. These metrics show that both solutions have high explanatory power. The consistency scores of the five sufficient configurations exceed the minimum required 0.75. The raw coverage of the configurations ranges from 0.26 to 0.48, which shows that they are empirically relevant. As the unique coverages range from 0.01 to 0.18, we see that all identified sufficient configurations contribute uniquely to either high or low use intention.

	High intention to use DeFi borrowing			**Low intention to use DeFi borrowing**	
	CH1	CH2	CH3	CL1	CL2
Performance expectancy	●	●	●	⊗	⊗
Effort expectancy	●	●	●	⊗	⊗
Social influence	●	●		⊗	⊗
Facilitating conditions	●		●	⊗	⊗
Hedonic motivation		●	●	⊗	⊗
Price value	★	★	★	⊗	⊗
Habit	●	●	●	●	⊗
Compatibility	●	●	●	⊗	⊗
Personal innovativeness in IT	●	●	●	●	⊗
Cost	●	●	⊗		
Raw coverage	0.48	0.47	0.43	0.26	0.26
Unique coverage	0.01	0.01	0.18	0.01	0.01
Consistency	0.90	0.90	0.93	0.95	0.97
Solution coverage		0.66		0.36	
Solution consistency		0.89		0.95	

Note: Black circles (●) indicate high beliefs, white crossed-out circles (⊗) indicate low beliefs, and blank spaces ( ) indicate "Don't care situations". Black stars (★) indicate a necessary condition that needs to be high to have a high intention to use DeFi borrowing.

Figure 1. Sufficient configurations for high and low intention to use DeFi borrowing.

4.2 Validation and Robustness of the Results

We tested the solutions for sensitivity to the sample and sensitivity to the calibration. To test for sensitivity to the sample, we increased the frequency threshold to four. The repeated analysis revealed substantially the same results for high and low use intention. We also changed the calibration anchors (minimum value = 1.5, mean value = 4, maximum value = 6.5), and a repeated analysis revealed the same results for high and low use intention. This finding shows that our results are robust.

5 Discussion

DeFi borrowing as the most popular DeFi application accounts for an estimated US$48 billion in cryptocurrencies (Chalmers, 2021). To establish DeFi borrowing for the long term, it is essential to attract sufficient users for DeFi borrowing. We draw on UTAUT to conduct a fsQCA on data of 142 potential users to come up with different explanations for their high and low use intention.

5.1 Research Implications

We contribute to the literature on DeFi (Lockl and Stoetzer, 2021) and technology use (Blut et al., 2022) in the following ways.

We complement initial research on DeFi (Lockl and Stoetzer, 2021), suggesting that social influence and relative benefits compared to traditional financial services of banks explain the intention to use DeFi borrowing. Our results confirm social influence as a belief relevant in the context of DeFi. We show that users evaluate the benefits of DeFi borrowing based on beliefs such as performance expectancy and effort expectancy. Most importantly, they need to perceive that DeFi borrowing has a high price value, or they will not have a high use intention, regardless of their other beliefs about DeFi borrowing. These beliefs align with existing research, revealing relative benefit as a cause (Lockl and Stoetzer, 2021). With our results, we provide a more nuanced understanding of use intention in the context of DeFi by zooming in on relative benefits. We so explain that users follow several beliefs to evaluate if DeFi borrowing is beneficial to them. We go beyond previous work by showing that users also have a high use intention because they enjoy using novel technologies such as DeFi borrowing. This finding shows that despite relative benefits, hedonic motivation and PIIT are also relevant in the context of DeFi borrowing. We advance DeFi research by outlining the causes of high intention to use DeFi borrowing.

Research grounded in UTAUT provides diverse explanations on what leads to intentions to use (see Table 1). With our configurational approach, we provide evidence that these results are not inconsistent. We rather show equifinality, which means that several ways, represented by configurations, lead to high use intention. Each of these configurations consists of multiple beliefs that guide use intention together. Our findings thus provide potential explanations for differing findings in previous research (see Table 5). For instance, the non-existent influence of social influence (Jang and Byon, 2020) and facilitating conditions (Karimzadeh et al., 2017) in some studies can be explained by the interplay between social influence, facilitating conditions, and hedonic motivation. Users who perceive two of these beliefs to a high degree can show a high use intention, regardless of whether they perceive the third belief to a high or low degree. We advance technology use research by explaining differences in the findings of previous studies using UTAUT and uncovering the causal complex relationship between beliefs and use intention.

