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Platform Ecosystem: The Logic of Digital Business Model Innovation

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Abstract: This paper examines the impact of big data capability and value network reconstruction on digital business platforms' ecosystem co-creation value. Furthermore, it presents a mechanism model, with business model innovation as the mediating variable. The findings of this study are of considerable importance for digital business platforms seeking to enhance their platform ecosystem co-creation value, particularly in light of their big data capability and value network reconstruction.

Keywords: Digital business platform; Big data capability; Value network reconstruction; Business model innovation; Platform ecosystem; Value co-creation

1. Introduction

The global digital economy has reached a point of significant expansion, with digital technologies such as big data, blockchain, cloud computing, and artificial intelligence entering a period of rapid growth and integration across various sectors of the social economy (Skare and Riberio Soriano, 2021). The amount of data in the era of digital economy has proliferated rapidly, and the data elements are important production factor and strategic resource for enterprises (Schradie, 2011). In the face of the new economic form, the input and output logic of a value chain has been difficult to help enterprises in the fierce market competition to achieve a clear advantage (Ren Yizhong, 2018). Meanwhile, the digital economy has prompted changes in the value logic, the elements in the business model have produced the alternation of the old and the new, for example, the O2O model is gradually replacing the traditional distribution channel module. This study aims to reveal how the big data capability(BDC) and value network reconstruction(VNR) of digital business platforms affect the platform ecosystem co-creation value(PECV) through the mediating variable business model innovation(BMI).

2. Literature Review of Platform Ecosystem Co-creation Value

The concept of ecosystems represents an application of the biological term 'ecosystem' to the field of management studies(Moore, 1993). Subsequently, ecosystem theory has developed into three distinct schools of thought: innovation ecosystems, business ecosystems, and platform ecosystems(Jacobides et al., 2018). Cenamor (2021) presents the argument that platform ecosystems are comprised of a core module and interchangeable modules. Tiwana (2015) initiated research on platform ecosystems from the standpoint of the three principal parties, platform enterprises, complementary enterprises and users. Cozzolino et al. (2021) offer a summary of these characteristics, which they identify as platformity, symbiosis, and synergy. Platformity emphasizes that the platform is the foundation, connecting multilateral participants. Symbiosis emphasizes value co-creation, resource sharing and complementary capabilities among various subjects, thus enhancing the overall competitive advantage. Synergy mentions that platform ecosystems are composed of multiple participants with heterogeneity (Hurni et al., 2022). In addition, they are distinguished from conventional organizational networks on account of their capacity to adaptively respond to external stimuli (Poniatowski et al., 2021). Furthermore, Ozalp et al. (2018) put forth the concept of networkedness, which posits that the intricate interconnections between participants in an ecosystem can be conceptualized as mesh-like institutions.

2.1 Dimensions of Platform Ecosystem Co-creation Value

PECV is currently a topic of considerable interest within the academic community. Busser and Shulga (2017) constructed a five-dimensional co-creation value evaluation system for Meaningfulness, Collaboration, Contribution, Recognition and Affective Response. In accordance with the findings of Zhong Qi et al. (2021), this paper will assess the PECV in relation to platform enterprises value, complementary enterprises value, users value.

2.2 Factors Influencing Platform Ecosystem

Some scholars examine the impact of government, owners and participants on platform ecosystems from the standpoint of diverse

subjects (Jacobides, 2019; Chen Jian et al., 2020). Additionally, an imbalanced competitive relationship is not conducive to the long-term development of the whole ecosystem(Guo and Wu, 2018; Feng et al., 2018; Shipilov and Gawer, 2020). The platform's homolateral and heterolateral network effects exert a significant influence on the platform ecosystem (Rangaswamy et al., 2020). Loux et al. (2020) postulated that platforms with a user base can attract other participants, and in turn attracts new users.

2.3 Synthesis of Platform Ecosystem Co-creation Value Research

Currently, research on the connotations and characteristics of platform ecosystem has initial progress, converging towards a dominant perspective. Nevertheless, existing research has focused unduly on the core enterprises of the platform, with insufficient attention paid to PECV. The limitations of research on platform ecosystem dimensions are primarily due to an insufficient research basis. The genesis of research into the factors influencing platform ecosystem was the need to address the bottleneck problem. The content of research has gradually shifted from an examination of the stakeholders involved in the platform ecosystem to an investigation of the interactions and relationships between these stakeholders.

