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Value Creation in Platform Enterprises: A Fuzzy-Set Qualitative Comparative Analysis

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Abstract: Platform enterprises have emerged as one of the most popular business models in the era of knowledge economy. The success of platform enterprises relies on continuous value creation by constructing an efficient platform and attracting more users to participate in order to create more value for the users and by the users. This study is to explore the key factors that drive value creation in platform enterprises' ecosystem to help better understand the management of platform enterprises as the knowledge-based entrepreneurial ventures in emerging markets. This study employs a newly emerged method—a fuzzy-set qualitative comparative analysis to empirically analyze the antecedent configurations of value creation for Chinese platform enterprises. This method extends qualitative comparative analysis by integrating fuzzy-sets and fuzzy-logic principles with qualitative comparative analysis principles, which offers a more realistic approach. This paper identifies different configurations for high and non-high levels of value creation in platform enterprises. The results show that continuous user commitment is crucial to creating positive value for Chinese platform enterprises, and active user participation and knowledge sharing as well as platform construction/improvement are the key elements that determine the platform enterprises' value creation process. The results also demonstrate a hybrid value creation logic with efficiency and innovation in platform enterprises. This study further identifies an asymmetric causality in the Chinese platform enterprises' value creation process that is crucial for knowledge sharing and effective management of platform enterprises. The findings can shed light on the strategic management of platform enterprises for emerging markets.

Keywords: platform enterprise; qualitative comparative analysis; emerging markets; sustainable competitive advantage; value creation

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1. Introduction

Along with the booming knowledge economy, platform enterprises as knowledge-based entrepreneurial ventures have become a symbol of emerging business models that are spearheading the development of global business theories and practices [1–3]. Among the first one hundred unicorn enterprises in the world, more than sixty of them are actually making profits, mainly from a platform business model, such as Apple, Intel, Amazon, Alibaba, JD.com, Facebook, and others. In addition, as the newly emerged knowledge-based business model, platform businesses are also more vital than traditional industry models [3]. For example, when Apple's iPhone entered the mobile market in 2007, the global mobile phone market was dominated by five giants: Nokia, Samsung, Motorola, Sony Ericsson, and LG. But after just eight years, Apple defeated them all by building an interconnected ecosystem—a platform business—to connect consumers and producers and became the global leader in smartphones [3]. Platform enterprises have also achieved amazing success in China, the most important emerging economy. Given the impressive

success of a large number of platform enterprises, it is essential to better understand which factors have helped platform enterprises create a sustainable ecosystem and how platform enterprises create value to maintain their competitiveness in China and other emerging markets [1–4].

The current research on platform businesses focuses on two-sided markets [2], network effects in an ecosystem [4], platform supervision and governance [5], and platform enterprise strategic management [6]. More recent research has realized that the competitive advantages of platform enterprises as knowledge-intensive entrepreneurial ventures lie in their value creation process in an interconnected ecosystem. For instance, empirical research has shown that platform openness is a key success factor for a platform enterprise's ecosystem, and opening up platform interface leads to positive effects in platform enterprises' knowledge sharing and value creation [7]. Research also indicates that the modularity of a platform architecture is a key force in value-creating and advantages-building, which further improves the scalability of the platform system in ensuring the versatility of the platform interface [5]. Based on the notion that value creation cannot be separated from platform users, studies on platform businesses have contended that user interaction is a basic embodiment of platform value creation [8], and, consequently, a good platform ecosystem should promote positive interactions ("cumulative" interaction) and avoid negative interactions ("consumption" interaction) to ensure continuous knowledge sharing and value creation within the platform enterprises' ecosystem. However, although this line of research on platform enterprises has produced impressive literature, more studies are needed on what are the driving factors of value creation in a platform enterprise and what is the dominant logic for platform enterprises to build competitive advantages in emerging markets. The answers to these questions are not only important for developing more robust theories on platform strategies but are also essential for providing insightful guidance on platform enterprises' value creation and a more sustainable development in emerging markets.

This study is intended to examine these critical issues on value creation in platform enterprises in order to identify key antecedent factors in the platform enterprises' value creation process in China and to help better understand the mechanism whereby platform enterprises build a sustainable competitive advantage. The research question to be answered in this study is which antecedent factors help platform enterprises create value and attract more users for sustainable development. The rest of this paper is divided into four sections: we first present a systematic review of related platform literature on basic theories and value-creation. Second, we identify main influencing factors and dominant logics that influence value creation in platform enterprises. The third section presents our research design including methods, data sampling, measurement, and empirical analysis to identify the driving factors and antecedent configurations in the Chinese context. The last section discusses the results and contributions, with research limitations and future research directions to conclude the paper.

In this study, we used a questionnaire method to survey platform users on their perceived usefulness of the platform and their participation in the process of value creation, because the acceptance of the users and their perception of value in the platform are essential to the success of any platform enterprise. We then used a fuzzy-set qualitative comparative analysis (fsQCA) to analyze the collected data in order to identify the driving factors and key antecedent configurations of value creation in platform enterprises.

The fsQCA approach is increasingly applied in strategy and organization research. While configurational theorizing has a rich tradition in strategy and organizational literature, the introduction of fsQCA has led to a new wave of "neo-configurational" studies that explicitly embrace causal complexity and address the mismatch between theory and methods in the literature. The fsQCA is especially suitable for analyzing small size data and the asymmetric causality and it has attracted more attention among strategy scholars in organization research. The fsQCA is thus a suitable approach for antecedent analysis of value creation in platform enterprises in this study because the fuzzy-set QCA divides the

configuration into multiple discrete values or indiscrete values to provide a finer granularity to unravel complex configuration causality.

2. Literature Review and Conceptual Framework

2.1. Literature Review on Value Creation in Platform Enterprises

Platform is a value-generating business model that allows interdependent parties to exchange information, products, or services [1–3,5–8]. To facilitate these transactions, platform enterprises leverage and create large, scalable networks of end-users and services that can be accessed on-demand. The last two decades have seen increasing research interests in platform enterprises [1–3,5–9] and more recent research on platform enterprises has focused on creating value in the platforms and on how they manage interactions with platform users and other stakeholders to survive in the competition. Unlike traditional value chain production or one-sided market exchanges, platform enterprises connect at least two markets with different needs and provide interfaces and venues to facilitate trade and interaction between suppliers and buyers [2,3,6]. Platform enterprises do not directly produce products or sell products to consumers. Instead, they provide trading spaces for buyers and sellers to form an interconnected ecosystem, and the value created by platform enterprises is often reflected in the platform usage fee rather than sales revenue [1,3,5–8]. Therefore, platform enterprises must be central and impartial to ensure that platform enterprises can manage and constrain every platform user in an impartial way. In essence, with the fast development of information technology and internet-based technology, platform enterprises use online resources to achieve real-time communications across regions and time zones, reducing the geographical and time constraints on platform users, which further promotes the rapid interactions among platform users [5,6].

