Journal of Global Information Management
Volume 31 • Issue 1

Digital Transformation and Firm Performance:
Benefit From Letting Users Participate

Feifei Zhao, School of Business Administration, Dongbei University of Finance and Economics, China
Tao Meng, International Business College, Dongbei University of Finance and Economics, China
Wei Wang, School of Economics and Finance, Xi'an Jiaotong University, China*
Faizan Alam, School of International Studies, Dongbei University of Finance and Economics, China
https://orcid.org/0000-0003-3703-5170
Bingchao Zhang, School of Management, Shandong Technology and Business University, China

ABSTRACT

Digital transformation has become an important channel for firms to build a competitive advantage in the digital economy. However, user participation, an important source of external knowledge for firms, has received limited attention in research related to digital transformation. Drawing on the knowledge-based view, the study uses a sample of 247 Chinese firms to investigate the impact of digital transformation on firm performance. The study examines the mediating role of user participation between digital transformation and firm performance and the moderating role of both environmental dynamics and absorptive capacity on the relationship between user participation and firm performance. Findings herein encourage digital transformation firms to pay attention to user participation, strengthen their ability to establish good relationships with users, improve their ability to absorb their knowledge, and make a strong effort to cultivate digital users.

KEYWORDS

Absorptive Capacity, Digital Transformation, Environmental Dynamics, Firm Performance, User Participation

INTRODUCTION

The deep integration between digital technology and the real economy (i.e., digital transformation) has become a major trend given the historical intersection of the new round of technological revolution. Digital transformation is the transformation undergone by firms that adopt digital technologies to create more value for the firm (Dehning et al., 2003; Tijan et al., 2021; Xie et al., 2022). Because successful digital transformation brings firms significant benefits such as increased agility, profit, and improvement in the services offered, many firms initiate digital transformation to achieve competitive

DOI: 10.4018/JGIM.322104 *Corresponding Author

This article published as an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.

advantage (Philippart, 2022; Sultana et al., 2021). According to the statistical data of the 2021 research on digital transformation index of Chinese enterprises released by Accenture, the average digital score has increased from 37 points in 2018 to 54 points in 2021 (based on the full score of 100 for the ideal digital enterprise in the future), with the proportion of Chinese firms having remarkable results in digital transformation significantly increasing from 7% in 2018 to 16% in 2021, indicating that the overall level of digital transformation of Chinese firms has seen steady improvements (Kong et al., 2022). Given the infinite possibilities and the significant benefits of digital transformation, digital transformation has become an important and promising topic in the information management field (Philippart, 2022; Sultana et al., 2021).

According to prior research, scholars have argued that digital transformation helps firms to be more competitive (Ferreira et al., 2019; Singh et al., 2021; Llopis-Albert et al., 2021). They discuss the relationship between digital transformation and firm performance from different perspectives, including information technology (IT) capabilities and organizational agility, thus making theoretical contributions to the digital transformation literature (Chouaibi et al., 2022; Nwankpa & Roumani, 2016). Although insightful conclusions have been made, prior literature focuses on the internal capabilities and resources of firms, leaving the role of external factors, especially users, underexplored. Users are those that use a firm's product and own the most relevant information and knowledge on the firm's products (Chatterji & Fabrizio, 2014). Moreover, in the digital age, information technologies empower users such that the distinctions between users and firms are blurred (Prahalad & Ramaswamy, 2000). Users can participate in the production, design, and other projects to help firms improve their business. As such, user participation, which captures a firm's interaction with users to co-construct the offering (Ngo & O'Cass, 2013), has become one of the most important ways to increase firms' competitiveness (Rayna & Striukova, 2021). Thus, exploring digital transformation from a user participation perspective and finding out how digital transformation promotes firm performance through user participation are valuable undertakings.

In our study, we examined the relationship between digital transformation and firm performance via a lens of user participation. Because digital transformation makes knowledge more reachable (Dehning et al., 2003) and user participation provides an important source of knowledge for all firms (Abrell et al., 2016), we developed our research framework based on the knowledge-based view (KBV) (Grant, 1996) in which we propose that digital transformation promotes firm performance through the mediation role of user participation. We also propose two moderators, environmental dynamics and absorptive capacity (Cohen & Levinthal, 1990; Sun et al., 2020), to moderate the relationship between user participation and firm performance because the two variables affect firms' information and knowledge obtaining, and they are thus relevant.

Based on the framework, we discussed the following important research issues from theoretical analysis and empirical tests:

- Does digital transformation promote user participation and firm performance?
- If so, does user participation mediate the relationship between digital transformation and firm performance?
- Given that different firms have different capacity and are in different environment, is the impact of user participation on firm performance significantly moderated by environmental dynamics and absorptive capacity?

Drawing on a survey data of 247 Chinese firms, we examined our research framework and made three main contributions herein: First, we enriched the research on digital transformation by discussing it from a user participation perspective and finding that user participation plays a mediating role in the relationship between digital transformation and firm performance. Second, we introduced the KBV to study firms' digital transformation, thus extending its range of application. Third, we went

beyond the mainstream user participation literature, which studies users' behavior, to study the impact of user participation on a firm, enriching literature on user participation.

THEORETICAL FOUNDATION AND HYPOTHESIS DEVELOPMENT

Theoretical Background and Research Framework

As an extension of the resource-based view (RBV) (Moreno et al., 2012; Cuthbertson & Furseth, 2022) that emphasizes competitive advantage results from the heterogeneity of firms' resources (Barney, 1991), the knowledge based view (KBV) redirects RBV to knowledge and describes knowledge as the most important strategic resource in any organization (Kogut & Zander, 1992), thereby significantly impacting long-term firm performance (Grant, 1996).

According to KBV, knowledge can be obtained from firms' external stakeholders (Grant, 1996) such as users and customers (Abrell et al., 2016). Such knowledge brings heterogeneous resources and knowledge (Cai et al., 2022) and helps firms in both operation and innovation (Abrell et al., 2016; Bano & Zowghi, 2015). In the digital age, the development of information and communication technologies empowers firms and makes knowledge more reachable. In this situation, firms frequently use those digital technologies to obtain knowledge and manage their business relationships (Dehning et al., 2003).

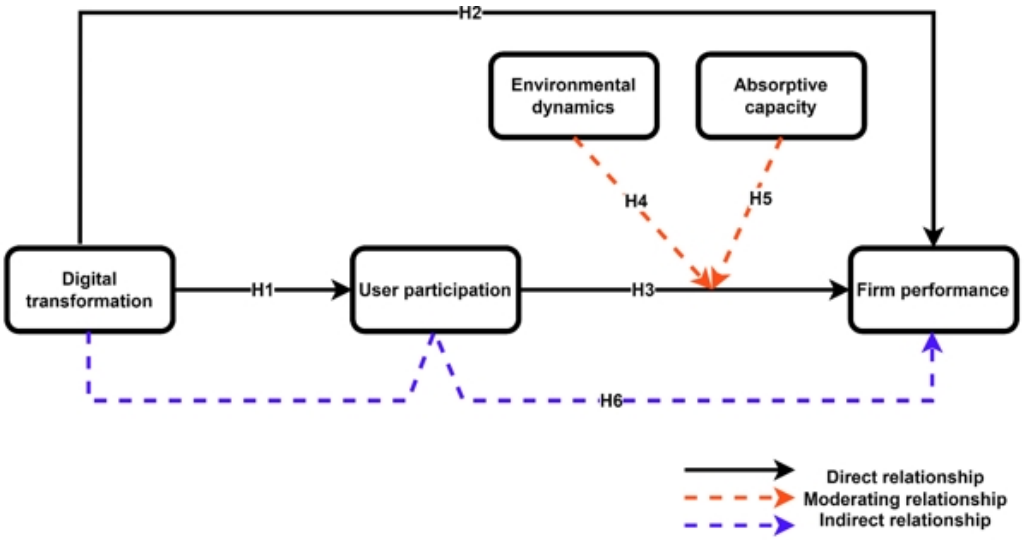
Hence, such digital technologies and the changes that they sparked aroused the interests of KBV scholars (e.g., Trantopoulos et al., 2017; Xie et al., 2022). For example, based on KBV, Trantopoulos et al. (2017) examined how searches in external knowledge sources, combined with IT, influences firms' process innovation performance. Gupta et al. (2021) revealed the relationship between big data analytics and firm market performance. Xie et al. (2022) studied how digital transformation affects agricultural firms' pro-land behavior.

Among the research on digital technologies, digital transformation, which is a kind of organizational change caused by the use of digital technologies, such as big data, cloud computing, mobile technology, digital twins, and social media platforms, to improve firms' business, processes, and relationships (Dehning et al., 2003; Tijan et al., 2021; Xie et al., 2022; Zheng et al., 2022), has become an emerging research context for information management scholars (e.g., Ferreira et al., 2019; Xia et al., 2022; Xie et al., 2022) because it brings important organizational changes and is essential for improving productivity, core competitiveness, and sustainability (Eller et al., 2020). Following this stream of research, we studied digital transformation's impact on firm performance based on the KBV. We propose that digital transformation promotes both user participation and firm performance, and we posit the mediating role of user participation in the relationship between digital transformation and firm performance based on KBV. User participation is studied because users are an important source of knowledge for all firms (Abrell et al., 2016) and the use of digital technologies expands firms' ability to connect their users (Amit & Han, 2017). We also proposed two moderators—environmental dynamics and absorptive capacity—to moderate the relationship between user participation and firm performance. Environmental dynamics affect firms' information and knowledge obtaining, and in a dynamic environment, the knowledge of technology or product-related trends is sorely needed (Sun et al., 2020). Absorptive capacity is firms' capacity to identify, absorb, and commoditize external knowledge (Cohen & Levinthal, 1990). Hence, the two variables are relevant. Our research model is presented and summarized in Figure 1.

