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How Does External Environment Affect Individual Service Innovation Performance? Empirical Evidence from The Tourism and Hospitality Industry

Ming Lei

National Institute of Development Administration,
International College, Bangkok, Thailand
School of Business Administration,
Guangxi University of Finance and Economics, Guangxi, China
***Corresponding author** Email: minglei@gxufe.edu.cn*

Chih-Hung Chen

National Institute of Development Administration,
International College, Bangkok, Thailand
Email: Chih_hung.che@nida.ac.th

Abstract

Purpose: This study investigates the internal and external factors determining individual service innovation performance in the tourism and hospitality industry (T&H). The research gives decision-makers insights into the external environmental factors that can promote individual innovation. Internal environmental factors, knowledge sharing, and information literacy are vital in this process.

Design/methodology/approach: This study adopts a quantitative methodology by collecting the data from questionnaires of mid- and high-level management in high-star hotels in China. CB-SEM methodology is used to test the research hypotheses and model.

Findings: The study results support the proposed model that the external environmental factors of technological turbulence and market turbulence can positively affect individual service innovation performance through the chain-mediating effect of the internal environmental factors of information literacy and knowledge sharing.

Originality/value: Based on the resource-based view (RBV), the knowledge-based view (KBV) and contingency theory, this study proposes a research paradigm of "external environment-individual-innovation performance" and a novel chain mediation model, which confirms the complementarity of the three theories. The results provide operative solutions for innovation decision makers and management of T&H firms on ways to promote individual innovative service innovation performance by utilizing the external environment turbulence factors.

Keywords: technological turbulence; market turbulence; knowledge sharing; information literacy; service innovation performance; tourism and hospitality (T&H)

JEL classification: D81, L84

1. Introduction

Innovation has always driven firms to maintain their competitive edge and move forward (Xu, et al., 2023). Firms in different industries are committed to innovation and valued by many countries because of their important contribution to gross domestic product (GDP) growth and national competitiveness (Arkolakis, et al., 2018). Thus, measuring the effectiveness of different innovation activities has also become a hot topic in academia and industry (Richtnér, et al., 2017).

In the wake of the global economic downturn following the pandemic, the issue of how to revive the economy has become a common concern around the world (Gagnon, et al., 2023). As an engine of world economic growth, the service industry is important in promoting global economic development (Moslehpour, et al., 2018). The T&H sector, as an essential service industry branch, mainly focuses on providing intangible services, which is unique in its greater focus on the customer service experience (Wu, et al., 2023). Thus, service innovation performance has become an important indicator for measuring the innovation results of T&H firms. T&H and academics continuously explore at both practical and theoretical levels to improve service innovation performance. In particular, the factor of external environmental turbulence has received increasing attention from firms as an important background for studying innovation strategies (Bodlaj & Čater, 2019). As an industry that cannot survive without the flow of tourists, the T&H sector has been hardest hit by the pandemic. Given its contribution to the global economy and its important role in job creation, the revitalization of T&H post-pandemic has been a hot topic for industry and academia (Vărzaru, et al., 2021).

Although external environmental turbulence has become the norm in all industries (Mokhtarzadeh, et al., 2022), T&H's instability, vulnerability, and unpredictability compared to other industries has long been a consensus among academics and the industry. Many contingencies (e.g., wars, epidemics, political instability, policy changes) can cause market fluctuations, such as changes in consumer demand and preferences for T&H products (Campo, et al., 2014). Coupled with the fact that T&H is a highly experiential industry and customers are always looking for new and unique experiences (Ali & Omar, 2014), improvement of customer satisfaction and customer loyalty is a top priority for every company (Vinh, et al., 2023). Thus, it is necessary for T&H firms to constantly think about how to innovate their services to meet their guests' changing preferences and needs. Even if consumer demand preferences for products and services in T&H are susceptible to change without the interference of external factors, numerous unpredictable and uncontrollable external environmental factors further exacerbate the industry's market uncertainty (Tang, et al., 2019).

In addition to market turbulence, the development of IT has become a driving force and one of the determinants of service innovation in business (Liao, et al., 2014). In the aftermath of the pandemic, various sub-sectors of T&H, such as hotels, restaurants, tourist attractions, and transport, have further increased their investment in and use of IT equipment to reduce risks and enforce strict pandemic

prevention and control policies (Sujood, et al., 2023). In addition, T&H is widely regarded as an information-intensive industry as T&H firms rely heavily on information technology in dynamically managing information, studying consumer behavior, managing operational processes, marketing, and implementing service and product innovations (Juliana, et al., 2022). T&H firms face various uncertainties and require more investment in IT to better adapt to the changing market environment (Akour, et al., 2022). Especially during the pandemic, IT is a buffer against Covid-19 in different industries (Choi, et al., 2023). The rapid growth of IT has also brought technological turbulence to T&H. Both technological and market turbulence are essential components of environmental turbulence. Environmental turbulence refers to the speed and extent of change in a firm's external environment, mainly reflected in the volatility and unpredictability of industry technologies and customer preferences (Jaworski & Kohli, 1993). Environmental turbulence is both a challenge and an opportunity for firms.

