Technological Forecasting & Social Change 184 (2022) 121996

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

journal homepage: www.elsevier.com/locate/techfore

Mobile information technology's impacts on service innovation performance of manufacturing enterprises

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ARTICLE INFO

Keywords:
Mobile information technology (MIT)
Service innovation
Dynamic capability theory
Technological innovation diffusion theory

ABSTRACT

Purpose: Given the rapid adoption of intelligent and digital manufacturing among the current business environment, emerging mobile information technology (MIT) becomes an ever more important factor, driving innovations in manufacturing sectors. This paper analyzes the impact of MIT on innovation service performance in manufacturing firms and builds a model structuring the mechanisms of this information technology.
Design/methodology/approach: This paper proposes a theoretical model and derives a set of hypotheses based on the dynamic capability theory and innovation diffusion theory. Data used in this paper is collected via surveying 462 manufacturing firms in China using valid questionnaires. Statistical analysis, such as the AMOS method, is then carried out using the data collected to investigate and identify influencing factors upon which to build the model and test the hypotheses.
Findings: This paper presents findings that indicate MIT having a direct impact on a firm's service innovation capabilities (SIC) and service innovation performance (SIP). In particular, SIC continuously drives the growth of SIP in a firm, and hence acts as a mediating factor. Moreover, results indicate that both SIC and SIP varies with the strength of innovation network in each firm, while the moderated mediating effect of SIC remains constant. In other words, the performance of service innovation was not to be impacted by certain basic conditions of firms.
Originality/value: This paper is the first attempt to investigate the relationship between the manufacturing industry and advanced technology adoption of enterprise innovation networks and service innovation capabilities. Results are application for adaptation in firms within the manufacturing industry regarding adoption of such advanced technology, such as MIT, and are supportive of these firms constructing enterprise innovation networks and investing in efforts to shape service innovation capabilities. Findings suggests that initiatives associated with adoption of advanced technology are likely to improve service transformation abilities and service innovation performance.

1. Introduction

Faced with the multiple pressures of technological progress, intensified competition and personalized demand upgrading, the integration of production and service has become an important way of improving a firm's value creation ability and means of obtaining sustainable competitive advantage through actively promoting the service-oriented transformation of manufacturing (Gebauer et al., 2011; Li et al., 2019). The current transformation of the manufacturing mode, shifting from a manufacture focus to one of service or innovation focus, results in a high-level form of manufacturing that adds value to the firm through functions and services carried forth by its products (Zhao et al., 2020; Gao and Yuan, 2020). This transformative process allows manufacturing firms to keep in pace with new technological innovations and industry transformation, enhancing the competitiveness of the manufacturing industry while adapting to the unique consumption needs of each individual consumer. Furthermore, given multiple factors driving the field of mobile network, advancing field of information technology, and the ongoing COVID-19 pandemic, the service-oriented manufacturing industry becomes more and more in need of rapid innovation. Indeed, manufacturing servitization is a dynamic process of innovation, impacted by the optimal allocation of the innovation resources and

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https://doi.org/10.1016/j.techfore.2022.121996
Received 15 January 2022; Received in revised form 16 July 2022; Accepted 24 August 2022
Available online 6 September 2022

innovation management behavior. Service innovation of manufacturing revolves around the change of service content or the change of interaction with customers in the whole product life cycle (Wise and Baumgartner, 2000). The essence of manufacturing firm's servitization provides consumers with high value-added services, such as intelligent services with personalized customization by developing services related to the firm's products that oriented to specific customer relations and provide overall solutions (Servitization and Industry 4.0 convergence in the digital transformation of product firms: A business model innovation perspective). Moreover, the "digital" characteristics of manufacturing enterprises' servitization are becoming more and more obvious. Therefore, we face two situations: first, manufacturing service innovation under digital information technology becomes an important part of enterprise innovation (Zhang and Li, 2022). Furthermore, the manufacturing enterprises are prone to fall into the dilemma of "service paradox", which hinders their servitization process (Luo and Jiang, 2020). For example, Siemens, Xerox, Intel and others have suffered from this service paradox, even to the point of incurring great losses. On the other hand, given the increasingly obvious digitization of manufacturing firms, whether the associated issue of information technology (i.e., IT) availability increases in importance for the overall service-oriented innovation in manufacturing becomes a topic of necessity. We will proceed our discussion in this paper focusing on these issues.

Manufacturing service innovation is a complex system process. Under the influence of more fluctuating market demand and increasingly complex production relations, a complete service innovation support system depending on certain IT should be constructed for the continuous mining of customer service demand and optimization of service resources (Storey et al., 2016). The manufacturing firm can overcome service difficulties to realize advanced service through a digital platform (Marion et al., 2015). Indeed, the modern service activity sector of a firm is essentially the process of continuously strengthening its service capabilities through IT innovations (Neely, 2009). At present, China's service-oriented manufacturing industry have invested a lot in information technology software and hardware related to R&D, production, sales, internal management, and external connection, but the benefits of information investment are quite different depending on the individual firm (Guopeng and Yu, 2009). This difference extends from the varying yet overall low conversion rate of enterprise IT knowledge. In other words, only by being absorbed and transformed into the enterprise's innovative service capabilities can IT with certain capabilities can play its expected role on the dynamic service innovation capabilities of an enterprise for improving service innovation performance.

Research Question 1. How to form IT capabilities and how to promote the formation of dynamic service innovation capabilities for an enterprise?

Given current industry conditions, advanced information technology is now more than ever a necessary and sufficient condition for enterprises to provide innovative services. Fittingly, mobile information technology (i.e., MIT), as a new generation of mobile information technologies including mobile Internet, non-contact information identification, remote information monitoring and so on (He et al., 2014), can more effectively support the digital operation of enterprises, which consequentially eases the transformation of the enterprise competitive strategy from "product-centered" to "customer-centered." Specifically, MIT's characteristics of mobile convenience, real-time interaction, information personalization and information content enrichment prop the expansion of service function and the service channels, shortening the process of enterprise innovation, improving the accuracy and efficiency of enterprise innovation, reducing the cost of enterprise innovation, and enhancing the value of enterprise innovation (Grnroos, 2012). As a key driver of advanced innovative services, MIT helps to ignite the innovative potential of enterprises for developing advanced services (Cenamor et al., 2017). However, a limit must be imposed on the degree of investment in service innovation, else an excessive push for service innovation will easily push manufacturing enterprises into the dilemma of "service paradox." Despite the importance of IT on manufacturing innovation, existing studies primarily focus on the up-front business value of IT, and a lack of research is evident on the effects IT innovation diffusion has on the innovation mechanism of manufacturing services (Khin and Ho, 2020). In particular, the relationship between MIT and enterprise service innovation and service innovation performance calls for further analysis. Along these lines, the influence of MIT on enterprise service innovation becomes a natural topic of further interest.

Research Question 2. Then, in a certain state of enterprise organization, what is the influence mechanism and path of MIT on an enterprise' service innovation capability and service innovation performance?