Digital Transformation and User Participation

Digital transformation is an organizational strategic change based on the diffusion and shaping of digital technology (Hanelt et al., 2020). When a firm undergoes digital transformation, digital technologies such as big data, social media platforms, cloud computing, mobile, and digital twins are used to improve their business (Liu et al., 2022; Xia et al., 2022; Xie et al., 2022; Xu et al.,

Figure 1.
Conceptual framework



2023). For example, firms could use big data to analyze their users to detect the most valuable users (Davenport, 2014). They may even use social media to communicate with their users to obtain timely feedback (Agnihotri et al., 2022). With the help of such digital technologies, firms could acquire useful knowledge.

Users are those who use a firm's products. Because of their frequent use of products, users have more information and knowledge on the firm's products and thus can be an important knowledge source for a firm (Chatterji & Fabrizio, 2014). To acquire users' knowledge, firms often invite some users to participate in some projects to share their knowledge (Bogers et al., 2010; Bano et al, 2015) or directly collect information by interacting with them on social media (Kamboj et al., 2018). User participation refers to the degree to which the user is involved in designing, producing, delivering, and diffusing a product or service (Dabholkar, 1990; Ngo & O'Cass, 2013). Thus, user participation is an important topic in research on firms' knowledge (e.g., Xin et al., 2022). According to prior research, digital and technological antecedents, such as technological empowerment, digital environment, and technical capabilities, are potent in explaining user participation (Brodie et al, 2019; Harmerling et al., 2017; Ngo & O'Cass, 2013). Therefore, we propose that digital transformation can promote user participation.

First, digital transformation provides platforms for communication and interactions, both of which help users participate. Digital transformation involves use of digital technologies, making firms and users have a more convenient channel to communicate. Hence, digital transformation creates platforms to share information and knowledge, thus promoting user participation (Nambisan et al. 2017). As Rayna et al. (2015) noted, digital technology provides platforms and enables users to intervene at any stage of the production process. Second, digital transformation helps firms implement product customization (Jin et al., 2020), enabling users to contribute their knowledge throughout the production process. When firms implement product customization, users become more willing to join the process of both production design and production. This in turn increases users' participations in the projects offered by firms (Verhoef et al., 2021). Third, digital transformation helps build trust relationships between firms and users. Digital technologies, such as big data and social media, enable firms to effectively and conveniently communicate with their users (Xie et al., 2016), thereby promoting a better trust relationship (Li et al., 2010). In high-trust environments, users are more eager to share

their knowledge and participate in firms' projects or the platforms (Ikeda & Marshall, 2016; Zhang & Sundaresan, 2010). Hence, digital transformation offers better chances for users to participate and share their knowledge. Formally, we formed the following hypothesis:

Hypothesis 1: Digital transformation has a positive impact on user participation.

Digital Transformation and Firm Performance

Firm performance is an assessment of the firm's return on assets, net profit, sales and market share levels (Ngo & O'Cass, 2013; Ramaswami et al., 2009), thus reflecting the competitiveness of the firm. In the digital age, information technologies bring great changes for firms and thus have attracted the attention of scholars in investigating the antecedents of firm performance from a technological perspective (Almulhim, 2021; Lal & Bharadwaj, 2022; Li et al., 2022; Wang et al., 2022). For example, Hao and Song (2016) studied the impact of technology-driven strategy on business performance, and Xie et al. (2022) studied the impact of big data analytics capabilities on firm performance through organizational agility. Amidst this literature, digital transformation has been paid much attention (Ferreira et al., 2019; Llopis-Albert et al., 2021; Nwankpa & Roumani, 2016) because it is an important strategic change in the digital age. Digital transformation applies and imparts digital technology into firms' ecosystems, enabling them to use digital resources to create differentiated value and obtain competitive advantages (Bharadwaj et al., 2013). In our study, we propose that digital transformation promotes firm performance.

First, by applying digital technology, digital transformation contributes to the quality and efficiency of knowledge search and thus improves firm performance. Digital technology such as social media helps firm access and manage various external relationships (Sashi, 2012), thus helping firms obtain diverse knowledge. Other digital analysis tools, such as big data analysis, enable firms to benefit from a deep and high-quality knowledge search (Trantopoulos et al., 2017; Lanzolla et al., 2021). Second, digital transformation enables better knowledge sharing between firms and their partners, thereby creating better relationships. For example, when using digital technology, firms experiencing digital transformation can share more knowledge with their external partners, thus promoting a better business relationship (Marion & Fixson, 2021; Balakrishnan & Das, 2020), giving these firms a better business environment (Van de Ven, 1992) and thus contributing to their better performance. Third, digital transformation improves organizational agility by increasing firms' intellectual capital (Ahmed et al., 2022). This, in turn, further enhances management capabilities—such as data management, knowledge management, and relationship management—and therefore, helps firms achieve better performance. Essentially, digital transformation improves firms' external knowledge obtaining, knowledge sharing, and knowledge managing, thus promoting their performance. Formally, we formed the following hypothesis:

Hypothesis 2: Digital transformation has a positive impact on firm performance.

User Participation and Firm Performance

User participation refers to users' actively or passively participating in firms' projects on designing, producing, delivering, and diffusing a product or service to share their knowledge on firms or products (Dabholkar, 1990; Ngo & O'Cass, 2013). User participation is an important external knowledge source for firms (Cui & Wu, 2016). Through user participation, factors such as customer satisfaction, loyalty, trust, perception of customization, and cost reduction are all ultimately improved (Hossain et al., 2022). Additionally, user participation reduces the time required for innovative products to reach the market (Feng et al., 2014), improves service quality (Ngo & O'Cass, 2013), and bolsters technology commercialization capability (Cai et al., 2022). Using data from 395 small and medium-sized enterprises (SMEs) in the manufacturing and service sectors, Zaborek and Mazur (2019) found

that user participation improves the firms' operational and financial performance. Our study proposes that user participation promotes firm's performance.

First, user participation helps firms acquire product-related knowledge. For firms, their users know their products most, and these users usually have the most cutting-edge knowledge of the market. By then, users' participation in firms' projects make their knowledge recognized by the firms (Cai et al., 2022). This understanding helps the firms know more about their products and market, enabling them improve their products or services to get a better performance (Taghizadeh et al., 2018; Zhang, 2011). Second, user participation is a process in which firms embed external knowledge into their knowledge value networks. Getting knowledge from users facilitates cooperations and other kinds of cross-boundary activities, thus improving firms' competitiveness (Bano & Zowghi, 2015). Third, user participation helps firms learn from their users and increase their organizational knowledge assets. Knowledge learning and transferring provide diverse knowledge for firms, improving firms' knowledge reserving and learning ability, letting them build a new knowledge system to create more value. Essentially, user participation provides firms a new channel to know, to learn and to create based on user's knowledge. Thus, it is beneficial to firm performance. Formally, we formed the following hypothesis:

Hypothesis 3: User participation has a positive impact on firm performance.

Moderating Roles of Environmental Dynamics and Absorptive Capacity

Environmental dynamics is the measurement and evaluation of the speed, degree, frequency, and unpredictability of environmental changes. High environmental dynamics indicate a more dynamic market demand; this implies more frequent entry and exit of competitors, changing regulations and technologies, and faster product development (Feng et al., 2020). In a more dynamic environment, firms have difficulty accurately estimating the status of their environment and predicting technology or product-related trends (Sun et al., 2020). Therefore, firms need more external knowledge to buffer uncertainty (Hung & Chou, 2013). Hence, we propose that environmental dynamics positively moderates the relationship between user participation and firm performance.

As an important way to acquire external knowledge, user participation generates rich, heterogeneous knowledge that helps companies understand market trends and make timely, accurate market forecasts. In a more dynamic environment, user participation becomes more valuable as environmental dynamics compel firms to learn more about the market (Camps & Luna-Arocas, 2009). Moreover, user participation is a great way to maintain firms' relationships with their users (Alam, 2002), helping firms improve user loyalty. In a more dynamic environment, loyal users provide firms continuous, stable income because they become more willing to repurchase. According to a meta-analysis by Nguyen et al. (2021), open innovation activities, including user participation, strongly contributes to firm performance in more dynamic environments because they provide knowledge on the newest demand flows and market trends. Thus, in more dynamic environments, user participation can prove to be more valuable. Formally, we formed the following hypothesis:

Hypothesis 4: Environmental dynamics positively moderates the relationship between user participation and firm performance.