Previous finding	Example study	Confirmed by study results	Explanation
Social influence increases use intention.	Dasgupta and Gupta (2019)	Confirmed by *CH1* and *CH2*.	The results suggest that social influence does not influence high use intention when users perceive high facilitating conditions and high hedonic motivation.
Social influence does not influence use intention.	Jang and Byon (2020)	Confirmed by *CH3*	
Facilitating conditions increase use intention.	Alamin et al. (2015)	Confirmed by *CH1* and *CH3*	Facilitating conditions do not influence high use intention when users perceive high social influence and high hedonic motivation to use the technology.
Facilitating condition does not influence use intention.	Karimzadeh et al. (2017)	Confirmed by *CH2*	

Table 5. Explanation of previous findings.

5.2 Practical implications

We use our findings to offer practical insights for blockchain technology platform providers of DeFi borrowing applications into how to attract sufficient users, which helps them establish their DeFi borrowing applications for the long term.

Blockchain technology platform providers should promote their DeFi borrowing application based on its price value rather than its cost. Having seen that users only have a high intention to use DeFi borrowing when they perceive it as worth it in terms of price value rather than actual cost, we suggest that blockchain technology platform providers should highlight the price value of DeFi borrowing compared to conventional loans in their advertising campaigns.

Blockchain technology platform providers should align their advertising strategy with the three configurations of users that have a high use intention. While the configurations share many beliefs that lead to their high use intention, e.g., performance expectancy and effort expectancy, not all show high social influence, facilitating conditions, and hedonic motivation. We, therefore, suggest that blockchain technology platform providers try to follow three different strategies for attracting potential users. While all strategies should address the shared beliefs, each strategy should also focus on the distinct beliefs of one specific configuration. For instance, blockchain technology platform providers might want to emphasize in advertisements for *CH2* that there is the opportunity to join a community of users that engage in DeFi borrowing (e.g., social influence) and that it is fun to use DeFi borrowing as a blockchain-based IS (e.g., hedonic motivation). At the same time, they should focus on facilitating conditions instead of social influence for *CH3*. For instance, they could highlight the different possibilities of contacting technical support in case of questions to give users the feeling of having the necessary resources to use DeFi borrowing.

5.3 Limitations and Future Research

This study has some limitations that need to be considered. We sampled users to make sure that they possess the requirements for using DeFi borrowing. With this, our study might exclude users who need a loan and have a high intention to use DeFi borrowing but are held back by not knowing how to acquire cryptocurrencies. To gain insights in that regard, future studies in this context might want to focus on user resistance (Wen et al., 2011) to explain why users that require a loan resist using DeFi borrowing. We also focus on DeFi borrowing, which is one of several DeFi applications. The configurations that lead to high intention to use DeFi borrowing might differ for other DeFi applications, such as staking (Vasile, 2021). We, therefore, call for future research to study how the configurations for other DeFi applications differ. While this study follows the tradition of using UTAUT to gain insights into use of technology in financial contexts (Yu, 2012), external factors such as legislation might influence how the beliefs influence DeFi borrowing use intention. Future research could build on this study to identify external factors relevant to DeFi borrowing.

This study focuses on use intention to explain how to attract users who do not yet engage in DeFi borrowing. With a broader diffusion of DeFi borrowing among users, future studies might want to take a migration theoretic perspective (Lee, 1966; Meier et al., 2021) to explain why users of one blockchain technology platform provider of DeFi borrowing switch to another one.