We propose an influence model incorporating the innovation diffusion capability of MIT, the service innovation capability of an enterprise, and its resulting service innovation performance to improve the innovation service efficiency of an enterprise, taking the perspective of technology innovation diffusion and enterprise dynamic capabilities. Using this model, we test the constituent factors and reveal the influence path through empirical data. The purpose of this study is not only to deepen the research framework of MIT, but also to provide reference to firm as they form their service innovation capability, product innovation capability and digital service capability through appropriate adoption and deployment of MIT.

The remainder of the paper is organized as follows. Section 2 presents literature review. Section 3 presents conceptual model and hypothesis. Sections 4 and 5 illustrated methodology and findings. The discussion, implication, and conclusion of this study are shown in Section 6.

2. Literature review

2.1. The connotation of MIT

Traditionally, MIT has always been regarded as a media that emphasizes communication function and communication form. With the popularization of wireless mobile communication, data acquisition technology, intelligent computing, and dynamic decision making, MIT is no longer just an improvement or extension of traditional IT, but a more generalized term describing a new form of IT including information perception, AI, Internet of Things, and so on (Paiola and Gebauer, 2020).

MIT's advantages over traditional IT mainly lie in information accessibility, accuracy, transparency, and decision support, all required for enterprise innovation management. Indeed, MIT's technological diffusion is the core enablement for innovation services of enterprises. Although MIT has no uniform definition, the term undoubtedly presents an integration of new information technologies supported by wireless communication. For example, information identification, information processing, information transmission, digital manufacturing services, and information decision capabilities of a firm can be constantly improved by BIM technology, Web technology, GIS technology, RFID technology, and other digital IT (Zhu et al., 2019). Therefore, the connotation of MIT can be generally summarized as shown in Table 1.

Due to the advantages of MIT on mobility and timeliness, enterprise management based on MIT has become more flexible, convenient, and efficient. Inevitably, MIT is bound to change the business value connotation of traditional IT. This change is mainly embodied in the value of MIT gradually shifting from a personal application level to an enterprise or organizational level (Elliott et al., 2015), from basic technical characteristics to potential in technology innovation, and from a "tangible" value to an "intangible" value. This shifting of value is evident in the increasing impact of IT on organizational capability or organizational performance (Sheng et al., 2005). Thus, the study of the intangible impact of MIT on an enterprise level becomes more meaningful.

Table 1
Connotation summary of MIT.

View	Function	Features of new MIT	Feature summary
Highlighted communication function	Wireless communication	Everywhere big data	Basic technical characteristics
	Information presenting	Data in diverse media and diverse forms	
	Wireless access to information	Convenient and fast information recognition	
highlighted Innovative applications of MIT	High integration supporting on information systems	More transparent and integrated information	Technical innovation characteristics
	Analysis and decision-making supporting on information	Smart decision data delivery	

2.2. Dynamic capability theory

With the increasing uncertainty of the competitive environment, the rigid competitiveness capabilities of enterprises may hinder their innovation. As a result, companies should continuously integrate, create, and reconstruct internal and external resources to dynamically obtain their sustained competitive advantages (Sun et al., 2014). Naturally, the concept of Dynamic Capability Theory (DCT) emerged to meet the needs emerging from rapid changes in technology and markets.

Teece et al. (1997) believe that the dynamic capabilities for an enterprise must be used to effectively coordinate and reconfigure internal and external capabilities to cope with environmental fluctuations in a hyper-competitive environment. Their paper emphasizes the enterprise's responsiveness to the environment, specifying that the response process is the learning process a firm undergoes through "perception," "acquisition," and "transformation," thereby improving the firm's efficiency and flexibility in responding to the external environment (Wen and Yang, 2022). Su and Liu (2013) proposed that dynamic capability includes three aspects: market perception capability, collaborative control, and resource reallocation of multi-organizations, organizational learning, and absorption capability. Wang et al. (2015) proposed that dynamic capability should include two dimensions: absorptive capability and transformative capability. While previous research does not define dynamic capability in a uniform manner, this paper seeks to unify the definition of dynamic capabilities to include information sharing, learning absorption, resource reallocation and integration, and collaborative innovation (Meng et al., 2008).

In these aspects, the dynamic capabilities of the enterprise can be shaped to ensure that the enterprise obtains and maintains a sustainable competitive advantage.

2.3. Technological innovation diffusion

Technology has to be fully applied and diffused to have a real impact on the economy. The driving force of diffusion innovation in an enterprise currently absorbing technology can be divided into tractive force and impetus (Li and Hu, 2015), among which the tractive force of enterprises' initiative diffusion innovation comes from both the pursuit of maximizing the interests of the enterprise itself and the attraction of technology to the enterprise (i.e., the capabilities of technology for innovation diffusion). Most studies on this technological innovation diffusion (i.e., TID) focus on basic concepts, dynamic mechanisms, and dynamic methods, while few studies consider the real-world implications of this capability of technology for innovation diffusion. Innovation diffusion capabilities technology.

In terms of the influencing factors of innovation diffusion of specific technologies, one of the important contributions of the TID Theory consists of the "subjective psychological cognition" factors influencing the adoption of innovative things by users, including perceived characteristics, perceived popularity, and perceived demand (Wang, 2014). Perceived characteristics account for most of the variation in innovation difference (49 % - 87 %) in terms of superiority, compatibility, ease of use, testability, and observability (Rogers, 1995). On this basis of TID, many scholars began to study the diffusion of new products/services in the interconnected environment and expand the influencing factors of innovation diffusion (Wei et al., 2020). Zollet and Back (2015) propose that complexity, perceived benefits, support from senior managers, and information intensity would influence the diffusion of interactive innovation on enterprise websites. Prior research also suggests that relative advantages, observability, trialability, complexity, perceived enjoyment, and perceived compatibility have a significant impact on students' behavioral intentions of online learning systems (Al-Rahmi, 2019).

Generally, the characteristics of TID can be summarized into three aspects: perceived advantages, perceived popularity, and perceived demand. Here, we define innovation popularity perception and perceived demand as essential factors that play into information technology innovation perception characteristics. The correspondence between the characteristics of MIT and the important factors of the TID are presented in Table 3.

In other words, Table 3 presents the components of MIT innovation diffusion capability based on TID interpretations. Furthermore, given that information technology is the source of enterprise innovation ability, and with MIT being a term of new intelligent information technology, MIT may provide a stronger complementary effect with enterprise innovation ability to jointly affect enterprise productivity and enterprise performance (Liu, 2018). Therefore, the technological innovation diffusion capability of MIT under the TID theory is a primary factor of enterprise innovation service, further forming the dynamic capability of enterprises to promote the rapid transformation of manufacturing enterprises in service innovation and obtain greater service innovation performance. Indeed, MIT forms appropriate technological innovation capability, consequentially promoting manufacturing service innovation to obtain better service innovation performance through effective technological innovation diffusion path.

3. Concept model and research hypotheses

3.1. The conceptual model

The effective use of IT provides value added to an enterprise's manufacturing capability and service capability (Ghobakhloo and Azar, 2018). Therefore, IT capability is one of the core factors driving the formation of an enterprise's dynamic innovation capability upon the premise of innovation performance. Based on the above analysis of MIT, DCT, and TID, while considering the individual differences of manufacturing companies, our research model is proposed in Fig. 1.