Absorptive capacity is the ability of a firm to identify, absorb, and commoditize external knowledge (Cohen & Levinthal, 1990). Firms with a better absorptive capacity can learn knowledge faster and can make full use of the knowledge, especially when knowledge is externally sourced (Foss et al., 2011). In open innovation literature, absorptive capacity is posited to help firms learn, absorb, and orchestrate external knowledge, making absorptive capacity positively moderate the relationship between user participation and technological innovation performance (Geilinger et al., 2020). Our

study argues that absorptive capacity moderates the relationship between user participation and firm performance.

Absorptive capacity facilitates the effective integration of new knowledge with existing knowledge in firms, helping create knowledge synergies and facilitating the application of new knowledge. For firms with greater absorptive capacity, external knowledge such as user knowledge can be easily identified and absorbed. Such firms could fast grasp and absorb the knowledge generated by users' participation in firms' projects. This strengthens their knowledge base and improves their competitiveness (Palacios-Marqués et al., 2015). Moreover, a greater absorptive capacity indicates that firms could fully utilize the absorbed knowledge. Hence, by using the knowledge generated by users' participation, firms could improve their quality of decisions (Yoo & Roh, 2021), respond quickly to the market, and commercialize knowledge more accurately into new products, thus bringing about improved performance (Malhotra et al., 2005). Formally, we formed the following hypothesis:

Hypothesis 5: Absorptive capacity positively moderates the relationship between user participation and firm performance.

The Mediating Role of User Participation

In the digital age, digital technologies have greatly expanded access to knowledge, reduced the cost of searching for knowledge, and enabled digital transformation firms to acquire the knowledge from a wider range of external users. Digital transformation allows users to be deeply engaged in the design and production of products and freely express themselves on both firm-owned and third-party social media. As Carlson et al. (2018) pointed out, by inviting users to participate, users' opinions can be obtained and more user-oriented products are developed, making the firms more competitive. Digital transformation provides a wide use of digital technologies, such as big data, mobile, and social media platforms, allowing firms to have convenient connections with their users and enabling user participation. We thus propose that user participation plays a mediating role in the relationship between digital transformation and firm performance.

Digital transformation expands the breadth of knowledge by embedding users in an organization's value network (Vial, 2019; Tan et al., 2020). Digital transformation facilitates the interaction between firms and users, enabling firms to more accurately capture and leverage users' knowledge and facilitate the effective generation of new knowledge and solutions (Boger & Horst, 2014). According to KBV, knowledge can be obtained from firms' external stakeholders, such as users and customers (Abrell et al., 2016; Grant, 1996) with such knowledge greatly helping firms in both operation and innovation (Abrell et al., 2016; Bano & Zowghi, 2015). Hence, knowledge from users increases firms' knowledge base (Bano & Zowghi, 2015; Diehr & Wilhelm, 2017), in turn, improving organizational learning and, eventually, firm performance (Bag et al., 2021; Do & Mai, 2022). Digital transformation also brings useful digital tools to promote deeper communication and richer interactions between firms and users (Matarazzo et al., 2021; Vial, 2019), thus creating a better environment for user participation. By arousing more user participation, knowledge could be integrated and breakthrough improvements could be made (Chen & Liu, 2020; Cui & Wu, 2016) to ultimately promote firm performance. User participation's role can also be seen in the case of COSMOPlat in China: To initiate successful digital transformation, the Haier groups developed a platform, COSMOPlat, to connect its users to achieve their participation in the entire process of product interaction, design, procurement, manufacturing, logistics, experience, iterative upgrading, and other processes. After 2017, Haier finished its digital transformation and started to generate profits based on the platform (311 Supply Chain Research Institute, 2019). By the end of 2021, this platform enabled 3,561 firms in the city of Qingdao, with an increase in industrial output value of over 21 billion (Qilu Evening News, 2022). Because of the important role of user participation in mobilizing firms' knowledge in the digital age (e.g., Abrell et al., 2016; He & King, 2008; Xin et al., 2022), we propose that user participation plays a mediating

role in the relationship between digital transformation and firm performance. Formally, we formed the following hypothesis:

Hypothesis 6: User participation mediates the positive relationship between digital transformation and firm performance.

RESEARCH METHODOLOGY

Survey Method, Data Collection, and Sample Profile

We used a sample from the Chinese manufacturing industry to test the proposed conceptual framework. The manufacturing industry provides a suitable scenario for two reasons. First, manufacturing is the foundation of China's economic development. Second, because of low value addition, an increasing number of Chinese manufacturing industries had considered digital transformation strategies as an opportunity to stay afloat, progress, and execute digital transformation following changes in the external environment (Zhong & Ren, 2023). We selected firms that implemented digital transformation strategies in the past two years for participation in our questionnaire survey. The survey sample was mainly located in representative regions of China, such as Shandong, Liaoning, Zhejiang, Jiangsu, Guangdong, and other provinces. We distributed questionnaires in both e-mail and paper versions.

To improve the questionnaire, increase the response return rate, and ensure the effectiveness and reliability, we delivered questionnaires and collected data from firms' representatives directly or with the help of government officials. Questionnaire respondents were middle and high-level decision makers, department heads, and senior key employees in firms that have implemented digital transformation strategies. To improve the questionnaire recovery rate, questionnaires were mainly issued in the form of anonymous respondents. Moreover, to improve the objectivity of the survey results, respondents were required to have worked in the firm for more than three years and also were adept with the organization's digital transformation strategies. The survey team distributed all questionnaires to avoid possible problems arising from entrusting a third party.

We developed the measurement scale based on the existing literature and adopted it for our study. First, based on a comprehensive review of the relevant literature, an English version of the measurement scale was developed, and the scale was then translated into Chinese by five academics with experience in foreign research. Second, after pre-testing 19 senior executives, we modified the relevant items in the questionnaire. Finally, full discussions with three professors in the field of digital transformation were held to form a formal questionnaire. Questionnaires were collected between May and October 2021, with 350 questionnaires being initially distributed. Ultimately, 311 questionnaires were collected. After excluding incomplete, missing, and inconsistent answers, we ended up with 247 valid questionnaires. The dropped sample showed no significant differences with the used sample in terms of size, age, and ownership. The distribution and statistics of the surveyed firms are summarized in Table 1. The table shows that 52% of the survey's respondents are from the traditional manufacturing industry, whereas 43% are from the IT and high-tech manufacturing industry. This finding clearly shows the digital transformation scenario in China.

Pre-procedure control and a post-test were also used to avoid and detect possible common method deviations (Podsakoff et al., 2003). For the pre-procedure control, first, the purpose of the research was hidden in the questionnaire survey to control the social expectation effect that the respondents may produce. Second, the questionnaire questions were randomly arranged to avoid filling bias owing to the similarity of the same dimension item. Simultaneously, for this study, we designed reverse questions to test the response attitude of the respondents. Third, the anonymous survey was promised in the questionnaire instructions to protect the privacy of the respondents. Meanwhile, for the post-test, we conducted T-tests on both the first 50 questionnaires that were collected and on the

Table 1.
Demographic profile of respondents

Demographics	Category	Frequency	Percent
Firm age	Less than 5 years	51	21
	5–10 years	36	14
	More than 10 years	160	65
Industry type	Traditional manufacturing industry	129	52
	IT and high-tech industry	106	43
	Others	12	5
Ownership	Private	83	34
	State-owned	95	38
	Foreign investment and others	69	28
Firm size	Less than 100 people	53	21
	100–500 people	56	23
	More than 500 people	138	56

last 50 that were collected. The results showed no significant difference between the two samples in the main variables.

Construct Items

All the questions used to assess the variables in this research were derived from prior studies, including questions of digital transformation (Aral & Weill, 2007; Nwankpa & Roumani, 2016), user participation (Ngo & O'Cass, 2013), firm performance (Ngo & O'Cass, 2013; Ramaswami et al, 2009), environmental dynamics (Miller & Friesen, 1982), and absorptive capacity (Yang & Tsai, 2019). Table 2 shows the constructs and their respective items. Additionally, this study used variables, such as firm age, industry type, ownership, and firm size (i.e., number of staff members), as the control variables.

RESULTS

Common Method Bias

There was a risk of common method bias (CMB) in this study because the predictor variables were represented by a similar responding method (Podsakoff et al., 2003). Many researchers (Kock et al., 2021; Rodríguez-Ardura & Meseguer-Artola, 2020; Schwarz et al., 2017) have thus proposed ways to mitigate CMB and reduce bias, such as participant anonymity, unambiguous research questions, and detailed guidance in surveys. This study constructed a common variance factor, and all items were loaded on the factor to check for homology variance. Results of the nested model are shown in Table 3. Among all these models, the five-factor model (i.e., M5) produced the best-fitting result (χ^2/df = 2.086, RMSEA = 0.066, GFI = 0.866, IFI = 0.975, CFI = 0.975, NFI = 0.954). The fitting result for M6, the common method factor model, was slightly lower than the five-factor model, M5 (χ^2/df = 3.119, RMSEA = 0.093, GFI = 0.836, IFI = 0.957, CFI = 0.957, NFI = 0.938). There was no significant improvement, indicating that there was no serious homology variance problem in the measurement (Harris & Mossholder, 1996).