Scholars have explored different value creation approaches to building sustainable competitive advantages in various platforms [9–18]. The traditional competitive strategy contends that business advantages can be enhanced by competitive analysis and market segmentation [13]. The resource-based view (RBV) argues that the key element of value creation is to obtain or control resources that are valuable, scarce, difficult to imitate, and irreplaceable [9,10,17]. The knowledge-based view and dynamic capability theory extends the resource-based view to consider knowledge and capability as specific and cumulative rare resources and further advocates for the flexible use of them to create value [11,14–16,18]. Classic organization economics has also conducted in-depth investigation into value creation. Take the transaction cost economics (TCE) as an example, it considers transaction fees as an important market parameter and thus advocates for the reduction of transaction costs through internalizing transactions as an important part of value creation [19,20]. Different from the theories discussed above, Schumpeter's innovation theory attaches more importance to the positive role of entrepreneurs and argues that innovation is to constantly break the old order and market equilibrium and inject new vitality into the market through creative destruction in order to create new value [21,22]. Based on the innovation theory, Teece has proposed and developed the Profiting from Innovation (PFI) theory to emphasize that firms can create value through innovation, based on two basic conditions: whether a firm has a strong appropriation regime to protect the innovation value from being imitated or stolen; and whether a firm has or can obtain complementary assets to ensure successful commercialization [22,23]. The resulting literature from these studies has provided a solid foundation for research on platform enterprises' knowledge management and value creation.

Research shows that internet-based platform enterprises have unique characteristics in their value creation. First, platform enterprises are not directly involved in manufacturing or production but provide necessary spaces and basic services to create value for platform users or interactive trading parties [3]. Second, platform enterprises do not use the traditional industrial value chain to connect producers and consumers. Consequently, the traditional value creation and capture logic for traditional enterprises, such as the Long-linked Technologies and value chain configuration [24,25], do not apply to platform enterprises. Third, platform enterprises are two-sided markets. The two-sided markets,

different from the traditional one-sided market, have two groups of supply and demand at the same time, and, thus, traditional pricing and business rules in the one-sided market do not work [2]. Fourth, platform enterprises as interconnected ecosystems have significant network effects [4]. Positive network effects produce a "snowball-effect" feedback mechanism that constantly attracts more users (of supply, demand, and other sides) to the platform and continues to increase the overall value within the ecosystem [26]. Fifth, platform enterprises are an open system and thus have higher openness than that of traditional enterprises. Open systems pose new challenges for platform enterprises to build sustainable competitive advantages. Platform users may participate in multiple similar platforms at the same time, a multi-homing phenomenon [27]. Because users can enter or exit the platform freely, thus changing the competition strategy of platform enterprises, how to enhance users' participation and value perception is not the only the focus of value creation in platform enterprises; it is also pivotal for platform enterprises to build a sustainable ecosystem to attract users.

Sixth, the value creation and capture process in platform enterprises is also different from that of traditional enterprises. In the age of the Internet of Things, the long tail economy has become more attractive, and emerging technologies such as Operational Technologies, Data Technologies, and Artificial Intelligence have drastically reduced the cost of the long tail market. Human-friendly and experience-oriented interactions have become essential to increasing consumers' willingness to pay [27]. As information asymmetry decreases, the willingness and urgency of users to participate in the platform becomes more important. As a result, new value creation elements such as user participation, continuous commitment, and knowledge sharing become more important for the creation of an efficient ecosystem. Seventh, the key elements that drive the value creation and capture in platform enterprises are different from those of traditional enterprises. While resources, capabilities, knowledge, and other factors still play an important role in the value creation of platform enterprises [28], knowledge-based value-creation activities such as innovative platform construction/improvement and platform launch have become an important part of value creation. Due to the particularity of the two-sided markets in platform enterprises, the launch of a platform is often a problem of "chicken and eggs". It is more difficult for enterprises to enter the platform market than traditional enterprises [29] and thus more difficult for new platform enterprises to create value and build an ecosystem.

These unique characteristics of platform enterprises have suggested that the construction of a platform ecosystem and the management of user participation are pivotal for value creation within the platform enterprises. Meanwhile, since platform users are multi-homing and thus can easily migrate to different platforms, it is of upmost importance for platform enterprises to actively create values to improve users' satisfaction, the core of user-participation and building sustainable ecosystems. With increased user participation, platform users are more willing to share their knowledge and provide positive user feedback, which attracts more users to participate, a self-enhancing knowledge-generating process. In addition, research on platform enterprises also examines the relationship between value creation and the platform evolution stage. In the emergence stage, platform enterprises focus on platform construction and improvement, and platform enterprises stimulate network effects through platform service innovation. In the expansion stage, platform enterprises rely on value creation to stimulate more network effects for a most sustainable ecosystem [30].

2.2. Driving Factors in Value Creation in Platform Enterprises

While research on platform enterprises may have different views on what constitutes key factors of value creation, and further for an innovative ecosystem in platform enterprises, our review of previous studies has identified two sets of antecedent conditions for value creation in platform enterprises: platform construction and user participation [2,6,31–36], which correspond to two different logics of value creation: the transaction-cost based efficiency logic [20] and the profit-from-innovation based innovation logic [22].

2.2.1. Platform Construction: The Efficiency Logic of Value Creation

Constructing an efficient platform is to improve service efficiency and provide efficient and convenient interaction spaces to connect platform users such as suppliers and consumers in order to form a sustainable platform [3]. The platform construction focuses on three dimensions: Platform Openness, Demand Matching, and Interaction Guidance. An open platform can enable platform enterprises to connect users and increase ecological diversity, a key element for a sustainable ecosystem [6,31]. Platform Openness not only helps the platform enterprise obtain and make good use of external resources and expand resources and capacity boundaries [32] but also increases user demand for platform-based services [33]. Studies have shown that platform openness has a significant positive impact on a firm's value potential [34]. Compared with a closed system, an open platform is more able to foster robust synergies by simultaneously drawing on the strengths of the platform and its consumers. Consumers with different demands and producers of different products/services are connected and attracted by platform openness, and economies of scale and economies of scope advantages are more likely to be achieved [35,36], which will enhance platform users' appraisal and willingness to pay in the platform system. Therefore, platform openness can help create more value in its ecosystem.

Platform enterprises can also quickly search, identify, compare, and filter information through powerful and secure functions to match the needs of suppliers and buyers, thus reducing transaction costs [1]. In the platforms that focus on searching and matching, platform enterprises help users find and compare information using the platform system interface to reduce the information asymmetry between suppliers and consumers, which can improve the matching efficiency between suppliers and consumers [37,38]. In the platforms that focus on targeted consumers, platform enterprises create platform users' profiles through users' historical data and information analysis to predict platform users' cognitive preferences with diverse and sophisticated data analysis tools in order to provide users with personalized products and services [39]. Therefore, with demand matching, platform enterprises can efficiently improve users' value perception and willingness to pay (WP) for platforms.