In Fig. 1, the observed variables and the latent variables are indicated respectively by rectangles and ovals, the dotted line arrows indicate the moderating effect of the moderating variable, while the firm line arrows represent the role of control variables.

3.1.1. Service innovation capabilities for manufacturing enterprise: dynamic capability perspective

This paper holds that the environmental adaptability and innovation in Table 2 are the indicators of the significance and goal level of innovation behavior, while the other four indicators in Table 2 can reflect the process capability of service innovation behavior. Therefore, the innovative service capabilities of enterprises can be represented by these aspects.

(1) Sharing of the tacit service knowledge

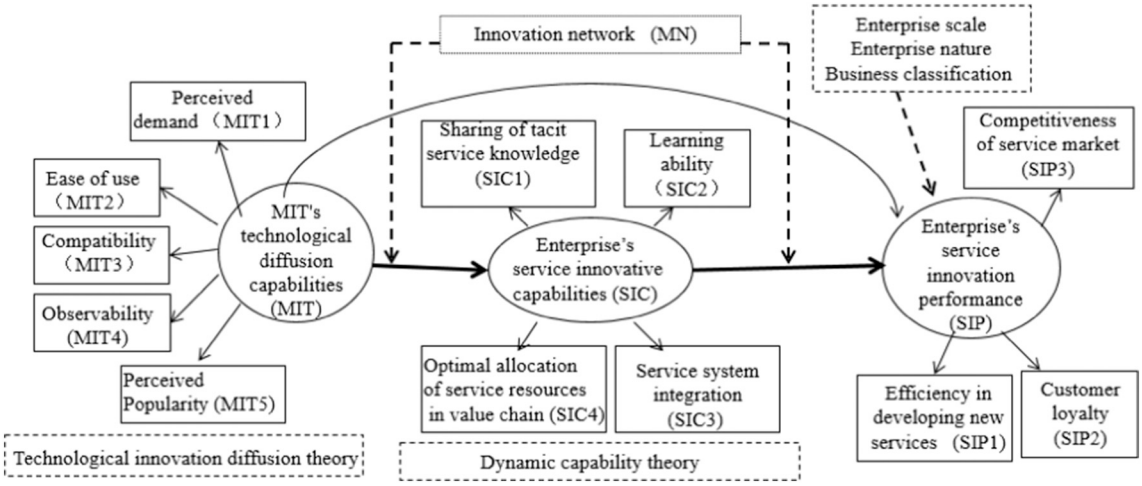

Fig. 1. Conceptual model.

Table 2
Summary of views on dynamic capability theory.

Author & year	Integration	Cooperation/Sharing	Adaptability	Learning/Absorbing	Innovation/Transformation	Dynamic allocation of resources
Teece et al. (1997)			√			√
Teece(2007)			√	√	√	
Wang and Ahmed (2007)				√	√	
Su and Liu (2013)	√	√		√	√	√
Long (2016)	√	√		√		√
Wang et al. (2015)	√	√		√	√	
Zheng (2006)	√	√	√	√	√	
Meng (2008)				√		√

The tacit knowledge in service knowledge has more unique value to the creativity of enterprises than explicit knowledge (Li et al., 2014). Because tacit knowledge is private interests, original knowledge of enterprises, through sharing tacit knowledge, can be collided to become new knowledge for stimulating enterprise innovation and eventually reaching innovation output (Wu, 2014). Enterprises share their tacit knowledge through certain channels (such as MIT), which then create new tacit knowledge that merge with the old tacit knowledge, resulting in a renewed form of tacit knowledge that ultimately stimulates enterprise innovation (Leonard and Sensiper, 1998; Khanisara, 2012). As a result, the sharing of tacit service knowledge is a key factor to improving the innovative service capabilities of enterprise (Hypothesis HH).

Hypothesis HH. The acquirement of tacit knowledge of innovation service is the most important factor for enterprises to improve their innovation service ability.

(2) Learning capability of an enterprise under certain IT

The innovation service ability of an enterprise lies in changing its habitual thinking and behavior through the absorption and learning of knowledge to provide customers with higher quality services (Xu et al., 2014). Enterprises with strong willingness will develop new services and shorten the development cycle of new services by absorbing and learning knowledge (Liu, 2019). Innovation oriented organizational learning ability can enhance its knowledge base and thus improve the performance of new service development (Ven and Andrew, 1986). In terms of the convenience of MIT for knowledge learning and dissemination, it is beneficial to the formation of enterprise learning ability. Therefore, the company's learning capability under the influence of MIT ability is a key component of the company's innovative service ability.

(3) Integration and optimal allocation of internal and external service innovational resources of enterprises

The Enterprise's innovative service activities is mainly reflected in the ability of enterprises on the optimal allocation of service resources in chain. Innovation resources are the input of innovation activities and also the key factor affecting the technological innovation ability of enterprises (Huang et al., 2017). It is an inevitable choice to obtain external innovation resources through cooperative sharing. At present, the studies of enterprise resources based on virtual organization value chain mainly focused on the optimal allocation of manufacturing resources, while the research on the optimal allocation of service-oriented resources is less (Mun et al., 2009; Ma and Yang, 2012). In view of the uncertain personalized service demand of customers, it is very necessary for an enterprise to innovate its service operation mode. In this case, MIT can be used to enable enterprises to establish service cooperation platform, share service resource information, establish service resource sharing environment, and optimize service resource allocation to the maximum extent.

From the above analysis, we believe that the system integration and service resource allocation ability of enterprise based on cooperative strategy should also be core factors of its service innovation capabilities.

3.1.2. The service innovation performance of manufacturing enterprise: innovation diffusion of service capability perspective

It can be seen from Fig. 1 that the innovative service capability of manufacturing enterprises is essentially the ability of service innovation to be evolved into performance, that is, service innovation performance is the result of innovation diffusion on the basis of technological innovation capability and service innovation capability. Therefore, according to the TID characteristics summarized in Table 3, we proposed the measurement indexes of SIP: Market Competitiveness of Service, Service Development Efficiency and Customer Loyalty. Perceived advantages

Table 3
The corresponding relationship between TID and MIT.

Features of new MIT	Perception forms of TID	Summary of TID characteristics
Everywhere big data	Ease of use	
Data in diverse media and diverse forms	Compatibility	Perceived advantages
Information traceability	Observability	
More integrated information	Herd conformity	Perceived popularity
Smart decision data delivery	Dynamic demand	Perceived demand

can be transformed into the perception of enterprise competitiveness and perceived prevalence will promote the high degree of collaboration and networking between enterprise partners, thus improving service efficiency and service quality. And perceived demand can just strengthen the concept of customer first, meet customers' personalized needs with diversified services, and improve customers' loyalty.

At present, service-oriented manufacturing intends to obtain differentiated competitive advantage by means of service innovation (Wade and Hulland, 2004). Service innovation performance is the result of service innovation combined with customer demand (Feng, 2016). The development of innovative services can improve customer satisfaction and obtain new customers, which reveal the innovative behavior of service providers affects the loyalty of enterprise customers (Woo et al., 2020). Moreover, higher customer satisfaction can produce higher customer loyalty, which is more important for service orientation than customer attraction (mainly relying on marketing to attract customers) (Wang and Chen, 2014). High quality in innovative service can promote customer loyalty and make the relationship between enterprises and customers more harmonious and dependent.