6 Conclusion

Based on the growing popularity of DeFi in recent years, we study why users intend to use DeFi borrowing. To gain insights in that regard, we draw on UTAUT and conduct a fsQCA on data of 142 potential users. We identify high price value as a necessary condition and uncover three sufficient configurations that lead to high intention to use DeFi borrowing and two sufficient configurations that lead to low intention to use DeFi borrowing. With our results, we contribute to the literature on DeFi and technology use. We enrich research on DeFi by explaining the causes of users' intention to use DeFi borrowing and explain previous findings of studies on UTAUT by taking a configurational approach and uncovering the causal complex relationship between beliefs and use intention.

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Appendix

Construct	Measurement item	Loading
Performance expectancy adapted from Venkatesh et al. (2012)	I find using DeFi for borrowing money useful in my daily life.	0.90
	Using DeFi helps me accomplish borrowing money more quickly.	0.92
	Using DeFi increases my productivity for borrowing money.	0.91
Effort expectancy adapted from Venkatesh et al. (2012)	Learning how to use DeFi for borrowing money is easy for me.	0.90
	My interaction with DeFi protocols for borrowing money is clear and understandable.	0.89
	I find using DeFi for borrowing money easy to do.	0.91
	It is easy for me to become skillful at using DeFi protocols for borrowing money.	0.89
Social influence adapted from Venkatesh et al. (2012)	People who are important to me think that I should use DeFi for borrowing money.	0.96
	People who influence my behavior think that I should use DeFi for borrowing money.	0.96
	People whose opinions that I value prefer that I use DeFi for borrowing money.	0.96
Facilitating conditions adapted from Venkatesh et al. (2012)	I have the resources necessary to use DeFi for borrowing money.	0.84
	I have the knowledge necessary to use DeFi for borrowing money.	0.84
	Using DeFi for borrowing money is compatible with my cryptocurrency portfolio.	0.83
	I can get help from others when I have difficulties using DeFi for borrowing money.	0.79
Hedonic motivation adapted from Venkatesh et al. (2012)	Using DeFi for borrowing money is fun.	0.95
	Using DeFi for borrowing money is enjoyable.	0.96
	Using DeFi for borrowing money is very entertaining.	0.93
Price value adapted from Venkatesh et al. (2012)	Using DeFi for borrowing money is reasonably priced.	0.91
	Using DeFi for borrowing money is a good value for the money.	0.92
	At the current price, using DeFi for borrowing money provides a good value.	0.92
Habit adapted from Limayem et al. (2007)	Using cryptocurrency for decentralized finance (e.g., liquidity providing, yield farming, staking) has become automatic to me.	0.90
	Using cryptocurrency for decentralized finance is natural to me.	0.89
	When faced with a particular task, using cryptocurrency for decentralized finance is an obvious choice for me.	0.94
Compatibility adapted from Moore and Benbasat (1991)	Using DeFi for borrowing money is compatible with all aspects of how I deal with my finances.	0.89
	Using DeFi for borrowing money is completely compatible with my current financial situation.	0.94
	I think that using DeFi for borrowing money fits well with the way I handle my finances.	0.95
	Using DeFi for borrowing money fits into the way I handle my finances.	0.94
Personal innovativeness in IT adapted from Agarwal and Karahanna (2000)	If I heard about new information technology, I would look for ways to experiment with it.	0.87
	In general, I am hesitant to try out new information technologies.	n.s.*
	Among my peers, I am usually the first to try out new information technologies.	0.77
	I like to experiment with new information technologies.	0.78
Cost adapted from Brown and Venkatesh (2005)	DeFi protocols that are available today for borrowing money are too expensive.	0.88
	I think DeFi protocols for borrowing money are quite pricey.	0.91
	I consider DeFi protocols for borrowing money as too costly.	0.98
Use intention adapted from Martins et al. (2014)	If I would need a loan, … … I would intend to use DeFi for borrowing money.	0.96
	… I would use DeFi for borrowing money	0.97
	… I would plan to use DeFi for borrowing money.	0.93

Note: Marked items (n.s.*) were dropped due to bad loadings, which indicates non-significance. We measured all items with a seven-point Likert scale from one (“Strongly disagree”) to seven (“Strongly agree”).

Table 6. Measurement items.