The turbulent external environment can make existing knowledge and information obsolete (Gemici & Zehir, 2021), and T&H firms are constantly exploring how to innovate to meet the challenges of uncertainty in the face of the turbulent external environment (Škokić, et al., 2016). Knowledge-based theory tells managers that the key to an organization's success is its ability to outperform its competitors in terms of knowledge acquisition, knowledge generation, knowledge use, and knowledge storage (Grant, 1996). Knowledge sharing is a communication behavior between the sharer and the receiver, which can promote new knowledge generation (Vuori & Okkonen, 2012). Therefore, in T&H firms, knowledge sharing can reduce the risk of knowledge obsolescence caused by the turbulent external environment to a certain extent, which is particularly important for T&H firms to maintain competitive advantage and innovation.

Past studies have shown that firms' internal environmental factors, such as leadership (Lecic, et al., 2023), knowledge sharing (Hu, et al., 2009), organizational culture (Hussain, et al., 2016), and so on, are typically important determinants of service innovation performance. However, most studies have not simultaneously examined the impact of external environmental factors, such as technological changes and market changes, on service innovation performance. According to contingency theory, the external environment also significantly impacts firm performance outputs and is an important background for firms to study and conduct innovation strategies (Bodlaj & Čater, 2019). Therefore, this study concludes that to explore the factors contributing to service innovation performance in T&H, which is highly susceptible to external environmental changes, it is more scientific to consider internal and external innovation environment factors. Thus, how to change the micro-environmental factors to adapt to the uncontrollable macro-environmental factors proactively and creatively is an issue that firms need to consider. Many scholars have recognized external environmental turbulence as an important background for firms' learning and innovation strategies. Still, empirical evidence on how it works at the micro level to ultimately generate innovation outputs is currently lacking.

This study aims to elucidate how external environmental turbulence affects individual service innovation performance. Specifically, to identify the chain mediating effects of information literacy

and knowledge sharing in the relationship between technological and market turbulence and service innovation performance. By explaining the external environmental turbulence affecting individual service innovation performance, this study helps managers understand the formation mechanism of individual service innovation performance so that they can make scientific decisions. Specifically, this study proposes that managers should emphasize employees' perception of changes in the external environment, improve employees' information literacy, and promote knowledge sharing. Finally, the theoretical and practical insights of the study are summarized, and future research is proposed.

2. Literature Review and Hypothesis Development

2.1 Market Turbulence and Service Innovation Performance

Market turbulence is the change rate in a firm's customers' product preferences and composition. It is viewed as part of environmental turbulence, along with technological turbulence (Jaworski & Kohli, 1993). In this study, market turbulence in T&H can be understood as the variability and unpredictability of the market faced by the firm, which reflects the rate of change in consumer preferences for products or services and consumer composition.

Market turbulence, as the norm for T&H, is characterized by unpredictability, rapid change, and instability, which can lead to difficulties for businesses to understand the current market state, identify customer needs, and predict future market trends (Santos-Vijande & Álvarez-González, 2007). The success of service innovations is primarily determined by the customer (Liao & Wong, 2008). When firms have a poor understanding of the current market status and future trends, there is a high probability that the products and services will not meet consumer demand and thus lose market competitiveness (Senbeto & Hon, 2020).

Service innovation is a broad concept first proposed by scholar Gallouj in 1997, and the concept emerged from the innovation theory of American scholar Schumpeter (Gallouj, 1997). Regarding the definition of service innovation performance, no literature has been found to provide a clear explanation of this concept. Based on previous research, this study argues that service innovation performance can be understood in the following ways: first, service innovation performance is an indicator to measure whether service innovation is successful (Hussain, et al., 2016). Second, service innovation is an extra-role behavior that involves a certain amount of risk, like physical product innovation, and therefore requires a set of evaluation indicators to measure it (Storey, et al., 2016). Third, service innovation performance can be seen as an outcome of service innovation, and there is a mutual reinforcement between the two (Hanif & Asgher, 2018).

Hence, T&H firms must frequently update and improve their services to meet customers' changing needs and preferences. Since individual innovation is essential for organizational innovation, especially in T&H, where employees are the leading service product producers, the improved

performance of firm service innovation depends heavily on individual service innovation. Therefore, this study concludes that market turbulence in T&H motivates individual employees to service innovation, while service innovation performance can be seen because of service innovation, and there is a mutual reinforcement between the two (Senbeto & Hon, 2020). Thus, the following hypothesis is proposed.

H1: Market turbulence positively affects service innovation performance.