Table 2.
Reliability and validity test

Latent Variable	Observed Variable	Cronbach's Alpha	CR	AVE
Digital transformation	The firm is integrating digital technologies to change business processes.	0.778	0.974	0.926
	The business operation of the firm is shifting toward the use of digital technologies.			
	The firm is operating business processes based on digital technology.			
User participation	The firm provides support services during cooperation with customers.	0.926	0.98	0.891
	The firm interacts with customers to jointly design products that meet customers' unique and ever-changing needs.			
	The firm cooperates with customers to better serve them.			
	The firm cooperates with customers to provide support systems to help them obtain more value from the services.			
	The firm cooperates with customers to jointly produce products that can mobilize their enthusiasm.			
	The firm chooses to allow customers to participate in the services.			
Firm performance	Compared with rivals, the firm has a higher market share.	0.775	0.967	0.908
	Compared with rivals, the firm has a higher profit margin.			
	Compared with rivals, the firm has higher operating income			
Environmental dynamics	The extent to which the firm's products or services have changed in technology.	0.909	0.969	0.861
	The extent to which customer needs or preferences are predictable (R)			
	The extent to which the rivals' actions are predictable (R)			
	The speed at which the products or services are updated			
	The frequency that the marketing strategy changes			
Absorptive capacity	The firm has the technical capability to absorb new external knowledge.	0.928	0.982	0.918
	The firm has the capability to use new external knowledge to achieve business goals.			
	The firm has a clear division of roles and responsibilities to analyze new external knowledge.			
	The firm has necessary skills to analyze new external knowledge.			
	The firm has the management capability to absorb new external knowledge.			

Note: CR = construct reliability; AVE = average variance extracted; (R) means a reversely coded item. Factor loading of all the items is greater than 0.80.

Reliability and Validity Test

SPSS 23.0 and AMOS 23.0 were used to assess the reliability and validity of the data. The results of the reliability and validity analysis are summarized in Tables 2 and 4. Both the internal consistency reliability index (i.e., Cronbach's alpha) of each latent variable and the combined reliability (CR) value were greater than 0.7, indicating that the measurement reliability of each latent variable met the required standard (Henson, 2001; Collier, 2020). Meanwhile, the factor loading of each item on each latent variable was greater than 0.8, and the AVE value of all latent variables was greater than 0.6, indicating that each variable has appropriate aggregate validity (Collier, 2020). As shown in Table 4, the square root of the AVE of each latent variable was greater than the correlation coefficient between the variables, thereby indicating good discrimination validity between the variables.

Table 3.
Nested model

Model	$\chi 2$	df	$\chi 2$ /df	RMSEA	GFI	IFI	CFI	NFI
Single-factor model M1	1432.499	209	6.854	0.154	0.578	0.86	0.86	0.84
Two-factor model M2	1198.912	208	5.764	0.139	0.621	0.887	0.886	0.866
Three-factor model M3	933.392	206	4.531	0.12	0.683	0.917	0.917	0.896
Four-factor model M4	542.286	203	2.671	0.082	0.822	0.961	0.961	0.94
Five-factor model M5	415.144	199	2.086	0.066	0.866	0.975	0.975	0.954
Common method factor model M6	552.0001	177	3.119	0.093	0.836	0.957	0.957	0.938

Note: M1 digital transformation + user participation + absorptive capacity + environmental dynamics + firm performance. M2 digital transformation + user participation + absorptive capacity + environmental dynamics; firm performance. M3 digital transformation + user participation; absorptive capacity + environmental dynamics; firm performance. M4 digital transformation + user participation; absorptive capacity; environmental dynamics; firm performance. M5 digital transformation; user participation; absorptive capacity; environmental dynamics; firm performance.

Table 4.
Correlation analysis and discriminative validity test

Variable	Mean	S.D.	1	2	3	4	5
1. Digital transformation	3.35	1.401	**0.962**				
2. User participation	3.494	1.387	0.725**	**0.944**			
3. Absorptive capacity	3.281	1.362	0.704**	0.722**	**0.958**		
4. Firm performance	3.076	1.306	0.637**	0.618**	0.671**	**0.953**	
5. Environmental dynamics	3.138	1.168	0.661**	0.638**	0.683**	0.673**	**0.928**

Note: *** means significant at the level of 0.001; ** means significant at the level of 0.01; * means significant at the level of 0.05; the bold diagonal value is the square root of AVE.

A nested model was also used to reverify the validity of the variables. Table 3 shows that the fit results of the five-factor model were better than those of the other models, further indicating appropriate aggregation and discrimination validity between the variables.

Finally, a collinearity diagnosis of variables was conducted, with digital transformation, customer participation, absorptive capacity, and environmental turbulence being used to regress firm performance. The VIF values were 7.175, 8.533, 8.169, and 4.134, respectively. All the values were less than 10, indicating that there was no serious collinearity problem in the data (Hair, 2009).

Hypothesis Tests

We tested the hypotheses in this study using hierarchical regression analysis; the specific outcomes of the classified regression are shown in Table 5.

Model 5 in Table 5 shows that the impact coefficient of digital transformation on user participation was significant ($\beta = 0.890$, $p < 0.001$). This illustrates that digital transformation has a significant effect on user participation, thereby supporting Hypothesis 1. Model 2 in the table shows that digital transformation has a significant positive impact on firm performance ($\beta = 0.808$, $p < 0.001$), supporting the main effect of digital transformation (Hypothesis 2). Model 3 added user participation. The regression results showed that user participation ($\beta = 0.497$, $p < 0.001$) and digital transformation ($\beta = 0.366$, $p < 0.001$) both have a significant positive impact on firm performance, thus supporting Hypothesis 3. Meanwhile, the coefficient of digital transformation becomes smaller than in model

Table 5.
Hierarchical regression analysis

Dependent variable	Firm performance			User participation		Firm performance			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Industry type	0.087	0.035	0.031	0.067	0.009	0.006	0.001	0.018	0.016
	(1.444)	(0.907)	(0.835)	(1.158)	(0.353)	(0.192)	(-0.005)	(0.509)	(0.455)
Firm age	0.351***	0.011	0.009	0.379***	0.004	-0.011	-0.006	0.007	0.002
	(5.549)	(0.246)	(0.212)	(6.303)	(0.135)	(-0.303)	(-0.157)	(0.174)	(0.044)
Firm size	-0.193**	0.066	0.087*	-0.327***	-0.041	0.053	0.039	0.080*	0.066
	(-3.063)	(1.545)	(2.129)	(-5.457)	(-1.399)	(1.432)	(1.062)	(2.031)	(1.671)
Ownership	-0.133*	0.012	0.045	-0.227***	-0.066*	0.038	0.026	0.040	0.035
	(-2.202)	(0.312)	(1.196)	(-3.95)	(-2.465)	(1.127)	(0.769)	(1.096)	(0.954)
Digital transformation		0.808***	0.366***		0.890***	0.161	0.151	0.217*	0.230*
		(18.479)	(4.073)		(30.013)	(1.902)	(1.821)	(2.333)	(2.501)
User participation			0.497***			0.267**	0.318***	0.247*	0.352**
			(5.546)			(3.126)	(3.735)	(2.399)	(3.191)
Absorptive capacity								0.418***	0.354***
								(4.409)	(3.636)
Absorptive capacity × User participation									0.110*
									(2.495)
Environmental dynamics						0.496***	0.499***		
						(7.794)	(7.998)		
Environmental dynamics × User participation							0.118**		
							(3.29)		
R^2	0.142	0.645	0.685	0.225	0.836	0.749	0.760	0.709	0.716
ΔR^2	0.142	0.503	0.040	0.225	0.611	0.607	0.011	0.567	0.007
ΔF	9.989***	341.491***	30.753***	17.583***	900.751***	192.772***	10.821**	155.229***	6.224*

Note: The value in brackets is the t value. *** means significant at the level of 0.001; ** means significant at the level of 0.01; * means significant at the level of 0.05

2, supporting that user participation plays a partial mediator between digital transformation and firm performance (Baron & Kenny, 1986), thereby supporting Hypothesis 6.

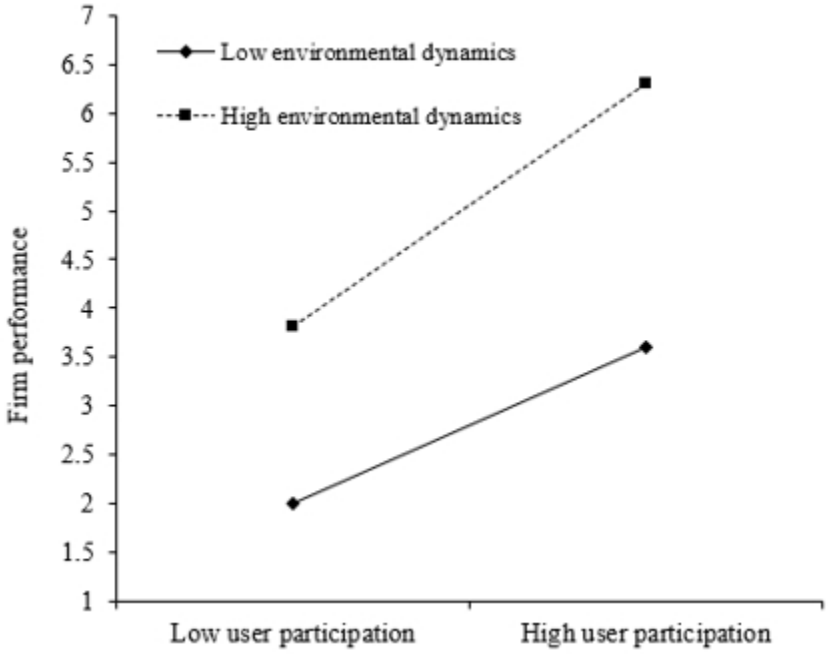
Model 7 in Table 5 adds the interaction term between environmental dynamics and user participation. The coefficient is significant ($\beta = 0.118$, $p < 0.01$), indicating that environmental dynamics have a significant positive moderating effect on the relationship between user participation and firm performance. Model 9 in Table 5 shows the moderating effect of absorptive capacity. There, the coefficient of the interaction term between absorptive capacity and user participation is also significant ($\beta = 0.110$, $p < 0.05$), suggesting that absorptive capacity has a significant positive moderating effect on the relationship between user participation and firm performance. Thus, both Hypotheses 4 and 5 were supported.