3. Literature Review of Big Data Capability

This paper, by analyzing the results of related research, finds that the conceptual definition of BDC is mainly based on the theoretical foundations of the IT capability theory, the resource-based theory, and the dynamic capability theory. In the IT capability and the dynamic capability theory, the core of BDC is to perform data analysis. In resource-based theory, an enterprise can be conceptualized as a collection of resources. The BDC can be considered a basic resource, which provides effective information for enterprise decision-making by making full use of massive data, thus enabling the enterprise to gain an advantage in the context of external market competition(Xie Weihong et al., 2016). In accordance with the resource-based theory and dynamic capability theory, this paper posits that BDC represents a higher-order dynamic capability, whereby big data resources are integrated, stored, analyzed and applied in order to cope with changes in the external environment.

3.1 Dimensions of Big Data Capability

Foreign scholars are more unified in their approach to the classification of BDC, with the theoretical basis of their research primarily comprising the resource-based theory and dynamic capability theory. In contrast, domestic scholars tend to categories BDC based on the big data activities conducted by enterprises(Xie Weihong et al., 2018). Additionally, domestic scholars have proposed a multitude of scales. This paper presents a synthesis of the views of various parties and proposes a division of the BDC dimension into four categories: integration capability, storage capability, analysis capability and application capability.

3.2 Impact of Big Data Capability on Platform Ecosystem

The utilization of BDC has been demonstrated to exert a beneficial facilitating influence on the value co-creation process within platform ecosystems. Scholars have demonstrated that data empowerment can effectively promote the value co-creation of platform enterprises through single-case analyses (Zhou Wenhui et al., 2018; Hu Haibo and Lu Haitao, 2018). In their 2018 study, Zhang Ying and colleagues examined the evolution of the big data service ecosystem, mapping the progression from data collection to decision-making along the value chain.

3.3 Impact of Big Data Capability on Business Model Innovation

The investigation of the beneficial impact of BDC on BMI has made notable advancements. In the context of consumption upgrading, Li Wen et al. (2020) proposed that the three dimensions of BDC are a closed whole with a coordinated and cooperative relationship with each other. Each of these dimensions possesses a path to drive BMI. Li Wen et al. (2022) employed the fsQCA method to demonstrate that in-depth analysis capability represents the core grouping condition that drives BMI.

3.4 Synthesis of Big Data Capability Research

There remains a lack of consensus and a paucity of unified understanding on in-depth examination of the connotations and constituent elements of the emerging concept of BDC. The enhancement of BDC on the performance of platform core enterprises has been widely agreed upon by scholars. However, based on the value co-creation perspective of this paper, research on the PECV of BDC on platforms is limited. Consequently, this represents a significant research gap that requires urgent attention in the future. Scholars have conducted empirical analyses of diverse research subjects and discovered that BDC exerts a considerable positive impact on BMI. Furthermore, there is a substantial body of research elucidating the influence pathways traversing various dimensions.

4. Literature Review of Value Network Reconstruction

With the advent of the digital economy and the accelerated advancement of digital technology, the conventional industrial boundaries have been dismantled, and cross-industry value networks have gradually supplanted individual core enterprises as the primary agents of value creation. The value chain and other related theories have been called into question for their inability to provide a coherent explanation for the emergence of a new economic form of cooperation based on win-win strategies. At this juncture, value network theory has garnered consid-

erable interest by advocating for inter-firm competitiveness and challenging the undue emphasis on competitive relationships in value chain theory (Gulati et al., 2000; Kothandaraman & Wilson, 2001). The value network is dynamic and user-centered. Value is transmitted in a two-dimensional network-like manner among stakeholders in the network. The members of the value network in the narrow sense are suppliers, focal firms, competitors, substitutes, complementarities and customers. However, in real life, there are many other economic agents involved in the network activities, such as partners, intermediaries. It may no longer be the case that traditional cost and revenue coordination elements have become transformed into each other. This illustrates that the narrow value network theory is unable to account for the increasingly complex economic forms that are prevalent in the present era. The VNR considered in this paper is comprehensive and advocates the reconstruction of the traditional value network.