In addition, platform enterprises can optimize the platform structure to increase users' WP through a simple and easy-to-use interactive interface. Detailed operation guides and well-designed demonstrations are used to reduce users' learning curves in platform-related operations [35], which can make the interface more convenient and flexible [40]. During the interaction, platform enterprises also encrypt user information through a series of algorithmic systems to ensure the security and reliability of user information [41,42]. Clear user instructions increase a platform's convenience; diversified interactive solutions provide more choices, and sophisticated information encryption technology ensures information security and reduces opportunity costs for users to participate in the platform. Therefore, with well-designed interaction guidance, platform enterprises can increase the platform's market efficiency and enhance users' value perception and further the WP for the platform.

2.2.2. User Participation: The Innovation Logic of Value Creation

The second dominant logic of value creation in platform enterprises is the innovation logic, which is to increase platform value through user participation and complementary resources, with the focus on three dimensions: Knowledge Sharing, Complementarity Supply, and Continuous Commitment. Firstly, as one type of knowledge-based entrepreneurial venture, platform enterprises heavily rely on platform users to contribute knowledge to the development of an ecosystem, and, thus, knowledge sharing is the most important contribution platform enterprises can obtain from platform users. Platform users may be general buyers following the traditional mainstream consumer market, or long-tail market users pursuing a personalized experience [43]. The long-tail market is harder to distinguish and satisfy than the mainstream market, mainly due to the high costs of searching and identification. However, within platform enterprise, long-tail market users hold more knowledge expertise and discernment experience due to special user prefer-

ences and cumulative consumption behaviors, and when they share this expertise or these experiences, they will be able to foster a vital ecosystem in the platform. In particular, when platform users with knowledge expertise receive reciprocal returns (reputation or material incentives) from knowledge-sharing activities, their willingness to share knowledge will be stronger [44]. Therefore, platform users' knowledge-sharing behaviors facilitate value creation in platform enterprises.

Secondly, the Profiting from Innovation (PFI) theory considers complementary resources as an "innovative" attribute because complementary resources can promote the overall value of the platform, and complementary assets are also crucial for latecomers to overcome their innovation disadvantages to achieve fast growth and even exceed their rivals [22]. This "innovation" is not a mutated "Schumpeter Innovation", like product and technology innovation, but rather a process of value creation using the complementarity among platform users [22,42]. In the platform business, enterprises that are most likely to create value and build a winner-takes-all market are often those platform enterprises with the best complementary resources [22,41]. Therefore, the type and the form of complementarity that platform users can provide in the platform is crucial for platform enterprises to advance value creation. With complementarity from both suppliers and consumers, platform users have a better perception of the platform and a greater willingness to pay for the platform [45], which provides users with a larger space to interact or trade [22]. In addition, whether a user chooses to trade in a particular platform is not only dependent on the number of similar products and merchants (market thickness) but also on whether other users' evaluation of whether the physical product meets users' demands. As a result, complementarity can increase platform users' attention to the platform, and high complementarity can directly contribute to platform users' purchase decisions (willingness to pay) and appraisal (system evaluation). Therefore, complementarity supply in the platform can also promote platform enterprises' value creation.

Thirdly, in the process of value creation in platform enterprises, knowledge sharing and complementarity supply describe the type of the input from platform users as complementary resources, while continuous commitment directly reflects the intensity of platform users' input in the platform. Continuous commitment is a manifestation of commitment, representing platform users' investment in resources and continuity in the platform. This continuous investment behavior itself can generate strong path dependence [46,47]. On the one hand, continuous attention to the platform itself is a payment of time (placing limited attention resources in the platform) [48]. On the other hand, continuous active interaction in the platform has also increased the efficiency of the platform and thus increased the overall value of the platform ecosystem through "cumulative interaction" [8]. Therefore, continuous commitment can promote platform enterprises' value creation.

2.3. Configurational Framework

The dual value creation logic—efficiency logic and innovation logic—based our conceptual model of the platform enterprise is presented in Figure 1. Although contemporary research agrees that value creation in platform enterprises is an outcome of platform construction and user participation, existing studies are limited in exploring the combined effects of each set of factors, i.e., past research has largely ignored the complex combinations of different factors from both platform construction and user participation. At the same time, the existing research is not clear as to whether there is a difference in antecedent configurations (asymmetric causality) between platform enterprises with high levels of value creation (presence of value creation results) and platform enterprises with non-high levels of value creation (absence of value creation results). Adopting the fuzzy-set qualitative configurational analysis (fsQCA) can help explore the configuration effects among different factors, thus bridging this research gap. Therefore, we introduce a configurational framework in this study and argue that platform enterprise value creation does not depend on a single factor but rather on the complex combinations of platform construction and user participation.

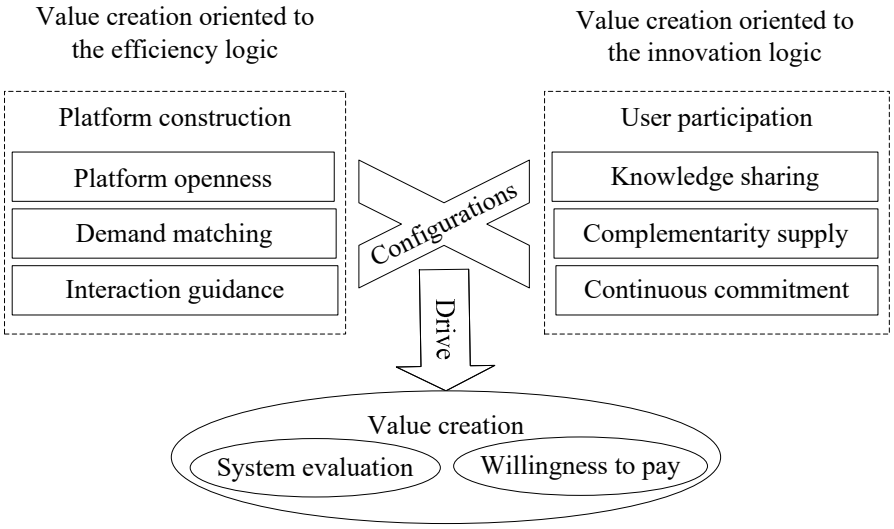

Figure 1. A Model of Value Creation in Platform Enterprises.

3. Methods

Our proposed research model shows that platform construction and user participation are two sets of conditions that drive value creation in platform enterprises, based on two general logics: the efficiency logic and the innovation logic. Based on this research model, we collect data to explore how these two sets of conditions interact to achieve different results and whether these two types of conditions have similar or different effects on value creation in platform enterprises. We choose to use the fuzzy-set Qualitative Comparative Analysis (fsQCA) method to analyze the configuration of different antecedents. The fsQCA is a most suitable approach for antecedent analysis because the fuzzy-set Qualitative Comparative Analysis divides the configuration into multiple discrete values or indiscrete values in an interval of 0 to 1 for calibration, which provides a finer granularity to unravel complex configuration causality. FsQCA addresses an important limitation of QCA: the fact that conditions are binary, thus restricting the analysis, as it cannot fully capture the complexity in cases that naturally vary by level or degree [49,50]. This restriction of QCA is likely an important reason that QCA has not been widely adopted in multiple contexts. The fsQCA extends QCA by integrating fuzzy-sets and fuzzy-logic principles with QCA principles [49,50], which offers for a more realistic approach since conditions can get all of the values within the range of 0–1.