We then ran further analyses to support the moderating effects by Bootstrap (Table 6). The interaction coefficient between environmental dynamics and user participation was 0.134 ($p < 0.01$), and the confidence interval was [0.054, 0.215], excluding 0. The coefficient of the interaction term between absorptive capability and user participation was 0.138 ($p < 0.05$) and the confidence interval was [0.029, 0.248], excluding 0. To further illustrate the findings, we plotted the interaction effects in Figures 2 and 3 (Aiken et al.,1991). The figures show that during low environmental dynamics,

Table 6.
Bootstrap moderating effect test results (Bootstrap = 5000)

Interaction term	Estimated value	Standard deviation	t-value	p-value	95% confidence interval	
					LLCI	ULCI
Environmental dynamics × user participation	0.134	0.041	3.29	0.001	0.054	0.215
Absorptive capacity × user participation	0.138	0.055	2.495	0.013	0.029	0.248

Figure 2.
The moderating effect of environmental dynamics on user participation and firm performance



the positive impact of user participation on firm performance is relatively weak, whereas during high environmental dynamics, user participation has a strong positive impact on firm performance. Meanwhile, in the presence of low absorptive capacity, user participation has a weaker positive impact on firm performance, while in cases of high absorptive capacity, user participation has a strong positive impact on firm performance.

To accumulate further evidence on the mediating effect (Hypothesis 6), we relied on the recommendations of Preacher and Hayes (2008), who suggested testing the mediating effect by the significance of indirect effects with bootstrap. Thus, the bootstrap interval test was performed in this study using the SPSS process program produced by Hayes, while the total, direct, and indirect effect values were simultaneously calculated. Table 7 shows the results: The indirect effect is significant (95% CI [0.275, 0.542]), providing further evidence on the mediating effect.

Meanwhile, Table 7 also show a positive direct effect of digital transformation on firm performance (95% CI [0.176, 0.506]). Based on these aforementioned results, a partial mediating effect is thereby supported.

Because our sample is mainly drawn from two industries, we further analyzed whether our research model had differences for firms from different industries. We conducted such an additional

Figure 3.
The moderating effect of absorptive capacity on user participation and firm performance

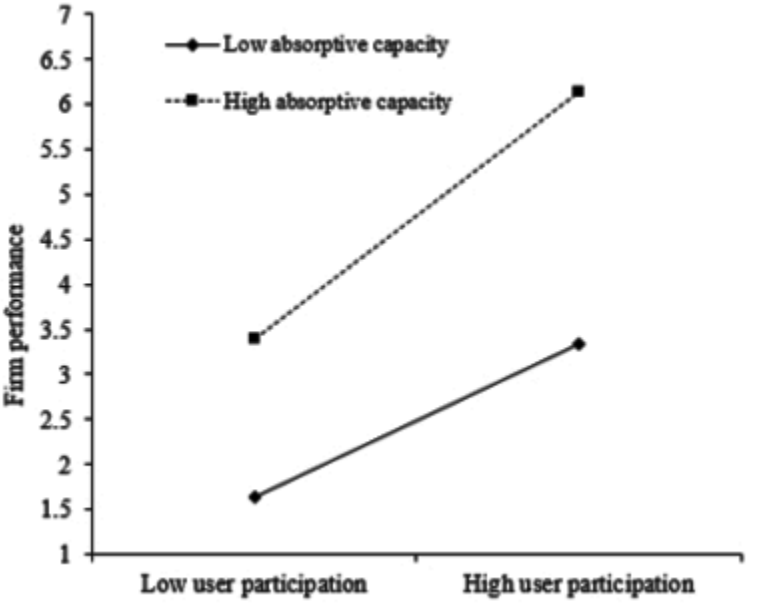


Table 7.
Bootstrap mediation effect test results (Bootstrap = 5000)

Path	Effect size	Standard deviation	95% confidence interval	
			LLCI	ULCI
Total effect	0.753	0.041	0.673	0.833
Direct effect (digital transformation-firm performance)	0.341	0.084	0.176	0.506
Indirect effect (digital transformation-user participation-firm performance)	0.412	0.067	0.275	0.542

analysis using two subgroup samples. In our traditional manufacturing industry sample, Hypotheses 1, 2, 3, and 6 are all supported. Meanwhile, in our IT and high-tech manufacturing industry sample, all the hypotheses are supported. The differences may be because firms from the different industries have different degrees of dependence on their users. For firms from IT and high-tech manufacturing industry, users' role may be more important.

DISCUSSION

Research Conclusion

Our study explored the relationship between digital transformation and firm performance using data from 247 Chinese firms. We also investigated the mediating role of user participation and the moderating roles of environmental dynamics and absorptive capacity. Our main findings are as follows. Digital transformation has a positive impact on firm performance, and user participation plays a partially mediating role on the relationship between digital transformation and firm performance. Environmental dynamics and absorptive capacity both positively moderate the relationship between

user participation and firm performance: User participation promotes firm performance more for firms in a more dynamic environment or for firms with a better absorptive capacity.

Theoretical Implications

Our study makes three important theoretical contributions. First, findings suggest that user participation partially mediates the relationship between digital transformation and firm performance. Previous empirical studies on the relationship between digital transformation and firm performance mainly focused on firms' internal capability, such as information technology capabilities and organizational agility (Chouaibi et al., 2022; Nwankpa & Roumani, 2016), ignoring the role of user participation. Our study provides a new theoretical perspective on how digital transformation affects firm performance. We argue that user participation is a new source of external knowledge (Xin et al., 2022), with a theoretical framework forwarded to understand how firms benefit from digital transformation based on user participation. This ultimately enriches the research on digital transformation.

Second, we introduce the KBV to study firms' digital transformation, extending the application of the KBV. The KBV shows that a firm's competitive advantage depends on the extent to which it encourages the exploration of new and valuable knowledge. Although this theoretical framework has been used in information management literature (e.g., Moreno et al., 2012; Wang et al., 2017), there remains a lack of knowledge on digital transformation from the KBV lens. Based on KBV, our research model reveals the role of digital transformation in reaching external knowledge and the role of user participation as an important source of knowledge. By looking at digital transformation through a KBV lens and stepping outside a firm to study user participation as a mediation, our study contributes to the literature on KBV in the management system field. By implementing a digital transformation strategy, firms ultimately gain incremental knowledge from user participation, helping them gain a competitive advantage.

Finally, most of the existing research on user participation comes from the marketing field, including sub-disciplines, such as service management and brand management, to directly study users' behavior. Little attention has been paid into how user participation actually affects firm performance. Our study investigates how user participation contributes to firm performance and how environmental dynamics and absorptive capacity moderates the role of user participation, thereby enriching study on the impact of user participation at the firm level. Additionally, because digital transformation is an all-round strategic renewal and transformation of internal and external activities of firms by digital technology, this study resounds calls of Dong and Sivakumar (2017) that more research should be done on the effect of technical factors on user participation.

Practical Implications

Our paper has several practical implications. First, firms must fully recognize the importance of user participation in digital transformation. In the digital age, users are an important source of external knowledge for firms. Implementing a user-oriented digital transformation strategy helps firms accurately grasp market demand, predict market trends, and enhance their market value. Firms should thus utilize the knowledge value brought by user participation to enhance user experience, provide customized services to users, and strengthen the relationship with them, thereby improving their competitiveness.

Second, firms should improve their ability to absorb and utilize users' knowledge through promoting user participation. Firms should use the positive externalities brought by digital transformation to improve their own knowledge acquiring capacity; firms should use this improved capacity to supplement their existing knowledge base with user knowledge and establish an effective internal and external knowledge transformation mechanism.

Finally, firms in digital transformation should develop digital platforms to support user participation and to provide a solid foundation for user participation. Using the knowledge from

users, firms reduce information distortion and decision-making errors. Digital transformation firms should also ensure cultivating digital users and enhancing user stickiness.