The characteristics of the value network include an inconsistent input-output ratio of stakeholders due to the pursuit of overall economic efficiency, which is a process of balancing competing interests. The relationships between stakeholders in the value network are complex and evolving, necessitating a coordination mechanism to prevent the disintegration of the value network caused by the network members' relationships becoming adversarial (Wang Shuxiang et al., 2014; Silva et al., 2017); the value network is characterized by a hierarchical structure, with a smaller number of business entities at the upper levels of the pyramid (Wang Shuxiang et al., 2014).

4.1 Dimensions of Value Network Reconstruction

A significant number of scholars have adopted a modular approach to the study of VNR, with their work drawing upon the insights of Luo Min (2005), Yu Donghua and Rui Mingjie (2007). This paper proposes a distinction between internal and external VNR. The internal VNR is concerned with the core competence, product and organizational structure, whereas the external VNR is focused on the suppliers, technological innovation, users, industrial environment and capital market orientation.

4.2 Impact of Value Network Reconstruction on Platform Ecosystem

VNR has a beneficial impact on the platform ecosystem. The connotation of value network reconfiguration and platform ecosystem is consistent to some extent, and the positive contribution of VNR to PECV is inevitable. Wang et al. (2018) proposed from the perspective of supply chain that under certain circumstances, the network supply chain brings more benefits to all the subjects in the supply chain than the vertical supply chain. Ning Lianju et al. (2022) employed a single case study to deduce the logic of the evolution of value networks and the innovation capability of platform-based enterprises in platform ecosystems.

4.3 Impact of Value Network Reconstruction on Business Model Innovation

The process of BMI entails the continuous deconstruction and reconstruction of the value network, with the objective of realizing the value of all parties involved (Wang Qin, 2011). Some scholars have already examined the relationship between VNR and BMI, basing their work on Zott and Amit's (2007) dimensional division of BMI into efficiency-based and novelty-based categories (Ren Yizhong, 2018). Value networks and business models are consistent in value creation (Benny and Wahyono, 2019), and thus this paper introduces the mediating variable of BMI to study the mechanism by which VNR indirectly affects platform ecosystem. The majority of research on BMI based on value networks conducted by scholars thus far has focused on network embedding as the entry point. This approach, however, risks falling into the "embeddedness paradox" of strong and weak links (Zhang Chunyu et al., 2018). The theory of strong linkage advantage posits that strong linkages can facilitate the acquisition of scarce resources and the establishment of trust relationships for enterprises. In contrast, the theory of weak linkage advantage suggests that weak linkages can enable the efficient delivery of novel and heterogeneous resources. This paper posits that the advantages derived from strong and weak linkages are not static but rather undergo a process of constant alternation. The strategic positioning and life cycle of the value network within the enterprise serve as pivotal determinants in the dynamic evolution of relative advantages.

4.4 Synthesis of Value Network Reconstruction Research

The applicability of value chain theory is increasingly being questioned in light of the evolving economic landscape, with value network theory emerging as a potential alternative. The field of research on VNR is still in its early stages of development, and there is currently no established research framework. There is a diversity of opinion among scholars regarding the components of VNR. However, there is a growing consensus emerging. The research on the impact of VNR on the platform ecosystem has primarily focused on the core enterprises within the ecosystem. However, it is imperative to expand the scope of research to encompass other participants in the ecosystem in the future. The processes of VNR and BMI are aligned in their objective of value creation. However, the extant literature on these topics exhibits a lack of consensus regarding the classification of dimensions and the influence path.

5. Literature Review of Business Model Innovation

Osterwalder (2010) proposed the business model canvas in his seminal work, Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. The manner in which different business models are presented varies according to the specific characteristics

of the modules. The definition of BMI proposed by scholars is based on four perspectives: organizational structure, strategic operation, the nature of innovation and value creation. From the perspective of organizational structure, alterations to any constituent element of the organization may precipitate BMI. From the perspective of strategic operation, BMI represents a more advanced form of innovation than product, process and business innovation. From the perspective of the nature of innovation, BMI is a disruptive innovation based on the recognition and perception of new opportunities. From the perspective of value creation, the crux of BMI lies in the acquisition of value based on the innovation of the value proposition, creation and delivery. For digital business platforms, collaborative innovation and value co-creation represent the distinctive hallmarks of platform BMI (Zhong Qi et al., 2021). In accordance with the value creation perspective, this paper posits that BMI represents a form of innovation predicated on value proposition innovation, with the objective of facilitating the processes of value creation and value realization.