Therefore, the measurement items of SIP are not complicated, but there are certain theoretical meanings. The utility of the indicators and the validity of impact paths should be further tested in empirical analysis.

3.2. The influence path hypotheses

3.2.1. The impact of MIT capability on the service innovation capability of an enterprise

The impact of IT on business performance needs to go through a complex transformation process, which could be fulfilled by embedding business activities or adjusting other intermediate variables (Plattfaut et al., 2015). Therefore, the role of MIT on the service innovation of enterprises should be embedded in the service innovation activities of enterprises to improve the service innovation ability of enterprises and then affect the innovation performance. IT capabilities are positively affecting enterprise innovation capabilities, which further affect the service innovation performance of enterprise positively (Chen and Tsou, 2012; Zhang and Yang, 2019). To a certain extent, MIT works the same way.

Based on these analyses, the research hypothesis (H1) is proposed, namely, some capabilities of MIT have a positive impact on the service innovation capability of an enterprise. This is a manifestation of MIT's key driving force.

Hypothesis H1. MIT capabilities are positively correlated with service innovation capabilities.

3.2.2. The impact of MIT capability on the service innovation performance of an enterprise

IT capability has a positive impact on service innovation performance of manufacturing firms (Zhao et al., 2015). Enterprise innovation performance can be impacted by IT-based innovation process. However, at present, the research on the technological innovation performance of an enterprise by IT has obviously not matched with the enterprise's intelligent manufacturing and intelligent service strategy. With the gradual development and application of some Internet information technology, as a comprehensive concept of mobile communication technology and advanced information technology, MIT is playing an increasingly prominent role in promoting overall innovation in economic activities (Zeng et al., 2018). The wireless nature and transparency of MIT can more effectively deliver service content at a lower cost and realize diversified and innovative services (Edgar and Gálvez, 2014). The strong interaction and information integration ability of MIT makes it have omnipresent service mode, which provides strong support for multi-party interactive innovation. MIT can create a new market space for enterprises, improve the innovation ability of enterprises, and promote the innovation performance of enterprises (Ji and Zhang, 2019).

Based on this, this paper holds that there should be a positive correlation between MIT capability and service innovation performance of enterprise, so the following hypothesizes are put forward.

Hypothesis H2. MIT capabilities are positively related to the innovation performance of enterprises.

3.2.3. Mediating role of enterprise's service innovation capability

Regarding the IT capabilities play a decisive role in the practice of service innovation in enterprises (Zheng et al., 2014a), so is the IT based service innovation capability of an enterprise. However, only IT is embedded in the enterprise with other resources to promote the formation of certain enterprise capabilities, can it bring innovative competitive advantages to enterprise (Wang et al., 2010). The key to the influence of IT on enterprise performance lies not in the quantity of IT resources owned by enterprise, but in the capability of IT applied in enterprise which can indirectly affects the performance of enterprises through the transformation and allocation of IT resources into the core competence of enterprise (Zhao and Chen, 2013). That is, the IT capability will promote the formation of the innovation service ability of an enterprise in the innovation activity, which should be an intermediate variable between the IT capability and the enterprise innovation performance.

Therefore, the research hypothesizes of H3 can be set that the service innovation capabilities of enterprises have direct and positive role in promoting the service innovation performance of an enterprise.

Hypothesis H3. The service innovation capabilities are positively correlated with service innovation performance.

Furthermore, the positive role of MIT in the service innovation performance for enterprise should be through the intermediary of the service innovation capability for enterprise. So, hypotheses are proposed below:

Hypothesis H31. The service innovation capability for enterprise plays a mediating role in the relationship between MIT's capability and the service innovation performance of an enterprise.

Hypothesis H32. There is a progressive effect between the three dimensions. In other words, the stronger the MIT capability is, the stronger the enterprise's service innovation ability will be, and the higher the enterprise's service innovation performance will be.

3.2.4. Moderating role of innovation network

The technological innovation network refers to the form of connection and interaction between innovation subjects (Imai and Baba, 1991). Innovation network refers to the form that different organizations or enterprises have complementary resources to overcome certain complexity and uncertainty in system innovation, and then cooperate to innovate (Dang and Zheng, 2011). Firm's position and relationship quality in the innovation relationship network have different effects on service innovation performance. Most scholars believe that enterprises located in the center of innovation network can obtain more valuable information for innovation, thus their innovation ability will be stronger

(Zaheer and Bell, 2005). Considering the purpose of innovation service, relationship quality is generally regarded as the relationship firmness between innovation members and the richness and availability of service resources in the relational network. The stability of innovation relationship and the quality of resources from the relationship have a positive impact on innovation capability (Wang, 2018). Relationship strength and quality of relationship resources are conducive to enterprises' exploration and acquisition of new knowledge and have a significant positive impact on the improvement of enterprises' technological innovation ability and technological innovation performance (Rufang and Weixing, 2016; Yong et al., 2018). This is achieved by promoting the knowledge absorption and transformation of enterprises, technical exchanges and cooperation and external innovation resource support to improve the technological innovation ability.

Based on the analysis, this paper makes the following research hypotheses:

Hypothesis H4. The innovation network plays a positive moderating role in the process of transforming MIT capability into firm service innovation capability, and also positively influences the generation of firm service innovation performance, which is thought that SIC has a moderated mediating effect.

Hypothesis H41. the higher quality of internal and external integrated innovation resources between enterprises and partners has, the stronger the service innovation ability of enterprises should be.

Hypothesis H42. the more stable the innovation network relationship is, the more conducive the enterprise is to the effective integration of internal and external innovation resources, and the more adaptable the enterprise is to the dynamic environment, so as to improve the innovation service ability of the enterprise.

3.2.5. *The control effect of enterprise basic condition*

Firm size negatively moderates the influence of political relationship on technological innovation and economic performance (Jinbo, 2020). Jie et al. (2009) found that enterprise scale and enterprise innovation showed a significant inverted U-shape, contrary to the results of (An et al., 2006), which may be due to intra industry differences. Sun et al. (2016) found that there is a significant relationship between enterprise scale and enterprise innovation. China's manufacturing enterprises generally fall into three categories: state-owned enterprises, private enterprises, and other enterprises (foreign-funded enterprises, foreign-funded enterprises, etc.). For the innovation performance, private enterprises performed better than state-owned enterprises (Hu and Yuandi, 2015).

Taking into considerations on the possible impact of enterprise scale, enterprise nature, and enterprise type on its innovation behavior and performance (Damanpour, 2010), the three variables are used as control variables, which will play a controlling role in the influence of other factors on SIP (Hypothesis H5).

Hypothesis H5. The influence of service innovation capabilities on innovation service performance is controlled by the basic conditions of the firm.