Limitations and Opportunities for Future Research

This paper has several limitations. First, China has released many policies to support firms' digital transformation such that Chinese firms' digital transformation may have some differences with those in other countries. Thus, the generalizability of our results becomes an important issue. A natural extension therefore is to replicate our research model in other countries. Second, all variable data were obtained through self-reporting and voluntary participation in digital transformation firms. This leads to common method bias and nonresponse bias. Although we have done some tests to rule these out, these biases cannot be totally eliminated. Future research could use different data or a different research design to avoid this issue. Finally, our study did not distinguish between different types of user participation. Different firms may have a different user type (i.e., firm users or individual users). Because we focused on firms' strategy on user participation, we did not distinguish the type of users. However, users in different levels may have different behavioral preferences such that their participation may have some differences. Future research could thus further investigate participation in different levels.

CONFLICT OF INTEREST

All authors of this article declare there are no competing interest.

ACKNOWLEDGMENT

This research was supported by the major project of the National Natural Science Foundation of China (NSFC) "Research on the Formation Mechanism of Sharing Economic Organizations: The Perspective of Peer Production" (Grant No. 72072026), the project of Liaoning Province "Research on the Mechanism and Promotion Policy of High Growth of Enterprises in the Era of Digital Economy" (Grant No. XLYC1904017). This research was also supported by the project of Dongbei University of Finance and Economics "Influence mechanism and evolutionary path from catching up to surpassing for latecomer enterprises of smart manufacturing in the era of 'Smart+'" (Grant No. GSY2021007).

REFERENCES

Abrell, T., Pihlajamaa, M., Kanto, L., Vom Brocke, J., & Uebernickel, F. (2016). The role of users and customers in digital innovation: Insights from B2B manufacturing firms. *Information & Management*, *53*(3), 324–335. doi:10.1016/j.im.2015.12.005

Agnihotri, R., Kalra, A., Chen, H., & Daugherty, P. J. (2022). Utilizing social media in a supply chain B2B setting: A knowledge perspective. *Journal of Business Logistics*, *43*(2), 189–208. doi:10.1111/jbl.12289

Ahmed, A., Bhatti, S. H., Gölgeci, I., & Arslan, A. (2022). Digital platform capability and organizational agility of emerging market manufacturing SMEs: The mediating role of intellectual capital and the moderating role of environmental dynamism. *Technological Forecasting and Social Change*, *177*, 121513. doi:10.1016/j.techfore.2022.121513

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Sage Publications, Inc.

Alam, I. (2002). An exploratory investigation of user involvement in new service development. *Journal of the Academy of Marketing Science*, *30*(3), 250–261. doi:10.1177/0092070302303006

AlMulhim, A. F. (2021). Smart supply chain and firm performance: The role of digital technologies. *Business Process Management Journal*, *27*(5), 1353–1372. doi:10.1108/BPMJ-12-2020-0573

Amit, R., & Han, X. (2017). Value creation through novel resource configurations in a digitally enabled world. *Strategic Entrepreneurship Journal*, *11*(3), 228–242. doi:10.1002/sej.1256

Aral, S., & Weill, P. (2007). IT assets, organizational capabilities, and firm performance: How resource allocations and organizational differences explain performance variation. *Organization Science*, *18*(5), 763–780. doi:10.1287/orsc.1070.0306

Bag, S., Gupta, S., Kumar, A., & Sivarajah, U. (2021). An integrated artificial intelligence framework for knowledge creation and B2B marketing rational decision making for improving firm performance. *Industrial Marketing Management*, *92*, 178–189. doi:10.1016/j.indmarman.2020.12.001

Balakrishnan, R., & Das, S. (2020). How do firms reorganize to implement digital transformation? *Strategic Change*, *29*(5), 531–541. doi:10.1002/jsc.2362

Bano, M., & Zowghi, D. (2015). A systematic review on the relationship between user involvement and system success. *Information and Software Technology*, *58*(1), 148–169. doi:10.1016/j.infsof.2014.06.011

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120. doi:10.1177/014920639101700108

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182. doi:10.1037/0022-3514.51.6.1173 PMID:3806354

Bharadwaj, A., Sawy, O. A. E., Pavlou, P. A., & Venkatraman, N. (2013). Digital business strategy: Toward a next generation of insights. *Management Information Systems Quarterly*, *37*(2), 471–482. doi:10.25300/MISQ/2013/37:2.3

Bogers, M., Afuah, A., & Bastian, B. (2010). Users as innovators: A review, critique, and future research directions. *Journal of Management*, *36*(4), 857–875. doi:10.1177/0149206309353944

Brodie, R. J., Fehrer, J. A., Jaakkola, E., & Conduit, J. (2019). Actor engagement in networks: Defining the conceptual domain. *Journal of Service Research*, *22*(2), 173–188. doi:10.1177/1094670519827385

Cai, L., Lu, S., & Chen, B. (2022). Constructing technology commercialization capability: The critical role of user engagement and big data analytics capability. [JOEUC]. *Journal of Organizational and End User Computing*, *34*(9), 1–21. doi:10.4018/JOEUC.303677

Camps, J., & Luna-Arocas, R. (2009). High involvement work practices and firm performance. *International Journal of Human Resource Management*, *20*(5), 1056–1077. doi:10.1080/09585190902850273

Carlson, J., Rahman, M., Voola, R., & De Vries, N. (2018). Customer engagement behaviours in social media: Capturing innovation opportunities. *Journal of Services Marketing*, *32*(1), 83–94. doi:10.1108/JSM-02-2017-0059

Chatterji, A. K., & Fabrizio, K. R. (2014). Using users: When does external knowledge enhance corporate product innovation? *Strategic Management Journal*, *35*(10), 1427–1445. doi:10.1002/smj.2168

Chen, J., & Liu, L. (2020). Customer participation, and green product innovation in SMEs: The mediating role of opportunity recognition and exploitation. *Journal of Business Research*, *119*(3), 151–162. doi:10.1016/j.jbusres.2019.05.033

Chouaibi, S., Festa, G., Quaglia, R., & Rossi, M. (2022). The risky impact of digital transformation on organizational performance—Evidence from Tunisia. *Technological Forecasting and Social Change*, *178*, 121571. doi:10.1016/j.techfore.2022.121571

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, *35*(1), 128–152. doi:10.2307/2393553

Collier, J. E. (2020). *Applied structural equation modeling using AMOS: Basic to advanced techniques*. Routledge. doi:10.4324/9781003018414

Cui, A. S., & Wu, F. (2016). Utilizing customer knowledge in innovation: Antecedents and impact of customer involvement on new product performance. *Journal of the Academy of Marketing Science*, *44*(4), 516–538. doi:10.1007/s11747-015-0433-x

Cuthbertson, R. W., & Furseth, P. I. (2022). Digital services and competitive advantage: Strengthening the links between RBV, KBV, and innovation. *Journal of Business Research*, *152*, 168–176. doi:10.1016/j.jbusres.2022.07.030

Dabholkar, P. A. (1990). How to improve perceived service quality by improving customer participation. In B. J. Dunlap (Ed.), *Proceedings of the 1990 Academy of Marketing Science (AMS) Annual Conference. Developments in Marketing Science: Proceedings of the Academy of Marketing Science*, (pp. 483–487). Springer. doi:10.1007/978-3-319-13254-9_97

Davenport, T. H. (2014). How strategists use "big data" to support internal business decisions, discovery and production. *Strategy and Leadership*, *42*(4), 45–50. doi:10.1108/SL-05-2014-0034

Dehning, B., Richardson, V. J., & Zmud, R. W. (2003). The value relevance of announcements of transformational information technology investments. *Management Information Systems Quarterly*, *27*(4), 637–656. doi:10.2307/30036551

Diehr, G., & Wilhelm, S. (2017). Knowledge marketing: How can strategic customers be utilised for knowledge marketing in knowledge-intensive SMEs? *Knowledge Management Research and Practice*, *15*(1), 12–22. doi:10.1057/s41275-016-0039-1

Do, T. T., & Mai, N. K. (2022). Organizational learning and firm performance: A systematic review. *International Journal of Productivity and Performance Management*, *71*(4), 1230–1253. doi:10.1108/IJPPM-02-2020-0051

Dong, B., & Sivakumar, K. (2017). Customer participation in services: Domain, scope, and boundaries. *Journal of the Academy of Marketing Science*, *45*(6), 944–965. doi:10.1007/s11747-017-0524-y

Eller, R., Alford, P., Kallmünzer, A., & Peters, M. (2020). Antecedents, consequences, and challenges of small and medium-sized enterprise digitalization. *Journal of Business Research*, *112*, 119–127. doi:10.1016/j.jbusres.2020.03.004

Feng, C., Ma, R., & Jiang, L. (2021). The impact of service innovation on firm performance: A meta-analysis. *Journal of Service Management*, *32*(3), 289–314. doi:10.1108/JOSM-03-2019-0089

Feng, T., Sun, L., Sohal, A. S., & Wang, D. (2014). External involvement and firm performance: Is time-to-market of new products a missing link? *International Journal of Production Research*, *52*(3), 727–742. doi:10.1080/00207543.2013.828177

Ferreira, J. J. M., Fernandes, C. I., & Ferreira, F. A. F. (2019). To be or not to be digital, that is the question: Firm innovation and performance. *Journal of Business Research*, *101*, 583–590. doi:10.1016/j.jbusres.2018.11.013

Foss, N. J., Laursen, K., & Pedersen, T. (2011). Linking customer interaction and innovation: The mediating role of new organizational practices. *Organization Science*, *22*(4), 980–999. doi:10.1287/orsc.1100.0584