5.1 Dimensions of Business Model Innovation

Scholars have made in-depth research on the components of BMI, and this paper combines the research themes to sort out the related literature. The scholars' dimensional division of BMI is diversified due to the different research objects and themes, and most of the articles will take the value proposition innovation and value creation innovation as the dimensions, and this paper also introduces the value realization innovation dimension(Spieth et al. 2016).

5.2 The Mediating Role of Business Model Innovation

BMI is a frequently utilized mediating variable in a multitude of related research fields. It is evident that the research framework concerning the mediating role of BMI between digital empowerment and enterprise value is well-developed(Guo Hai and Han Jiaping, 2019; Zhang Jie and Kuang Minghui, 2024; Wang Chao et al., 2024; Jing Hui and Jiang Kehui, 2024). Additionally, VNR and BMI are consistent in value creation (Benny and Wahyono, 2019). Consequently, this paper introduces BMI as a mediating variable and investigates the impact of the digital business platform's BDC and VNR on the PECV.

5.3 Synthesis of Business Model Innovation Research

The field of research on BMI is still in its infancy, and there is currently no mature theoretical research framework that is generally accepted by the academic community. Nevertheless, BMI has been more extensively researched as a mediator variable in related studies. Furthermore, BMI offers a suitable and well-developed perspective for investigating the mechanisms through which BDC and VNR affect PECV. Consequently, this paper considers it a mediator variable. The research on BMI as a mediator between BDC and various types of enterprise performance has already established a coherent system of inquiry. However, there is a paucity of studies on the mediating role of other participants in the platform ecosystem. The extant studies have accorded undue attention to the relationship between external VNR and BMI, while undervaluing the decisive role of internal VNR on BMI.

6. Synthesis of Literature Review

This paper presents a comprehensive review of the pertinent literature, offering a detailed account of the mechanism model that integrates the digital business platform with the research topic of this paper, see Figure 1.

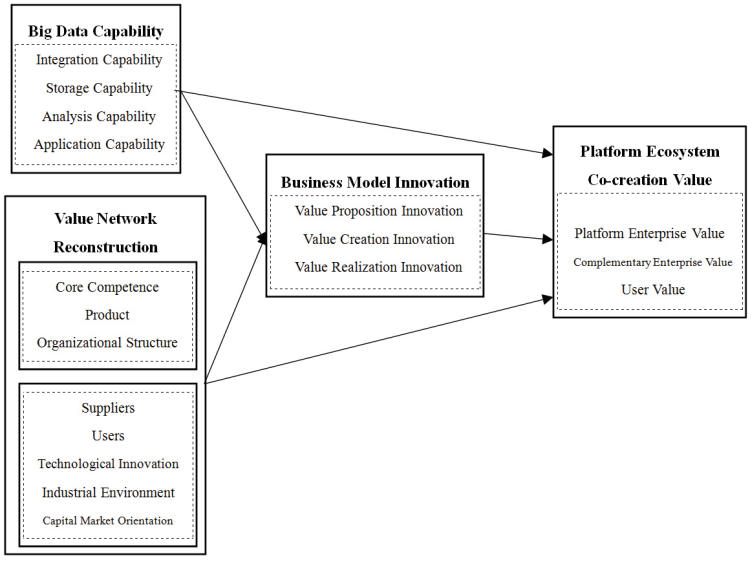

Figure 1. Mechanism Model

In the mechanism model, platform ecosystem co-creation value is categorised into platform enterprise value, complementary enterprise value and user value. For the dimension of big data capability, this paper considers that integration capability is the ability to integrate big data-related data resources, manpower and technology; storage capability is mainly reflected in the construction of parallel computing platform and distributed storage; analysis capability is the ability to mine valuable information from massive data; application capability is the ability to realise insight, prediction and intelligent operation based on big data value. For the dimension of value network reconstruction, this paper considers that the internal VNR includes the reconstruction of core competence, product and organisational structure; the external VNR includes suppliers, technological innovation, users, industrial environment and capital market orientation. With regard to the dimension of BMI, this paper considers that value proposition innovation is the innovation of customer value through the accurate positioning of target groups and their needs; value creation innovation is the enterprise innovation activity that brings about an increase in the scale of value creation and the form of value creation with the goal of realising the value of the customer; and value realisation innovation is the innovation activity concerning profit mechanisms and the measures to ensure the acquisition of value.

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