4. Research methodology

4.1. *Questionnaire design*

Questionnaire data are generally classified into objective data with financial data as an example and subjective perception data. In general, the reliability and validity of the cognitive indicators from objective data can better meet the research needs (Davern and Wilkin, 2008; Ketokivi and Schroeder, 2004), which is why the cognitive and perception data of the questionnaire survey will be used in the paper. Perceived enjoyment. The setting of questionnaire indicators has been shown in Fig. 1, and the question items corresponding to these indicators are summarized in Table 4 mainly through literature reading methods.

To test the theoretical model proposed, questionnaire surveys were conducted with 550 manufacturing companies in China as the research objects, excluding invalid questionnaires, and finally 462 valid questionnaire data were obtained, with 84.0 % of valid responses. In this paper, the five-point Likert scale was used to measure the variables, with five be the highest number for an item. Then, survey data based, SPSS22.0 software will be used to analyze the survey data. Table 5 shows the descriptive statistics for a sample size of 462.

Table 4
Questionnaire measurements.

Factor	Index	Item	Literature
The capacities of MIT (MIT) (Kim et al., 2019; Setia et al., 2013; Greengard, 2011)	MIT1	The application of MIT improves the ability to predict consumer demand	Setia et al., (2013); Kim et al., (2019); Greengard,(2011)
	MIT2	The device and tool of MIT are easier to use, more useful and more reliable	
	MIT3	MIT is universal and its application does not need to abandon our original information technology architecture	
	MIT4	The information transmitted by MIT is more transparent and controllable	
	MIT5	Partner requirements or technology development	
Innovation network (MN) (Wang, 2018; Rufang and Weixing, 2016; Yong et al., 2018)	MN1	Relationship strength	Wang (2018); Chen, et al., (2016); Dai (2018)
	MN2	Quality of relationship resources	
The service innovation capability for enterprise (SI) (Chen et al., 2017; Zheng et al., 2014b)	SIC1	The sharing of private knowledge between groups	Chen Sheng (2017); Zheng, et al. (2014)
	SIC2	Entrepreneurs and employees are easy to accept and learn new things, and the service system is intelligent and decision-making	
	SIC3	High heterogeneous integrated service system	
	SIC4	Enterprise has service-oriented virtual organization in which service resources can be dynamically configured	
Service innovation performance of enterprise (SP) (Greengard, 2011; Zhao and Feng, 2015; Ghasemaghaei and Hassanein, 2015; Dai et al., 2014)	SP1	Is the competitive pressure of an enterprise in the industry alleviated by the improvement in their service innovation?	Zhao and Feng (2015); Ghasemaghaei et al., (2015); Dai et al. (2014); Setia et al., (2013)
	SP2	Is the satisfaction rate of customer high and is the turnover rate of customer low?	
	SP3	Can enterprises effectively and quickly adjust the service mode and content?	

Table 5
Sample descriptive statistics ($N = 462$).

Sample description	Classification standard	Frequency	%	Cumulative percentage
Manufacturing type	Light textile	205	44.37	44.37
	Pharmaceutical manufacturing	50	10.82	55.19
	Machinery	121	26.19	81.38
	Electronics and communication	86	18.62	100
Enterprise nature	State owned	100	21.65	21.65
	Collective	159	34.42	56.06
	Private	182	39.39	95.45
	Foreign funded	21	4.55	100
Enterprise size	100 ≤ Size<500	150	32.47	32.47
	500 ≤ Size<1500	178	38.53	71
	1500 ≤ Size	134	29	100

As can be seen from Table 5, China's private enterprises and collective enterprises are relatively active, and they are the backbone of China's manufacturing industry. At the same time, except for the light textile manufacturing industry, which accounts for a large proportion, the number of other manufacturing enterprises is not much different. Overall, the types of companies surveyed are widely distributed, and the survey data are representative.

4.2. Confirmatory analysis

The indicators for testing the item quality mainly include reliability, validity, and distinction. To do it, Confirmatory Analysis (CFA) was carried out testing the 4 factors and 14 Measurement items. Reliability is often used by Cronbach's α coefficient and Composite Reliability (CR) to measure the variables in scale stably and reliably. The higher the reliability is, the smaller the error is (Wang et al., 2020). Table 4 displays the data reliability coefficients of all constructs are >0.8, indicating that the scale used in this paper has high reliability.

Validity is an important index to measure the quality of the relationship between latent variables and significant variables. Data validity should generally be test by Convergent Validity and Discriminated Validity (Gefen et al., 2011). As shown in Table 6, the average extracted variance value (AVE) value of each construct is higher than 0.5, and the factor loading of the observation item corresponding to each construct is >0.7, suggesting a good aggregation (convergence) validity of samples data (Fornell and Larcker, 1981).

Besides the strong cohesion of data, the weak external coupling (i.e. strong discrimination) should be presented in Table 7.

The square root values of AVE on the diagonal line of Table 5 are all greater than the maximum absolute value of the correlation coefficient between factors, implying good discriminant validity. Therefore, a structural equation model can be constructed based on these data.

Table 7
Correlation coefficient matrix.

Factor	MIT	MN	SIC	SIP
MIT	0.713			
MN	0.56	0.861		
SIC	0.495	0.541	0.788	
SIP	0.525	0.473	0.436	0.764

5. Findings

5.1. Structural equation modeling

Based on the survey data, empirical analysis is performed on Fig. 1 and the proposed research hypotheses will be tested by AMOS 22.0 software. Generally, there are many fitting indicators for testing model, and a few commonly used indicators, including Chi-square, GFI, RMSEA, RMR, CFI, NFI, NNFI, IFI are sufficient. The fitting validity analysis of the overall model in this study is shown in Table 8.

As can be seen from Table 8, these commonly used indicators meet the standards, indicating that there is no “dislocation” between all factors and analysis items, and no analysis items need to be removed from the model.

Ignoring the estimated residual terms during model fitting, the basic structural equation model with significant path coefficient is presented in Fig. 2.

Fig. 2 reveals the causality and intrinsic influence between variables intuitively, and confirms the status of M's moderating roles and the mediating roles of SIC.

For service innovation performance, SIP2 is the most fundamental performance form, which embodies the market share, profit margin, brand degree and sustainable development of enterprise products driven by the meeting of enterprise individuation, precision, and diversified market service demand. Moreover, SIP3 is a performance factor that has a consistent relationship with SIP2.The higher customer loyalty is the foundation of enterprise's benign development, which is the internal guarantee of improving enterprise's market competitiveness. At the same time, the efficiency of new service R & D will also affect the spontaneity to servicing customers and the grasping of market opportunities. Therefore, the service innovation performance of manufacturing enterprises can be measured from these core factors.

The relationship between factors and measurement items can help us to clarify the dependency relationship and dependency intensity between them. Obviously, the standardized load coefficients are close to or higher than 0.6, indicating that the measurement relationships are more tenable. Moreover, MIT3, SIC3, and SIP2 are respectively the most important indexes for latent variables with influence relationship in Table 10.

This table appears that the standardized path coefficient of the three

Table 6
Results of reliability and validity.