Geilinger, N., Woerter, M., & von Krogh, G. (2020). The division of innovative labour: When does customer codevelopment contribute to firm innovation performance? *Technology Analysis and Strategic Management*, *32*(6), 653–665. doi:10.1080/09537325.2019.1692133

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, *17*(S2), 109–122. doi:10.1002/smj.4250171110

Hanelt, A., Bohnsack, R., Marz, D., & Marante, C. A. (2020). A systematic review of the literature on digital transformation: Insights and implications for strategy and organizational change. *Journal of Management Studies*, *58*(5), 1159–1197. doi:10.1111/joms.12639

Hao, S., & Song, M. (2016). Technology-driven strategy and firm performance: Are strategic capabilities missing links? *Journal of Business Research*, *69*(2), 751–759. doi:10.1016/j.jbusres.2015.07.043

Harmeling, C. M., Moffett, J. W., Arnold, M. J., & Carlson, B. D. (2017). Toward a theory of customer engagement marketing. *Journal of the Academy of Marketing Science*, *45*(3), 312–335. doi:10.1007/s11747-016-0509-2

Harris, S. G., & Mossholder, K. W. (1996). The affective implications of perceived congruence with culture dimensions during organizational transformation. *Journal of Management*, *22*(4), 527–547. doi:10.1177/014920639602200401

He, J., & King, W. R. (2008). The role of user participation in information systems development: Implications from a meta-analysis. *Journal of Management Information Systems*, *25*(1), 301–331. doi:10.2753/MIS0742-1222250111

Henson, R. K. (2001). Understanding internal consistency reliability estimates: A conceptual primer on coefficient alpha. *Measurement & Evaluation in Counseling & Development*, *34*(3), 177–189. doi:10.1080/07481756.2002.12069034

Hossain, M. A., Akter, S., Yanamandram, V., & Gunasekaran, A. (2022). Operationalizing artificial intelligence-enabled customer analytics capability in retailing. [JGIM]. *Journal of Global Information Management*, *30*(8), 1–23. doi:10.4018/JGIM.298992

Hung, K.-P., & Chou, C. (2013). The impact of open innovation on firm performance: The moderating effects of internal R&D and environmental turbulence. *Technovation*, *33*(10–11), 368–380. doi:10.1016/j.technovation.2013.06.006

Ikeda, K., & Marshall, A. (2016). How successful organizations drive innovation. *Strategy and Leadership*, *44*(3), 9–19. doi:10.1108/SL-04-2016-0029

Jin, J., Ma, L., & Ye, X. (2020). Digital transformation strategies for existed firms: From the perspectives of data ownership and key value propositions. *Asian Journal of Technology Innovation*, *28*(1), 77–93. doi:10.1080/19761597.2019.1700384

Kamboj, S., Sarmah, B., Gupta, S., & Dwivedi, Y. (2018). Examining branding co-creation in brand communities on social media: Applying the paradigm of stimulus-organism-response. *International Journal of Information Management*, *39*, 169–185. doi:10.1016/j.ijinfomgt.2017.12.001

Kock, F., Berbekova, A., & Assaf, A. G. (2021). Understanding and managing the threat of common method bias: Detection, prevention and control. *Tourism Management*, *86*, 104330. doi:10.1016/j.tourman.2021.104330

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science*, *3*(3), 383–397. doi:10.1287/orsc.3.3.383

Kong, G., Huang, J., & Liu, S. (2022). Digital transformation and within-firm pay gap: Evidence from China. *Emerging Markets Finance & Trade*, ●●●, 1–19. doi:10.1080/1540496X.2022.2149262

Lal, P., & Bharadwaj, S. S. (2020). Understanding the drivers of cloud-based service adoption and their impact on the organizational performance: An Indian perspective. [JGIM]. *Journal of Global Information Management*, *28*(1), 56–85. doi:10.4018/JGIM.2020010104

Lanzolla, G., Pesce, D., & Tucci, C. L. (2021). The digital transformation of search and recombination in the innovation function: Tensions and an integrative framework. *Journal of Product Innovation Management*, *38*(1), 90–113. doi:10.1111/jpim.12546

Li, D., Lai, F., & Wang, J. (2010). E-business assimilation in China's international trade firms: The technology-organization-environment framework. [JGIM]. *Journal of Global Information Management*, *18*(1), 39–65. doi:10.4018/jgim.2010091103

Liu, K. P., Chiu, W., Chu, J., & Zheng, L. J. (2022). The impact of digitalization on supply chain integration and performance: A comparison between large enterprises and SMEs. [JGIM]. *Journal of Global Information Management*, *30*(1), 1–20. doi:10.4018/JGIM.315301

Liu, Y., Wang, W., & Zhang, Z. (2022). The dual drivetrain model of digital transformation: Role of industrial big-data-based affordance. *Management Decision*, *60*(2), 344–367. doi:10.1108/MD-12-2019-1664

Llopis-Albert, C., Rubio, F., & Valero, F. (2021). Impact of digital transformation on the automotive industry. *Technological Forecasting and Social Change*, *162*, 120343. doi:10.1016/j.techfore.2020.120343 PMID:33052150

Malhotra, A., Gosain, S., & El Sawy, O. A. (2005). Absorptive capacity configurations in supply chains: Gearing for partner-enabled market knowledge creation. *Management Information Systems Quarterly*, *29*(1), 145–187. doi:10.2307/25148671

Marion, T. J., & Fixson, S. K. (2021). The transformation of the innovation process: How digital tools are changing work, collaboration, and organizations in new product development. *Journal of Product Innovation Management*, *38*(1), 192–215. doi:10.1111/jpim.12547

Matarazzo, M., Penco, L., Profumo, G., & Quaglia, R. (2021). Digital transformation and customer value creation in Made in Italy SMEs: A dynamic capabilities perspective. *Journal of Business Research*, *123*, 642–656. doi:10.1016/j.jbusres.2020.10.033

Miller, D., & Friesen, P. H. (1982). Innovation in conservative and entrepreneurial firms: Two models of strategic momentum. *Strategic Management Journal*, *3*(1), 1–25. doi:10.1002/smj.4250030102

Moreno, V., Pinheiro, J. R. M., & Joia, L. A. (2012). Resource-based view, knowledge-based view and the performance of software development companies: A study of Brazilian SMEs. [JGIM]. *Journal of Global Information Management*, *20*(4), 27–53. doi:10.4018/jgim.2012100102

Nambisan, S., Lyytinen, K., Majchrzak, A., & Song, M. (2017). Digital innovation management: Reinventing innovation management research in a digital world. *Management Information Systems Quarterly*, *41*(1), 223–238. doi:10.25300/MISQ/2017/41:1.03

Ngo, L. V., & O'Cass, A. (2013). Innovation and business success: The mediating role of customer participation. *Journal of Business Research*, *66*(8), 1134–1142. doi:10.1016/j.jbusres.2012.03.009

Nguyen, T. P. T., Huang, F., & Tian, X. (2021). A meta-analysis of the impact of open innovation on performance. *Journal of Management & Organization*, 1–18. doi:10.1017/jmo.2021.38

Nwankpa, J. K., & Roumani, Y. (2016). IT capability and digital transformation: A firm performance perspective. In *Proceedings of Thirty Seventh International Conference on Information Systems (ICIS 2016).* Association for Information Systems.

Palacios-Marqués, D., Soto-Acosta, P., & Merigó, J. M. (2015). Analyzing the effects of technological, organizational and competition factors on Web knowledge exchange in SMEs. *Telematics and Informatics*, *32*(1), 23–32. doi:10.1016/j.tele.2014.08.003

Philippart, M. H. (2022). Success factors to deliver organizational digital transformation: A framework for transformation leadership. [JGIM]. *Journal of Global Information Management*, *30*(8), 1–17. doi:10.4018/JGIM.304068

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *The Journal of Applied Psychology*, *88*(5), 879–903. doi:10.1037/0021-9010.88.5.879 PMID:14516251

Prahalad, C. K., & Ramaswamy, V. (2000). Co-opting customer competence. *Harvard Business Review*, *78*(1).