3.1. Sampling and Procedure

Platform enterprises have emerged as one important economic driver in China. Considering that China is one of the most important emerging markets, it is necessary to explore platform enterprises and their value creation in China in order to obtain a better understanding of platform enterprises in emerging markets. We chose Chinese platform enterprises for this study also because of the booming sharing economy in China and the fast-growing technological capabilities and related rapid development in platform enterprises [51–53] Our study focuses on the configuration of antecedents for platform enterprises' value creation, and the data are examined at the level of platform enterprises. We used questionnaires to obtain the first-hand data on Chinese platform enterprises (please see Appendix A for the questionnaire items used in this study). The purpose of using the questionnaire method is to reduce the subjectivity of respondents' assessment of various factors by surveying a number of respondents. The quantitative nature of the questionnaire can help reduce this subjectivity. At the same time, in order to reduce the common method variance, we also used market data to assess platform performance. In this study, we followed the following criteria in data collection: (1) We first compiled a list of platform enterprises and used questionnaires to survey platform users in order to

collect data on the features of these platform enterprises. The collected data were then grouped and classified based on which platforms these users participated in. (2) The selected platform enterprises should consist of a variety of different enterprises, including platforms that had failed or dissolved. (3) We then determined the appropriate sample size. The analysis using fsQCA can incorporate logical remainders (unobserved cases) into the analysis process, and, thus, the sample size could be very small (10 or less), medium (10–50), or large (above 50), depending on the number of parameters/conditions. Given that the number of conditions (three from platform construction and three from user participation) in this study is six, it is suitable to use a medium sample [54]. (4) The selected platform enterprises should come from different industries to avoid the selection bias in industry factors. (5) The selected platform enterprises should have been established for more than a year to avoid a situation where the newly launched platforms often have incomplete data. (6) The selected enterprises should include both pure platform enterprises (only operating platform business, no non-platform business) and hybrid platforms enterprises (including both pure platform businesses and traditional non-platform businesses) in order to control for the impact of the business model on the analysis.

Using these screening principles, we selected 26 Chinese platform enterprises in different industries for data collection, including e-commerce platforms, food take-out platforms, online taxi-hailing platforms, online literature platforms, and fresh food/housing service platforms (please see Table 1 for sample information). The data were collected in two rounds: In the first round, we contacted university student volunteers for participation and then randomly selected those who agreed to participate to answer the questionnaires based on their platform experiences. In the second round, we focused on the platforms with insufficient data (fewer than 10 completed questionnaires) by asking these students to download the apps from the relevant platforms to use them and then fill out the questionnaires based on their experiences. After two rounds of data collection, we had a total of 324 valid questionnaires on 26 platform enterprises (at least 10 valid questionnaires per platform).

Table 1. The distribution of sampled platform enterprises.

Platform	Response #	Sector	Platform	Response #	Sector
TMCS	24	E-commerce	WPDS	14	E-commerce
MTWM	18	Online food services	SZZC	10	Car-hailing
DDCX	22	Car-hailing	YDYC	10	Car-hailing
ZYKJ	18	Online literature	CCZC	12	Car-hailing
JDDS	14	E-commerce	SDPT	10	Courier locker
ELWM	16	Online food services	LHPT	10	Non-truck Carrier
QQYD	14	Online literature	DDSW	10	3D Design
SQXS	10	Online literature	MKKJ	10	Online Pay
BDWM	10	Online food services	WSYJ	10	Software
PDDS	12	E-commerce	CMKJ	10	Fresh delivery
BYYD	10	Online literature	SSYG	10	Fresh delivery
YSXS	10	Online literature	YXDZ	10	Electronic Parts
SQYC	10	Car-hailing	LJSC	10	Housing Service

3.2. Measurement

3.2.1. Platform Construction

The platform construction assesses which actions the platform enterprises take to build an effective platform and to create a positive and favorable user ecosystem. Platform construction is composed of three variables: platform openness, demand matching, and interaction guidance. Platform Openness (PO) refers to the degree of openness of the platform system. This study used a three-item scale from previous studies on platform openness to assess three aspects of platform openness: registration requirements, exclusive-

ness, and qualification conditions [55–57]. Demand Matching (DM) refers to the degree to which platform enterprises can match supply (product/service provided by supplies) with demand (demand and appeal of consumers). Demand matching is reflected in both search matching and targeted notification, and this study adapted the existing scale to a two-item scale to assess these two dimensions [58].

Interaction Guidance (IG) refers to the degree to which the platform enterprise achieves architectural optimization and creates a convenient and flexible interactive environment for platform users. This study employed a three-item scale adapted from existing scales to assess three different dimensions of interaction guidance: detailed information and institutionalized guidelines and manuals, the equality of users-and-users, users-and-platform in status and power [59], and the platform's interfaces through various forms of interactive channel construction (such as websites, emails, apps, etc.) [40,42]. All the variables were measured using 7-point Likert scales. The respondents was asked to indicate their degree of agreement with the descriptions of the platform, with 1 to 7 representing totally disagree to totally agree. The sample items for Platform Openness, Demand Matching, and Interaction Guidance are "I can still join other platforms after I register for this platform", "I can find satisfactory information from the platform with little time or cost", and "The platform provides very detailed guidance, manuals, or explanation whereby I can easily learn how to use all available functions", with the Cronbach alphas for Platform Openness, Demand Matching, and Interaction Guidance in this study at 0.86, 0.75, and 0.78, respectively, all above the acceptable level (0.70).

3.2.2. User Participation

User participation describes the process through which platform enterprises' suppliers and consumers continuously interact to provide complementarity, which helps improve platform system performance and create ecological values [60]. User participation includes three dimensions: knowledge sharing, complementarity supply, and continuous commitment. For Knowledge Sharing (KS), we assessed the willingness to share knowledge [61] and the reciprocity of knowledge sharing with a 3-item scale adapted from items used in previous studies [62]. Complementarity Supply (CS) refers to the supply of complementary resources (such as evaluation, recommendation, reputation building, etc.) to the platform, which includes general complementarity and strict complementarity. This study used a four-item scale used in previous studies to assess the four most typical complementarities to measure the complementarity created by platform users [57]: platform users' likes and scores (or star-rating), and consumers' detailed evaluation and suppliers' targeted solutions. The first two are general complementarities and the latter two are strict complementarities.