Latent variable	observed variable	Std Dev.	Std. Estimate	Cronbach's Alpha	KMO	CR	AVE
MIT	PF1	0.907	0.569	0.835	0.838	0.837	0.509
	PF2	0.838	0.809				
	PF3	0.803	0.813				
	PD1	0.83	0.739				
	PD2	0.874	0.641				
MN	MN1	0.859	0.83	0.851	0.741	0.851	0.741
	MN2	0.835	0.893				
SIC	SIC1	0.814	0.779	0.903	0.89		
	SIC2	0.812	0.815	0.867	0.775	0.868	0.622
	SIC3	0.779	0.775				
	SIC4	0.81	0.783				
SIP	SIP1	0.797	0.69	0.806	0.703	0.807	0.583
	SIP2	0.715	0.849				
	SIP3	0.748	0.76				

Table 8
Model fitting.

General indicators	χ^2/df	GFI	RMSEA	RMR	CFI	NFI	NNFI	IFI
Criterion	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9	>0.9
Value	2.212	0.967	0.051	0.028	0.979	0.963	0.969	0.979

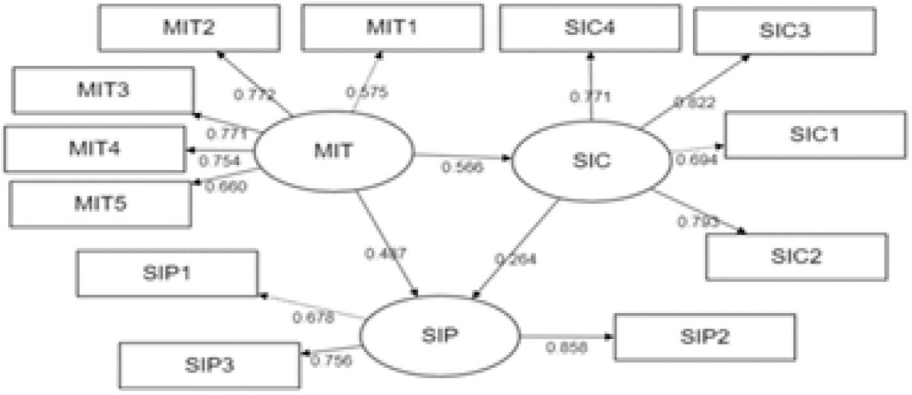

Fig. 2. Basic structural equation model.

direct influences (MIT≥ SIC, MIT≥ SIP2, SIC≥ SIP) are all >0, and the paths are significant at the level of 0.01, indicating the validity of the positive direct influence hypotheses. This also suggests that the research hypothesis of SIC as an intermediary variable between MIT and SIP is confirmed.

5.2. Mediating effect analysis

Should the service innovation capability of enterprises be the intermediary variable in the promotion of mobile information technology capability to enterprise service innovation performance? Does the firm's innovation network have a moderating effect on the mediating variables? This is also an important part of exploring the innovation performance mechanism of SIC and improving the innovation network mechanism. The mediating effect of 5000 samples based on the sampling test method shows that there is 'MIT ⇒ SIC⇒SIP' mediating path, illustrating the certainty of the mediating effect hypothesis. Then, according to the 95 % confidence level, the specific mediated effect was analyzed to obtain the fully mediated effect, as Table 11.

As can be seen from Table 9, SIC2 and SIC3 are important observed mediating variables. The capabilities of perceived market demand, easy use and observability for MIT can promote enterprise service innovation performance through the integration and learning ability of enterprise service system.

Table 9
Measurement relationship.

X	→	Y	SE	z	p	Standardized load coefficient
MIT1	→	MIT	–	–	–	0.575
MIT2	→	MIT	0.107	11.504	0	0.772
MIT3	→	MIT	0.103	11.516	0	0.771
MIT4	→	MIT	0.103	11.618	0	0.754
MIT5	→	MIT	0.103	10.713	0	0.66
SIC1	→	SIC	–	–	–	0.694
SIC2	→	SIC	0.078	14.636	0	0.793
SIC3	→	SIC	0.113	10.062	0	0.822
SIC4	→	SIC	0.1	11.035	0	0.771
SIP1	→	SIP	–	–	–	0.678
SIP2	→	SIP	0.079	14.423	0	0.858
SIP3	→	SIP	0.076	13.791	0	0.756

5.3. Moderating role for innovation network (MN)

5.3.1. The moderating role of MN in the influence of MIT on SIC

Will the mobile information technology capability (MIT) be a different impact on the company's innovative service capability (SIC) under the disturbance of the enterprise's innovative network? To clarify this confusion, in the case of MN mediation, the influence of MIT on SIC and SIC on SIP respectively would be analyzed. The results are as follows.

Some moderating roles can be seen from three models in Table 12. Model 1 is the influence of MIT on SIC. Model 2 comes from model 1 by adding moderation variable, while model 3 is based on model 2 of adding interaction term (the independent variable * the moderation variable). According to the $t = 12.161$, $p = 0.000 < 0.05$ in Model 1, MIT will have a significant influence on SIC. Moreover, the interaction term between MIT and MN is significant (t = 4.879, p = 0.000 < 0.05), meaning that the positive impact of MIT on SIC will be significantly different with different levels of moderated variable MN. The extent of this moderate can be described as the simple slope data in Table 13.

Evidently, (+1SD) and (-1SD) for ME will play differently role. In good innovation network, MIT has stronger direct positive impact on SIC. However, the low level of MN had no moderating role for MIT and SIC. The specific role of MN moderating can be referred to Table 14.

Low quality innovation network resources will not play a moderating role. The more reliable the relationship in the innovation network is, the greater its moderating effect will be. Research hypothesis H41 and H42 are respectively partially true and true.

5.3.2. The moderating role of MN in the influence of SIC on SIP under certain control conditions

Under the basic conditions of an enterprise, such as manufacturing type, enterprise nature and enterprise size, the influence of other factors on the service innovation performance of an enterprise will be controlled moderating. Hence, the controlled moderating role of MN to the influence of SIC on SIP is assumed as Table 15.

Table 14 indicates that SIC would have a significant positive influence on SIP regardless of MN. Furthermore, no matter levels at high, medium and low, MN will play a positive moderating role in the relationship between SIC and SIP. MN may be an inevitable catalyst for the transformation of service innovation capability into service innovation performance.

In short, Tables 13 and 15 explain the moderating hypothesizes proposed are feasible. At the same time, surprisingly, the three control variables did not play the role of the original hypothesis.

5.4. Moderated mediator

Since SIC has a mediating effect, is the mediating effect subject to the moderating effect of firm's innovation network? Undoubtedly, it is also necessary research issue of exploring the innovation performance mechanism of SIC and improving the innovation network mechanism. In this paper, model 7 of bootstrap method is used to test the moderated mediating role (Hayes, 2013), the test results are shown as Table 16.

Table 16 indicates that the confidence intervals of bootstrap test for are (0.014, 0.058) and (0.033, 0.083) respectively for medium level innovation network and high-level innovation network. This reveals that the indirect path of mobile information technology capability influencing service innovation performance through service innovation capability is significant, and the intermediary role of service innovation capability is valid. However, for low innovation network level, the confidence intervals of bootstrap test are (− 0.012, 0.037), indicating that the mediating role of service innovation capability does not exist under the regulation of low innovation network. From the above analysis, we can see that when the innovation network level is high, the moderated mediating effect is tenable. Hence, the hypothesis of moderated mediating effect is partially tenable.