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, *40*(3), 879–891. doi:10.3758/BRM.40.3.879 PMID:18697684

Qilu Evening News. (2022). *The digitalization of national small and medium-sized enterprises focuses on the three-dimensional ecological empowerment of Shandong Kaos, which becomes a watershed in the industry*. Baijiahao. https://baijiahao.baidu.com/s?id=1749099754493806237&wfr=spider&for=pc

Ramaswami, S. N., Srivastava, R. K., & Bhargava, M. (2009). Market-based capabilities and financial performance of firms: Insights into marketing's contribution to firm value. *Journal of the Academy of Marketing Science*, *37*(2), 97–116. doi:10.1007/s11747-008-0120-2

Rayna, T., & Striukova, L. (2021). Involving consumers: The role of digital technologies in promoting 'prosumption'and user innovation. *Journal of the Knowledge Economy*, *12*(1), 218–237. doi:10.1007/s13132-016-0390-8

Rayna, T., Striukova, L., & Darlington, J. (2015). Co-creation and user innovation: The role of online 3D printing platforms. *Journal of Engineering and Technology Management*, *37*, 90–102. doi:10.1016/j.jengtecman.2015.07.002

Rodríguez-Ardura, I., & Meseguer-Artola, A. (2020). How to prevent, detect and control common method variance in electronic commerce research. *Journal of Theoretical and Applied Electronic Commerce Research*, *15*(2), 1–5. doi:10.4067/S0718-18762020000200101

Sashi, C. M. (2012). Customer engagement, buyer-seller relationships, and social media. *Management Decision*, *50*(2), 253–272. doi:10.1108/00251741211203551

Schwarz, A., Rizzuto, T., Carraher-Wolverton, C., Roldán, J. L., & Barrera-Barrera, R. (2017). Examining the impact and detection of the "urban legend" of common method bias. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, *48*(1), 93–119. doi:10.1145/3051473.3051479

Singh, S., Sharma, M., & Dhir, S. (2021). Modeling the effects of digital transformation in Indian manufacturing industry. *Technology in Society*, *67*, 101763. doi:10.1016/j.techsoc.2021.101763

Sultana, S., Akter, S., Kyriazis, E., & Wamba, S. F. (2021). Architecting and developing big data-driven innovation (DDI) in the digital economy. [JGIM]. *Journal of Global Information Management*, *29*(3), 165–187. doi:10.4018/JGIM.2021050107

Sun, W., Ding, Z., Xu, X., & Cui, K. (2020). Internationalization and firm default risk: The roles of environmental dynamism and marketing capability. *Journal of Business Research*, *121*, 142–153. doi:10.1016/j.jbusres.2020.08.027

311. Supply Chain Research Institute. (2019). *China's Internet industry platform—Haier COSMOPlat.* Baijiahao. https://baijiahao.baidu.com/s?id=1640715136447433711&wfr=spider&for=pc

Taghizadeh, S. K., Rahman, S. A., & Hossain, M. M. (2018). Knowledge from customer, for customer or about customer: Which triggers innovation capability the most? *Journal of Knowledge Management*, *22*(1), 162–182. doi:10.1108/JKM-12-2016-0548

Tan, F. T. C., Ondrus, J., Tan, B., & Oh, J. (2020). Digital transformation of business ecosystems: Evidence from the Korean pop industry. *Information Systems Journal*, *30*(5), 866–898. doi:10.1111/isj.12285

Tijan, E., Jović, M., Aksentijević, S., & Pucihar, A. (2021). Digital transformation in the maritime transport sector. *Technological Forecasting and Social Change*, *170*, 120879. doi:10.1016/j.techfore.2021.120879

Trantopoulos, K., von Krogh, G., Wallin, M. W., & Woerter, M. (2017). External knowledge and information technology: Implications for process innovation performance. *Management Information Systems Quarterly*, *41*(1), 287–300. doi:10.25300/MISQ/2017/41.1.15

van de Ven, A. H. (1992). Suggestions for studying strategy process: A research note. *Strategic Management Journal, 13*(S1), 169–188. 10.1002/smj.4250131013

Verhoef, P. C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J. Q., Fabian, N., & Haenlein, M. (2021). Digital transformation: A multidisciplinary reflection and research agenda. *Journal of Business Research*, *122*, 889–901. doi:10.1016/j.jbusres.2019.09.022

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The Journal of Strategic Information Systems*, *28*(2), 118–144. doi:10.1016/j.jsis.2019.01.003

Wang, H., Zheng, L. J., Xu, X., & Hung, T. H. B. (2022). Impact of financial digitalization on organizational performance: A look at the dark side. [JGIM]. *Journal of Global Information Management*, *30*(1), 1–35. doi:10.4018/JGIM.315307

Wang, K., Lu, H. C., Lee, R. C., & Yeh, S.-Y. (2017). Knowledge transfer, knowledge-based resources, and capabilities in e-commerce software projects. [JGIM]. *Journal of Global Information Management*, *25*(3), 63–80. doi:10.4018/JGIM.2017070104

Xia, H., Ye, P., Jasimuddin, S. M., & Zhang, J. Z. (2022). Evolution of digital transformation in traditional enterprises: Evidence from China. *Technology Analysis and Strategic Management*, ●●●, 1–21. doi:10.1080/09537325.2022.2124909

Xie, K., Wu, Y., Xiao, J. H., & Hu, Q. (2016). Value co-creation between firms and customers: The role of big data-based cooperative assets. *Information & Management*, *53*(8), 1034–1048. doi:10.1016/j.im.2016.06.003

Xie, Y., Chen, Z., Boadu, F., & Tang, H. (2022). How does digital transformation affect agricultural enterprises' pro-land behavior: The role of environmental protection cognition and cross-border search. *Technology in Society*, *70*, 101991. doi:10.1016/j.techsoc.2022.101991

Xin, X., Miao, X., Chen, Q., & Shang, T. (2022). User participation, knowledge management capability and service innovation: E-commerce enterprises in the digital age. *Asia Pacific Journal of Marketing and Logistics*, *34*(4), 629–646. doi:10.1108/APJML-10-2020-0724

Xu, J., Yu, Y., Zhang, M., & Zhang, J. Z. (2023). Impacts of digital transformation on eco-innovation and sustainable performance: Evidence from Chinese manufacturing companies. *Journal of Cleaner Production*, *393*, 136278. doi:10.1016/j.jclepro.2023.136278

Yang, S.-Y., & Tsai, K.-H. (2019). Lifting the veil on the link between absorptive capacity and innovation: The roles of cross-functional integration and customer orientation. *Industrial Marketing Management*, *82*, 117–130. doi:10.1016/j.indmarman.2019.02.006

Yoo, D., & Roh, J. J. (2021). Value chain creation in business analytics. [JGIM]. *Journal of Global Information Management*, *29*(4), 131–147. doi:10.4018/JGIM.20210701.oa6

Zaborek, P., & Mazur, J. (2019). Enabling value co-creation with consumers as a driver of business performance: A dual perspective of Polish manufacturing and service SMEs. *Journal of Business Research*, *104*, 541–551. doi:10.1016/j.jbusres.2018.12.067

Zhang, Z. (2011). Customer knowledge management and the strategies of social software. *Business Process Management Journal*, *17*(1), 82–106. doi:10.1108/14637151111105599

Zhang, Z., & Sundaresan, S. (2010). Knowledge markets in firms: Knowledge sharing with trust and signalling. *Knowledge Management Research and Practice*, *8*(4), 322–339. doi:10.1057/kmrp.2010.22

Zheng, L. J., Zhang, J. Z., Wang, H., & Hong, J. F. L. (2022). Exploring the impact of big data analytics capabilities on the dual nature of innovative activities in MSMEs: A data-agility-innovation perspective. *Annals of Operations Research*, 1–29. doi:10.1007/s10479-022-04800-6

Zhong, X., & Ren, G. (2023). Independent and joint effects of CSR and CSI on the effectiveness of digital transformation for transition economy firms. *Journal of Business Research*, *156*, 113478. doi:10.1016/j.jbusres.2022.113478

Feifei Zhao is a doctoral student in the School of Business Administration of Dongbei University of Finance and Economics. His research interest include digital transformation, organizational change,and innovation management. His work appears in international Journals such as Frontiers in Psychology, International Journal of Technology Management, Journal of Organizational and End User Computing, and Sustainability.

Tao Meng is an executive Dean International Business College and Professor School of Business Administration in Dongbei university of finance and economics, Dalian, China. His primary research interest in sharing economy, digital platform, network organization, marketing strategy, innovation strategy. His Work published in organizational changes, digital media, sharing economy, and consumer behaviours. He published various books and qualitative research papers in multiple journals. His Work appears in Sage Open, International Journal of Online Marketing, Business Perspectives and Research, European Journal of Business and Management, Strategic Innovative Marketing and Tourism, Information Technology & Tourism, Tourism Tribune, International Journal of Business and Economics Research, RMC Journal of Social Science and Humanities, Frontiers in Psychology. Currently, he is supervising various Chinese and internationals MS and PhD scholars around the globe.

Wei Wang is an Assistant Professor at the School of Economics and Finance, Xi'an Jiaotong University. His research interests include innovation, entrepreneurship and electronic commerce. His research has been published in Technological Forecasting and Social Change and Gender in Management.

Faizan Alam (Ph.D.) is a Lecturer in Marketing Management at the Dongbei University of Finance and Economics - School of International Studies, Dalian. He obtained his Ph.D. from Dongbei University of Finance and Economics in Dalian, China (2022). He also obtained his B.Sc. (Hons.) Statistics from Aligarh Muslim University, India (2014), and received a Master of Business Administration in marketing from Maulana Azad National Urdu University, Hyderabad, India (2017). His primary research interests are social media platforms, sharing economy, and consumer behavior. He is an emerging research scholar in marketing management. His work appears in international Journals such as Sage Open, Frontiers in Psychology, International Journal of Online Marketing, International Journal of E-Business Research, and International Journal of Islamic Marketing and Branding. He is a full-time editor and reviewer of many internationally indexed journals.

Zhang Bingchao (Ph.D.) is a Lecturer in School of Management of Shandong Technology and Business University, China. He has a number of high-quality publications in international peer reviewed journals and also engaged in several national and provincial level research projects. His research interests include big data and human resource management.