Continuous Commitment (CC) refers to the degree to which suppliers and consumers pay lasting attention to the platform and invest resources. The continuous commitment indicates an escalation of commitment, and platform users continue to invest resources even in failed investments. This study used a three-item scale from previous studies to assess platform users' continuous attention to and investment in platforms [48,63]. Similarly, all of the conditions were measured using 7-point Likert scales. The respondents was asked to indicate their degree of agreement with the descriptions of the platform, with 1 to 7 representing totally disagree to totally agree. The sample items for Knowledge Sharing, Complementary Supply, and Continuous Commitment are "I am willing to spend time sharing my ideas and suggestions in order to help the platform to improve its products and process", "I am willing to provide thorough evaluation based on my experiences on products in the platform", and "I will continuously pay attention to the development and progress in the platform", with the Cronbach alphas for Knowledge Sharing, Complementary Supply, and Continuous Commitment in this study at 0.81, 0.78, and 0.90, respectively, all above the acceptable level (0.70) and thus indicating a good validity

3.2.3. User Value Perception

As the criterion condition, user value perception describes the value creation result of platform enterprises. They reflect platform users' evaluation of the value of the product/service they receive. In the platform enterprise scenario, user value perception has two forms: system evaluation and willingness to pay. System Evaluation (SE) refers to a user's evaluation of platform system usability, including perceived usefulness and perceived ease of use, and Willingness to Pay (WP) measures whether the platform's suppliers and consumers are willing to pay for the platform-related services, including the willingness to pay with time, as well as to pay with money [64]. Therefore, this study used previous scales to assess these two dimensions using a similar 7-point Likert scale [64].

3.3. Reliability and Validity Check

We first examined the data to make sure they had good reliability and validity to meet the requirements of QCA. The reliability and validity of the measurement scales were analyzed with SPSS 20.0 and AMOS 18.0 (SPSS, Armonk, NY, USA). Both the Exploratory Factor Analysis (EFA) and the Confirmatory Factor Analysis (CFA) show that the Cronbach's Alpha coefficients of all examined conditions are above 0.7, and the Construct Reliability (synthetic reliability) are all above 0.7, indicating that the measurement reliability is good. Meanwhile, all of the factor loadings are greater than 0.6 (mostly higher than 0.7), all of the condition KMO values are above 0.7, and all the AVE (average extraction variance) exceeds 0.5, also indicating that the validity of the conditions examined in this study is good, as in Table 2.

Table 2. Results of the reliability and validity test.

Condition	Item	Factor Loading	CA	CR	AVE	KMO
Platform Openness	PO1	0.723	0.857	0.758	0.509	0.796
	PO2	0.728				
	PO3	0.689				
Demand Matching	DM1	0.735	0.747	0.727	0.571	0.800
	DM2	0.776				
Interaction Guidance	IG1	0.718	0.783	0.797	0.567	0.818
	IG2	0.746				
	IG3	0.793				
Knowledge Sharing	KS1	0.732	0.811	0.820	0.604	0.778
	KS2	0.827				
	KS3	0.770				
Complementary Supply	CS1	0.717	0.775	0.822	0.510	0.753
	CS2	0.758				
	CS3	0.665				
	CS4	0.786				
Continuous Commitment	CC1	0.827	0.899	0.859	0.669	0.824
	CC2	0.833				
	CC3	0.794				
System Evaluation	SE1	0.779	0.715	0.714	0.556	0.814
	SE2	0.711				
Willingness to Pay	WP1	0.868	0.902	0.789	0.653	0.803
	WP2	0.743				

Note: CA: Cronbach Alpha, CR: Construct Reliability, AVE: Average Variance Extracted.

3.4. Data Processing and Calibration

Based on the 324 questionnaires on platform enterprises, we calculated the scores of all of the conditions for QCA analysis with the following procedures: (1) Calculate the average of platform users' scores on the same item of the same platform as the score for that item. (2) Calculate the average of platform users' scores on different items (different dimensions of the same condition) of the same platform and use it as the score for each condition. These calculations provide raw scores for all of the conditions for the selected 26 platform enterprises.

The data need to be calibrated using the anchor points for fsQCA analysis. Determining the reference scale is the key to data calibration in fsQCA analysis. In order to avoid fuzzy points, four or six anchor points (fuzzy scores) are often used to convert the raw data into a fuzzy-set. Based on the practice in previous studies, we selected four anchor points as calibration references—0 (completely not affiliated), 0.33 (partially not affiliated), 0.67 (partially affiliated), and 1 (completely affiliated) [65]. The effective calibration in fsQCA is obtained through setting the proper threshold values (the representing raw scores for each condition in the data) so as to meaningfully represent the degree differences between different types and different samples in the data [54,65]. In addition, we also combine the distribution of the data with theoretical guidance to set the meaningful threshold value in order to obtain a more nuanced understanding [49]. During calibration, we found that the platform construction conditions (PO, DM, and IG) and the user value perception conditions (SE and WP) were generally right-skewed; thus, the calibration reference is created with the threshold value set at 4: completely not affiliated (0)—the raw score is 4 or lower; partially not affiliated (0.33)—the raw score is between 4 to 5; partially affiliated (0.67)—the raw score is between 5 to 6; and completely affiliated (1)—the raw score is between 6 to 7. We also found that the user participation conditions (KS, CS and CC) were generally left-skewed, and the sample differences were salient (the standard differences are 1.3518, 1.244, and 1.536); thus, the calibration reference is created with the threshold value set at 3: completely not affiliated (0)—the raw score is 3 or lower; partially not affiliated (0.33)—the raw score is between 3 to 4; partially affiliated (0.67)—the raw score is between 4 to 5.5; and completely affiliated (1)—the corresponding score is between 5.5 to 7.

After the data preparation and calibration as discussed above, this study creates the condition data fuzzy-set matrix required for fsQCA analysis, as shown in Table 3. It is clear that the 26 platform enterprises are evenly distributed in different conditions, with significant differences between different samples. Most conditions of the platform enterprise TMCS, MTWM, DDCX, ZYKJ, and other platform enterprises have scored 0.67 and above, while the platform enterprise LJSC, YXDZ, SSYG, and others have only scored 0.33 and below. Overall, the sample data cover a variety of different condition (conditions) combinations and thus provide a good observation space for presence configurations and absence configurations of outcome conditions in subsequent fsQCA analysis.

Table 3. Fuzzy-sets of conditions affiliation scores.

Platform Enterprises	PO	DM	IG	KS	CS	CC	SE	WP
TMCS	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MTWM	0.67	1.00	0.67	0.67	1.00	0.67	0.67	1.00
DDCX	0.33	1.00	1.00	0.67	0.67	1.00	1.00	0.67
ZYKJ	1.00	0.67	0.67	0.33	0.33	1.00	1.00	1.00
JDDS	1.00	0.67	1.00	1.00	0.67	1.00	1.00	0.67
ELWM	0.33	0.67	0.67	0.67	1.00	1.00	0.67	1.00
QQYD	1.00	0.67	0.33	0.33	0.67	1.00	0.67	0.67
SQXS	1.00	0.00	0.00	0.00	0.33	0.33	0.33	0.33
BDWM	0.33	0.67	0.67	0.33	0.67	0.67	0.67	0.67
PDDS	0.67	0.33	0.00	0.00	0.33	0.33	0.33	0.00
BYYD	1.00	0.33	0.00	0.33	0.33	0.33	0.67	0.33
YSXS	0.33	0.33	0.00	0.33	0.33	0.33	0.33	0.33
SQYC	0.33	0.00	0.00	0.00	0.00	0.00	0.33	0.00
WPDS	1.00	0.00	0.33	0.33	0.67	0.33	0.33	0.33
SZZC	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00
YDYC	0.67	0.00	0.00	0.00	0.33	0.00	0.00	0.00
CCZC	0.67	0.33	0.00	0.00	0.33	0.00	0.00	0.00
SDPT	0.67	1.00	0.67	1.00	0.67	1.00	1.00	1.00
LHPT	0.00	0.33	0.67	0.67	0.33	1.00	0.67	1.00
DDSW	0.67	0.33	0.00	0.67	0.67	0.67	0.67	0.33
MKKJ	0.67	0.00	0.67	1.00	0.67	1.00	0.67	1.00
WSYJ	0.00	0.33	0.67	0.67	1.00	0.67	0.33	1.00
CMKJ	0.00	0.67	0.33	0.00	0.67	0.67	0.33	0.33
SSYG	0.67	0.33	0.00	0.33	0.00	0.33	0.00	0.00
YXDZ	0.00	1.00	0.67	0.67	0.67	1.00	0.67	0.67
LJSC	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00

Note: PO = platform openness; DM = demand matching; IG = interaction guidance; KS = knowledge sharing; CS = complementarity supply; CC = continuous commitment; SE = system evaluation; WP = willingness to pay.