6. Findings

Based on the proposed conceptual model and theoretical hypothesizes, and for different research objectives, survey data based, the relationships among influencing factors, the moderating effect of innovation network and the moderated mediating effect of innovation service capability of enterprises have been summarized through empirical test, as shown in Table 17.

Finding 1. The mobile information technology capabilities are essential driving for an enterprise to achieve efficient service innovation performance.

With the continuous innovative integration of advanced IT and mobile communication service capabilities, MIT' capabilities of networked service, precision service and intelligent service are becoming stronger and stronger, which can better meet the needs of personalized and humanized services and improve the service innovation performance of manufacturing industry. MIT can not only be directly embedded into the service innovation activities of enterprises to produce direct service innovation performance, but also can play an indirect role through internalization into the service innovation ability of enterprises.

Meanwhile, the direct impact of MIT capabilities on the performance of enterprise service innovation is greater than the indirect impact (refer to Table 10). It indicates that as long as MIT transformed from a technical concept to a technical diffusion capability, can it promote the positive development of service innovation activities and can be absorbed as an enterprise's Service innovation capability has become a potential driving force for long-term service innovation.

Finding 2. Mobile information technology capabilities can actively directly help or moderated help companies in certain service innovation capabilities (refer to Tables 10 and 12), and this is the nature value of MIT.

In terms of strategic consistency, the prerequisite for this is that there is a consistent service strategy between the enterprise and the service partner, so that the use of internal and external integrated service systems can achieve collaborative service knowledge sharing, dynamic learning, and service decision-making capabilities. However, the driving effect of MIT on SIC should be two cases. Firstly, according to Fig. 1, enterprises should pay more attention to the construction of basic technical capabilities. Secondly, Table 11 based, for the mediating effect of SIC driven by MIT, MIT's perceived market demand will become the focus by enterprises for their high-quality service innovation development stage.

In view of the supportive relationship network of enterprises' innovation, it is necessary to prepare the innovation network based on the strength of innovation relationship and the quality of innovation relationship resources. This is not only the external support of the enterprise's service innovation ability, but also the foundation of the continuous development of the enterprise's innovation ability. It can be seen from the positive moderating effect of innovation network on MIT and SIC, and only a strong innovation network can enterprises have sustainable service innovation capability (refer to Tables 12 and 13).

Therefore, also taking account of Finding 1 and Finding 2, we are more awarded that capability is the core competitive resource for the sustainable development of enterprises. So, some advice can be given that manufacturing enterprises should increase the input of MIT hardware and increase the use of their hardware in the early stage of service transformation. In this way, service innovation mode will be innovated, and service performance will be promoted to a new level. Assuming that the enterprise has a certain technical facility, and the service transformation has begun to pursue the “quality” period, the enterprise needs to consolidate its innovation resources and innovation relationship network, through the learning and absorption of service innovation knowledge to solidified into its own service innovation ability, is the foundation of sustainable development of enterprise.

Finding 3. The transforming corporate service innovation capabilities into corporate service innovation performance is a dynamic process with moderated mediating effect of MN (refer to Tables 15 and 16) and is not controlled by expected variables such as the size, nature, and type of enterprise (refer to Table 16).

Firstly, obviously, the mediating effect of SIC is obvious and can also be a moderated by innovation network. In the short term, the certain service innovation capabilities of enterprises could give some expected service innovation performance. In the long term, enterprises should continuously optimize their innovation network to improve their dynamic service innovation capabilities and to support dynamic service innovation performance. In brief, the dynamic SIP should result from essentially the dynamic development process of MIT capabilities and SIC capabilities with high innovation network level.

Secondly, another interesting finding is that the performance of service innovation is not limited by the basic conditions of an enterprise with certain SIC capabilities. This maybe explained that as long as there

Table 10
Main path.

X	→	Y	SE	z	p	Standardized load coefficient
MIT	→	SIC	0.08	7.631	0	0.566
MIT	→	SIP	0.077	6.562	0	0.487
SIC	→	SIP	0.06	4.193	0	0.264

Table 11
Fully mediating path.

Indirect Path	Mediating effect	95 % BootCI	Fully mediation
MIT1≥ SIC2≥ SIP1	0.045	0.004–0.100	√
MIT2≥ SIC2≥ SIP1	0.03	0.001–0.076	√
MIT4≥ SIC2≥ SIP1	0.028	−0.000–0.065	√
MIT1≥ SIC2≥ SIP3	0.031	−0.005–0.082	√
MIT1≥ SIC3≥ SIP3	0.033	−0.005–0.086	√
MIT2≥ SIC2≥ SIP3	0.021	−0.003–0.062	√
MIT4≥ SIC2≥ SIP3	0.019	−0.004–0.055	√
MIT1≥ SIC3≥ SIP2	0.039	0.003–0.097	√

Table 12
The MN's moderating in the relation of MIT and SIC ($n = 462$).

	Model1	Model2	Model3
Constant	3.220** (137.104)	3.220** (147.192)	3.164** (130.446)
MIT	0.423** (12.161)	0.238** (6.071)	0.199** (5.098)
MN		0.606** (8.437)	0.611** (8.720)
MIT*MN			0.402** (4.879)
Sample size	462	462	462
R^2	0.243	0.345	0.377
Adjusted R^2	0.242	0.342	0.373
F	F (1,460) = 147.901, p = 0.000	F (2,459) = 120.825, p = 0.000	F (3,458) = 92.488, $p = 0.000$
△R^2	0.243	0.102	0.032
△F	F (1,460) = 147.901, p = 0.000	F (1,459) = 71.183, p = 0.000	F (1,458) = 23.806, p = 0.000

T value in brackets; Sample size 462.
* $p < 0.05$.
** $p < 0.01$.

Table 13
Simple slope of MN.

Moderating variable' level	regression coefficient	Std. error	t	p	95 % CI	
Mean level	0.199	0.039	5.098	0	0.122	0.275
High level (+1SD)	0.347	0.044	7.834	0	0.26	0.434
Low level(-1SD)	0.051	0.054	0.936	0.35	−0.055	0.157

Table 14
Simple Slope of MN1 and MN2.

Item	Moderating level	coefficient	t	p	95 % CI	
	Mean SD	0.219	5.502	0	0.141	0.297
MN2	+ 1SD	0.383	8.617	0	0.296	0.47
	-1SD	0.055	0.988	0.324	−0.054	0.163
	Mean SD	0.25	6.663	0	0.176	0.323
MN2	+ 1SD	0.372	8.35	0	0.285	0.46
	-1SD	0.127	2.351	0.019	0.021	0.232

Table 15
Moderating role and controlling role (n = 462).

	Model1	Model2	Model3
Constant	2.319** (37.267)	2.360** (39.687)	2.332** (39.180)
Enterprise scale	−0.010 (−0.403)	−0.016 (−0.710)	−0.013 (−0.562)
Enterprise nature	0.025 (1.139)	0.023 (1.102)	0.027 (1.281)
Industry category	0.008 (0.457)	−0.004 (−0.231)	−0.009 (−0.523)
SIC	0.294** (10.327)	0.171** (5.314)	0.173** (5.417)
MN		0.356** (7.022)	0.353** (7.025)
SIC*MN			0.195** (3.157)
R^2	0.195	0.274	0.289
Moderated R^2	0.188	0.266	0.28
△R^2	0.195	0.079	0.016
△F	F (4,457) = 27.669, $p = 0.000$	F (1,456) = 49.306, p = 0.000	F (1,455) = 9.964, $p = 0.002$

T value in brackets.
* p < 0.05.
** p < 0.01.

Table 16
Moderated mediating.

Level	Level Value	Effect	BootSE	BootLLCI	BootULCI
-1SD	1.381	0.008	0.013	−0.012	0.037
Mean SD	1.749	0.032	0.011	0.014	0.058
+1SD	2.118	0.056	0.013	0.033	0.083

Table 17
The summary of hypotheses tests results.

Hypotheses		Supported?
H1	MIT - > SIC	Yes
H2	MIT - > SIP	Yes
H3	SIC - > SIP	Yes
H31	MIT- > SIC- > SIP (Mediating role of SIC)	Yes
H32	MIT, SIC and SIP are proportional in turn	Yes
H4	MN ↙ ↘ Moderated mediating effect of SIC by MIT => SIC => SIP MN	Partially
H41	S Low-level innovation network resources have no moderating effect	Partially
H42	No matter how strong or weak the innovation network relationship has a moderating effect.	Yes
H5	The influence of innovation service capability on innovation service performance is not controlled by the basic conditions of the firm itself.	No
HH	The acquirement of tacit knowledge of innovation service is not the most important factor for enterprises to improve their innovation service ability.	No

are sufficient innovation resources and innovation capabilities, the size, nature, and type of the enterprise will not be an obstacle to the service innovation behavior of an enterprise. Namely, no matter the size of an enterprise, whether it is a private enterprise, a state-owned enterprise, or a foreign-funded enterprise, as long as it has good innovation resources and innovative resource network, the enterprise may improve its service innovation capabilities and service innovation performance. In a sense, this result will provide Chinese small and medium-sized manufacturing enterprises and private manufacturing with some confidence for the service-oriented transformation of manufacturing, and it will have a certain impact on their self-abasement and fear of reform psychology.

Finding 4. The innovative use of MIT for a manufacturing enterprise is important for the MIT's profound influence on its service innovation. At the same time, although some indicators are not the most important, but indispensable one for service innovation from the perspective of long-term service strategy development.

Since the MIT' diffusional capability has an undoubted positive impact on the service innovation of manufacturing enterprises. In addition to the obvious important factors, what other factors are potentially of greater value?

As far as the role of key observed variables are concerned, the basic technical characteristics of MIT, consisting of MIT2, MIT3 and MIT4, are the basic components of its capabilities, which is the critical adopting factors affecting the service innovation ability of an enterprise. In other words, MIT with the capabilities of easily information communication, integrated information and observed information for decision supporting are powerful means to guarantee the tacit knowledge sharing, optimizing service resources and promoting the interest of enterprise innovation learning. Meanwhile, the ability to share tacit knowledge and optimize the allocation of service resources in the value chain of an enterprise is the embodiment of its learning capability. With strong learning capability can an enterprise to maximize the value of service resources through sharing knowledge and information. That is, the key for enterprises to innovate is that they have learning culture and certain learning ability. In contrast, because of the private nature of tacit knowledge, even under the promotion of an enterprise's open strategy, its transfer and its penetration among subjects are slower, which is why the sharing speed of tacit knowledge will not be faster than that of

explicit knowledge. This may also be the fact that it is less important here than the other three factors (this may be the reason why hypothesis HH does not hold). Therefore, while continuously strengthening and perfecting the enterprise service innovation strategy, Chinese manufacturing enterprises should formulate the mobile information strategy and knowledge learning strategy of enterprises (The designated strategy should have the strategic coordination between the two. In other words, the updating and aggregation of information technology should be determined according to the actual situation of an enterprise, to promote the formation of innovative service ability of the enterprise smoothly. The smaller the loss of technical resources under the non-adventive strategy, the greater the utility, the greater the space for enterprise innovation knowledge sharing and learning, and the stronger the enterprise's innovation service capability), so as to effectively enhance the innovation capabilities of enterprises. In this way can we make effective use of the existing MIT resources and the service resources in value chain, promote tacit knowledge to create new service knowledge for enterprises, and enhance the competitiveness of service innovation of enterprises.

7. Discussion, implication and conclusion

Compared with the traditional IT technology, MIT has the characteristics of anytime, anywhere and transparency, which improves the service and wisdom of information. Based on MIT's information capabilities and the service capabilities of manufacturing enterprises in China, the empirical analysis on the structural model, shows that MIT is an important tool and resource for modern manufacturing enterprises. So, MIT can be an effective auxiliary measure for the service innovation of Chinese manufacturing enterprises, and it is the key to help enterprises maintain long-term competitive advantages with unique innovative manufacturing services capabilities.

The paper contributes to the theoretical and practice perspectives. Theoretically, based on dynamic capability theory and technological innovation diffusion theory, a theoretical model has been proposed to study the moderated mediating effect. We suggest that China's manufacturing enterprises should not be constrained by the size, nature, and type of enterprises, and should focus on the advanced technology adoption represented by MIT, the construction of an enterprise innovation network and the shaping of service innovation capabilities, to constantly improve the service transformation capability and service innovation performance of manufacturing industry. The service innovation performance of a manufacturing enterprise is directly affected by its service innovation capability, while the innovation capability of a manufacturing enterprise is directly affected by advanced IT such as MIT. The premise of the establishment of these influence relations also lies in the diffusion and internalization of MIT's acceptability characteristics into the enterprise's innovation capability to promote the enterprise performance. Therefore, IT does not directly act on an enterprise. Only when it is transformed into enterprise capabilities can technological innovation spread to new-level innovation achievements. Practically, at present, people have no consistent understanding about the positive influence of MIT on SIP. Some scholars even put forward the IT paradox that the short-term use of IT is benefit for the enterprise, and the long-term use will be reverse. The paper argues that MIT itself will not generate value, only become a booster of enterprise' innovation capabilities, it will be effective. Moreover, as long as MIT capabilities are set reasonably, it will play a long-term role in an enterprise. This shows that the conventional IT paradox is not suitable for the utility of the integrated advanced information technology.

Generally, enterprises should pay attention to tapping the innovation diffusion capabilities of MIT, attach importance to the capabilities of its' learning by absorption, improve its service system integrating with innovation partners, and strengthen the market competitiveness of enterprises with high-quality innovation service content and innovation service methods. Furthermore, enterprises should also focus on the construction and development strategy of innovation network in their innovation service strategy, which is also the internal and external integration of innovation relationship resources that can mediate the long-term service innovation performance of enterprises.

There are some limitations on the current research. Data was collected basically in Chinese enterprises. Cross-cultural comparison can be studied in the future. In addition, this paper only focuses on the level of service innovation. The following research can be carried out at the manufacturing innovation level, as well as a comparison study between service and manufacture innovation factors.

Data availability

Data will be made available on request.

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