4. Analysis and Results

4.1. Necessary Condition Analysis

The QCA method allows researchers to identify the combinations of causal conditions for the occurrence of an outcome, particularly when there are good reasons to suspect that there are several different casual conditions for a given outcome. The QCA compares several cases to identify whether causal conditions are necessary or sufficient to produce the given outcome, rather than identifying the net effects of the causal conditions. The outcome conditions in this study are system evaluation (SE) and willingness to pay (WP). The antecedent conditions that affect platform enterprise value creation are platform construction conditions and user participation conditions, including platform openness (PO), demand matching (DM), interactive guidance (IG), knowledge sharing (KS), complementarity supply (CS), and continuous commitment (CC). Before carrying out the configuration analysis using fsQCA, it is necessary to first analyze the necessity of the antecedent conditions for value creation. The calibrated data fuzzy-set, input by the fsQCA3.0 application, should follow the necessary condition analysis steps. The results are shown in Table 4.

According to the QCA approach, if the consistency coefficient is higher than 0.9 and has non-trivial coverage (coverage coefficient above 0.5), the antecedent condition can be regarded as a necessary condition for the result [49]. Table 4 shows that the largest consistency coefficients of all outcomes for the six antecedent conditions are mostly below 0.9. More specifically, the consistency coefficients and coverage coefficients of CC for SE and WP and the consistency coefficients and coverage coefficients of ~IG and ~KS for ~SE and for ~WP both simultaneously meet two threshold requirements, which means that these conditions are the necessary conditions for the corresponding outcomes. In addition to the above situations, the rest of the antecedent conditions do not meet the two threshold requirements at once. Given that most of the results of the necessity conditions analysis are below the criterion, further configuration analysis is thus needed.

Table 4. Necessity analysis of single conditions.

Conditions	SE		~SE		WP		~WP	
	Consistency	Coverage	Consistency	Coverage	Consistency	Coverage	Consistency	Coverage
PO	0.724	0.658	0.605	0.522	0.599	0.544	0.632	0.546
~PO	0.474	0.558	0.603	0.675	0.500	0.588	0.472	0.528
DM	0.750	0.858	0.392	0.425	0.725	0.829	0.339	0.369
~DM	0.498	0.463	0.869	0.768	0.448	0.416	0.843	0.745
IG	0.726	0.966	0.288	0.363	0.702	0.934	0.182	0.231
~IG	0.522	0.436	0.973	0.771	0.422	0.352	0.948	0.752
KS	0.750	0.909	0.366	0.420	0.750	0.909	0.287	0.331
~KS	0.522	0.465	0.921	0.777	0.448	0.398	0.921	0.778
CS	0.800	0.781	0.550	0.509	0.850	0.829	0.471	0.437
~CS	0.497	0.538	0.763	0.783	0.422	0.457	0.815	0.838
CC	0.950	0.826	0.471	0.389	0.950	0.826	0.392	0.324
~CC	0.298	0.372	0.790	0.937	0.223	0.278	0.790	0.938

Note: The "~" is used to indicate negation or "absent" in the configuration.

4.2. Configuration Analysis

4.2.1. Presence Configuration

According to the fuzzy-set matrix of six antecedent conditions and the result conditions of value creation, the truth table of the configuration analysis can be created by the truth table algorithm function of the fsQCA3.0 application. Once the frequency threshold (1.0 in this study) and consistency threshold (0.8 in this study) are set, the path analysis of a complex solution can be started. Then, following the prescribed steps of the configuration analysis, according to the intermediate solutions and the parsimonious solutions of the fsQCA 3.0 application output, the configuration for high levels of value creation can be created, as shown in Tables 5 and 6.

Table 5. Configurations for high levels of system evaluation.

Conditions	User Value Perception: High Levels of System Evaluation (SE)						
	1*a*	1*b*	1*c*	1*d*	1*e*	1*f*	**1*g***
PO		⊗		●	●	⊗	⊗
DM		⊗	●	⊗	●	●	●
IG	●	●	⊗		●		●
KS	●	●	⊗	●	⊗	⊗	
CS	●		●	●	⊗	●	●
CC	●	●	●	●	●	●	●
# of observations	9	2	2	2	1	2	4
Raw coverage	0.575	0.149	0.347	0.298	0.124	0.298	0.325
Unique coverage	0.151	0.025	0.025	0.025	0.025	0	0
Consistency	0.958	0.854	0.932	1	1	0.921	1
Solution coverage				0.826			
Solution consistency				0.942			

Note: "●" means the core causal condition is present and "•" means the peripheral causal condition is present; "⊗" means the peripheral causal condition is absent; a blank cell indicates that the condition, present or absent, does not lead to the result.

Table 6. Configurations for high levels of willingness to pay.

Condition	User Value Perception: High Levels of Willingness to Pay (WP)						
	1*a*	1*b*	1*c*	1*d*	1*e*	1*f*	1*g*
PO		⊗		•	•	⊗	⊗
DM		⊗	•	⊗	●	•	•
IG	•	•	⊗		•		•
KS	•	•	⊗	•	⊗	⊗	
CS	•		•	•	⊗	•	•
CC	●	●	●	●	●	●	●
# of observations	9	2	2	2	1	2	4
raw coverage	0.601	0.175	0.323	0.273	0.125	0.273	0.325
unique coverage	0.152	0.026	0.026	0	0.026	0	0
consistency	1	1	0.865	0.915	1	0.845	1
solution coverage				0.802			
solution consistency				0.914			

Note: "●" means the core causal condition is present and "•" means the peripheral causal condition is present; "⊗" means the peripheral causal condition is absent; a blank cell indicates that the condition, present or absent, does not lead to the result.

Tables 5 and 6 show that there are different configurations to cause high levels of value creation results (high levels of system evaluation and willingness to pay), indicating causality equivalence of the antecedent configurations of value creation. The configuration 1*a* of Tables 5 and 6 are the key configurations for high system evaluation and willingness to pay. The unique coverage rates are 0.151 and 0.152, respectively, and cover the most observations. This suggests that positive interaction guidance, active knowledge sharing, good complementarity supply, and continuous user commitment are most likely to jointly lead to high levels of value creation in platform enterprises. It can be noticed that platform construction conditions and user participation conditions are included in all of the configurations, which explains why the interactions of platform construction and user participation can achieve high levels of value creation in platform enterprises.

More specifically, based on active user participation, high levels of value creation (SE and WP) can be realized by (i) the presence of interaction guidance (1*a*) and (ii) the presence of platform openness and the absence of demand matching (1*d*). Based on platform construction, high levels of value creation (SE and WP) can be realized by the presence of continuous commitment, the absence of knowledge sharing, and complementarity supply (1*e*). Configurations 1*f* and 1g show the substitution effect between the presence of interaction guidance and the absence of knowledge sharing based on the conditions of ~PO, DM, CS, and CC. Configuration 1*b* depicts the presence of interaction guidance, knowledge sharing, and continuous commitment; high levels of value creation can be realized by limited platform openness and the absence of demand matching. Configuration 1*c* shows that the presence of demand matching, complementarity supply, and continuous commitment can achieve high levels of value creation even with the absence of interaction guidance and knowledge sharing.

4.2.2. Absence Configuration

After analyzing the presence path configuration of value creation in the platform enterprises, it is necessary to analyze the absence configuration of value creation in order to draw a relatively complete and prudent conclusion. Two reasons are as follows: (1) The fsQCA analysis assumes that the antecedent conditions have an asymmetrical causality with the result conditions; that is, the combination of factors that lead to "good" results are often not exactly the same as the combination of factors that cause "not good" results. In other words, the presence configuration that promotes positive results is not completely equivalent to the absence configuration that generates negative results (i.e., non-high levels of value creation). (2) Simultaneous analysis of high and non-high levels of the process can generate more insights for theory development and practical guidance. Therefore, in this

study, we not only explore the "successful process" but also the "non-successful process" so as to avoid the bias of actively pursuing successful cases at the expense of failed cases.

Using the fsQCA3.0 application, the truth table of antecedent conditions (PO, DM, IG, KS, CS, and CC) and the result conditions (~SE and ~WP) can be obtained. Based on the configuration analysis steps, once the frequency threshold (1.0 in this study) and consistency threshold (0.8 in this study) are set, the intermediate and parsimonious solutions on non-high levels of value creation (~SE and ~WP) can be obtained. According to the intermediate solutions and the parsimonious solutions, the configurations for non-high levels of value creation are shown in Tables 7 and 8.

Table 7. Configurations for non-high levels of system evaluation.

Conditions	User Value Perception: Non-High Levels of System Evaluation (~SE)			
	1	2	3	4
~PO		●	⊗	⊗
~DM	⊗	⊗	●	⊗
~IG	⊗	⊗	⊗	●
~KS	⊗	⊗	⊗	●
~CS	⊗		●	●
~CC	⊗	⊗	●	●
# of observations	9	7	1	1
Raw coverage	0.633	0.501	0.286	0.157
Unique coverage	0.133	0.027	0.079	0.053
Consistency	0.923	0.949	1	1
Solution coverage	0.870			
Solution consistency	0.943			

Note: "●" means the core causal condition is present and "•" means the peripheral cause condition is present; "⊗" means the core causal condition is absent, and "⊗" means the peripheral causal condition is absent; a blank cell indicates that the condition, existing or absent, does not lead to the result.

Table 8. Configurations strongly related to non-high levels of willingness to pay.

Conditions	User Value Perception: Non-High Levels of Willingness to Pay (~WP)	
	1	2
~PO		●
~DM	⊗	⊗
~IG	⊗	⊗
~KS	⊗	⊗
~CS	⊗	
~CC	⊗	⊗
# of observations	9	7
Raw coverage	0.685	0.527
Unique coverage	0.185	0.027
Consistency	1	1
Solution coverage	0.712	
Solution consistency	1	

Note: "•" means the peripheral causal condition is present; "⊗" means the core causal condition is absent and "⊗" means the peripheral causal condition is absent; a blank cell indicates that the condition, present or absent, does not lead to the result.

Comparing the configurations of six types of inhibition in value creation, it can be found that different antecedent configurations can cause non-high levels of value creation, which indicates causality equivalency about the antecedent configurations for non-high levels of value creation in platform enterprises. In the two coincident configurations for non-high levels of value creation, lower continuous commitment (~CC), demand matching (~DM), and lower knowledge sharing (~KS) are also the core causal conditions for the

results. In addition, the two configurations of non-high levels of value creation are also key configurations to advance negative systematic evaluation and lower willingness to pay, with the coverage rates being 0.133 and 0.185, respectively, which also cover the most observations. In other words, insufficient matching of supply and demand, insufficient interactive guidance, insufficient knowledge sharing, insufficient supply of complementarity, or lack of continuous user commitment are most likely to jointly lead to non-high levels of value creation in platform enterprises.

Specifically, based on the absence of user participation, the absence of demand matching and interaction guidance will promote non-high levels of value creation (1). Conversely, based on lower platform openness and demand matching, it will still produce non-high levels of value creation (~SE) even with active interaction guidance and user participation (4). Configuration 2 shows that, based on the absence of demand matching and knowledge sharing, non-high levels of value creation will be caused by the conditions of PO, ~IG, and ~CC. Configuration 3 depicts that, under the absence of platform openness, interaction guidance, and knowledge sharing, non-high levels of value creation (~SE) will be produced even with active demand matching, complementarity supply, and continuous commitment.

A comparison of the configurations of high and non-high levels of value creation in platform enterprises shows that (i) the configurations of high and non-high levels of value creation are apparently different, which demonstrates the asymmetric causality in the relationship between value creation antecedents and results in platform enterprises; (ii) all of the configurations include conditions of platform construction (oriented to the efficiency logic) and user participation (oriented to the efficiency logic), which means the value creation of platform enterprises need to be explained by hybrid logic instead of single logic. These findings further expand the conclusions of the existing studies [31]. Thus, the configuration analysis based on fsQCA is a proper way to explore the complex interactive causality in the context of value creation.

5. Implications and Future Research

This study analyzes the antecedent conditions and configurations that drive high and non-high levels of value creation in knowledge-based platform enterprises' ecosystems. Based on two dominant logics of value creation in platform enterprises, we proposed a research model and then used the empirical data to identify antecedent configurations using the fsQCA approach. The results show that platform construction and user participation are two core elements that affect the value creation of platform enterprises. Platform construction consists of three aspects: platform openness, demand matching, and interaction guidance, while user participation is composed of knowledge sharing, complementarity supply, and continuous commitment. The fsQCA analysis further indicates that value creation in platform enterprises follows a hybrid value creation logic in order to obtain sustainable competitive advantages. On the one hand, platform enterprises, as the main entity, actively match the needs of platform users and provide a user-friendly interface for user interactions as well as an open platform configuration to effectively reduce the platform cost, which follows a transaction-cost-based efficiency logic [20]. On the other hand, platform users, as the main players in the platform, also actively participate in knowledge sharing, provide complementarity information or products, and continue to pay attention/commitment to the platform, thereby enhancing the collaborative innovative value of platform enterprises, an innovation logic derived from PFI theory [22]. In addition, the fsQCA results also show that there is an asymmetrical causality between platform construction and user participation and platform enterprises' value creation. Active user participation is the key component for platform enterprises to create value, while negative platform construction is the major factor that causes non-high levels of value creation in platform enterprises. In addition, platform users' continuous commitment is the core condition in both high and non-high levels of value creation, indicating that users' continuous attention and dedicated commitment to the platform play a critical role in creating sustainable ecosystems, which is consistent with the findings of previous research [3,21].

While platform enterprises do not manufacture products themselves, their value creation is achieved through high-frequency interaction and knowledge sharing between platform users. Platform users can also obtain increased values through acquiring and adapting to efficient platform systems to meet their own needs, which makes them more likely to use the same platform. With platform users' continuous commitment, platform enterprises can continue to enjoy the benefits of the network effect [3].

5.1. Theoretical and Practical Implications

There has been insufficient evidence in platform ecosystems on how platform enterprises create sustainable competitive advantages, particularly in emerging markets. Based on the analysis of the existing literature, this study argues that platform enterprises can achieve sustainable growth through value creation and that platform construction and user participation are two groups of important antecedent conditions for value creation in platform enterprises. Our research model proposes a dual logic model for platform enterprises' value creation: efficiency logic and innovation logic. Then, using empirical data from Chinese platform enterprises, we identify the configurational effects and a hybrid logic of platform construction and user participation in one of the most vibrant emerging markets. The findings of this study can have important theoretical implications and provide insightful guidance for the strategic management of platform enterprises in the era of the sharing economy.

This study analyzes the antecedent configuration of platform enterprises' value creation and provides empirical evidence for the important roles of platform construction and user participation in this process, as well as the key paths that achieve high and non-high levels of value creation. The findings are valuable to yielding a better understanding of the value creation theory for platform enterprises. Past research on value creation has often assumed that there is a symmetric causal relationship between the antecedents and result conditions, thus ignoring the complexity in the causal effect between these two sets of configurations. Our study on the value creation path using two scenarios—"presence" (high levels of value creation) and "absence" (non-high levels of value creation)—confirms an asymmetric causality between the antecedent condition and the result condition: different factors have different impacts on value creation in platform enterprises. Our findings, using a fsQCA model and configuration analysis, are thus able to help develop a finer-grained theory of value creation in platform enterprises.

The results of the configuration analysis in this study also have important practical implications for platform businesses. The findings of this study show that, although platform construction and user participation follow different value creation logics, they both contribute to platform enterprises' value creation and in different roles. While active user participation is more able to promote knowledge sharing, which leads to positive value creation in platform enterprises, insufficient platform construction is more detrimental to value creation in platform enterprises. Based on this finding, we suggest that platform enterprises with weak competitive advantage and poor performance should first focus on platform construction, creating an open platform structure, effectively matching supply markets and demand markets and providing a user-friendly and fair interface for more frequent user interactions. The platform enterprises are also called on to explore how their management teams can be more entrepreneurial in creating opportunities for more efficient value creation and innovation in different sectors [66]. In contrast, those high-quality platforms that aim to gain sustainable advantages should pay more attention to user participation and interactions, encouraging users to actively share knowledge, provide complementary resources, and continuously stay committed to the platform ecosystem, thereby enhancing the collaborative value of the platform ecosystem. Given that China is one of the most important emerging markets, with many new innovative policies implemented for its new round of economic growth [67], the findings on platform enterprises and their valuable creation in the Chinese context can also have important implications for research on platform enterprises in other emerging markets.

5.2. Limitations and Future Research

This study examines the antecedent conditions of value creation in platform enterprises. Although we strictly followed the standard procedures of the fsQCA approach in research design, data collection, and analysis steps, there are still some limitations. First, the method fsQCA itself has some inherent limitations in developing accurate theoretical explanations for observed phenomena, which needs to be considered in similar future studies [50]. Second, although the sample size based on the theoretical model is relatively large (324 questionnaires), it involves only 26 Chinese platform enterprises, and, thus, only 26 cases can be used for fsQCA analysis. In addition, although the proportion of observed cases with the antecedent conditions meet the requirements of fsQCA analysis and the fsQCA analysis can incorporate unobserved samples into the analysis process, future analysis with a larger sample would be more convincing and robust. Third, while the questionnaires were completed by a variety of platform enterprises' users, including takeout restaurant distributors, online authors, and other supply-side users, they are mostly college students, which may cause bias in the results. Future research has to take this into consideration to enhance the robustness of the research. Fourth, this study attempts to analyze how Chinese platform enterprises create and acquire higher value through platform users' knowledge sharing and the enterprise's platform construction as important performance indicators of an ecosystem and thus focuses on the dominant value creation process for platform enterprises. This study combines a quantitative method—questionnaires—and a qualitative method—fsQCA—to examine the common antecedents of value creation in platform enterprises. Future studies could conduct more qualitative analysis on a particular type of platform for better understanding of platform enterprises, such as e-commerce platforms. Future research could also consider other aspects such as financial performance or strategic choices in other emerging markets in order to obtain a more holistic picture of how platform enterprises can create and sustain their competitive advantage in the age of the knowledge economy.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data are available upon request from the authors.

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A. Questionnaire Items

The questionnaire items used for platform construction and user participation in this study are as follows. All of the conditions were measured using 7-point Likert scales. Respondents was asked to indicate their degree of agreement with the descriptions of the platform, with 1 to 7 representing totally disagree to totally agree.

Platform Openness

- I don't need to go through a complex process (such as providing real name or detailed personal information) to register for this platform
- I can register for the platform without rigid scrutiny or meeting certain criteria for qualification
- I can still join other platforms after I register for this platform

Demand Matching

- I can find satisfactory information from the platform with little time or cost
- The platform recommends products or services or links to other information that is what I like, or I am looking for

Interaction Guidance

- The platform provides very detailed guidance, manuals, or explanation whereby I can easily learn how to use all available functions
- I have the freedom to decide how and when I can join or leave the platform
- I can interact with other platform users through various secure methods (such as apps, web site, or email)

Knowledge Sharing

- I am willing to spend time sharing my ideas and suggestions in order to help the platform to improve its products and process
- The platform provides a good environment and opportunities for me to share ideas and suggestions
- The platform provides appropriate incentives for my ideas or suggestions

Complementary Supply

- I am willing to write comments for products or services provided in the platform
- I am willing to provide thorough evaluation based on my experiences on products in the platform
- I believe the merchants in the platform have provided good products or services
- The merchants in the platform provide timely and specific responses to my suggestions and comments

Continuous Commitment

- I will continuously pay attention to the development and progress in the platform
- I am willing to continuously provide suggestions for helping improve products or services in the platform
- I am willing to continue using the products or services provided in the platform

System Evaluation

- The platform provides an efficient system to serve my needs
- I think it is easy to learn to use all the functions in the platform

Willingness to Pay

- I am willing to spend time in the platform
- I am willing to pay for the products or services provided in the platform

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