2.2 Technological Turbulence and Service Innovation Performance

Technological turbulence refers to the technological environment's instability, complexity, and unpredictability. It is an important indicator of the degree of technological iteration in a given industry and an important component of environmental turbulence (Jaworski & Kohli, 1993). The high rate of new technology updates implies high technological turbulence in T&H. High technological turbulence means that product life cycles are shortened, technology becomes obsolete rapidly, and firms tend to develop new products (Atuahene-Gima, 1995). Contingency theory emphasizes that the external environment is irresistible, but it also emphasizes human subjectivity (McAdam, et al., 2016). Management should not simply comply with the environment but for the specific industry and business environment to flexibly use the idea of contingency, improve employees' understanding of the external environment and cognition, and create a favorable environment for the firm. Technological turbulence offers a plethora of opportunities for service innovation in T&H. For example, VR (virtual reality)/AR (augmented reality) and meta-universe technologies can enhance the customer travel experience, AI (artificial intelligence) and QR code technologies streamline the service process, robots reduce face-to-face human contact, and so on (Kumar, et al., 2023). Therefore, this study argues that all the characteristics of high technological turbulence can contribute to service innovation performance. Accordingly, the following hypothesis is developed.

H2: Technological turbulence positively affects service innovation performance.

2.3 Role of Information Literacy between Market Turbulence and Service Innovation Performance

Information literacy has matured after more than 30 years of development. The focus of information literacy research by institutes and scholars in different countries has shifted to exploring the specific connotations and frameworks of information literacy and the differences in other contexts. At present, academics widely recognize the classification of the three information literacy contexts proposed by Lloyd (2006). However, most existing literature explores information literacy from the academic and educational context, and the research on the workplace context is still lagging (Widen, et al., 2023). In conjunction with UNESCO's statement that literacy is an ability, this study understands

information literacy as an information-processing ability, which is the ability of employees in T&H firms to solve problems by searching, acquiring, organizing, evaluating, using, and creating information when faced with complex issues and tasks arising from their work.

When market turbulence in T&H causes firms to have difficulty understanding the current market situation, identifying customer needs, and predicting future market trends, employees are prompted to seek consumer preferences through various channels. In the information age, the most efficient way to obtain market information is to collect product feedback and interact with customers through various OTA (online travel agencies) and social media platforms. Obtaining this information requires information literacy to identify opportunities better than competitors and grasp market information faster. Therefore, market turbulence will motivate employees to enhance their information literacy level to cope with external market uncertainties.

In addition, according to RBV and the definition of information literacy, employee information literacy can be viewed as a heterogeneous resource of the organization. In the workplace context, information literacy can create value and improve organizational efficiency (Lloyd, 2006). Information literacy in the workplace focuses on decision-making and judgment at work, the ability to work collaboratively with peers to accomplish work, interaction with society and culture, and the employee's ability to think critically about the complexity of information available to them (Hicks & Lloyd, 2016). Previous research shows that these characteristics of information literacy in the workplace have a positive impact on factors such as employee knowledge creation, lifelong learning ability, job fit, creativity, innovative behavior, opportunity perception, job performance, and organizational innovation (Hasanlu & Jafari, 2015; Li & Hung, 2010; Middleton, et al., 2018; Naveed, et al., 2022; Wu, 2018). Although no literature has been found on the impact of information literacy on service innovation performance, all these factors influenced by information literacy are closely related to service innovation performance. Thus, the following hypotheses are proposed.

> **H3**: Market turbulence positively affects information literacy.
> **H4**: Information literacy positively affects service innovation performance.
> **H5**: Information literacy mediates the relationship between market turbulence and service innovation performance.

2.4 Role of Knowledge Sharing between Market Turbulence and Service Innovation Performance

Knowledge sharing is widely recognized as the most critical segment of the knowledge management process, and one of the fundamental claims of knowledge management theory is that knowledge can be shared (Grant, 1996). Based on KBV, this study believes that knowledge is one of a firm's most important intangible resources, created, used, and shared by individual employees (Grant, 1996). By sharing knowledge among employees and between employees and consumers, an organization's

knowledge base can be constantly updated, thus contributing to its competitiveness (Sahoo, et al., 2023).

When market turbulence is high, there is a high probability of a mismatch between the products and services produced by an organization and the needs of its customers, which in turn affects the results of its operations and performance. During the pandemic, people panicked because of fake news (McAleer, 2020). The T&H market is also experiencing turmoil. To overcome market turbulence, knowledge and information sharing among members of the organization, between members of the organization, and between external individuals is needed to help firms make strategic adjustments. In short, market turbulence can motivate individuals in organizations to realize the importance of knowledge-sharing, which can lead to knowledge-sharing behaviors.

In the case of the T&H industry, customer demand for service offerings is characterized by individualization and diversity. This, coupled with the fact that the industry is susceptible to rapid changes in market preferences due to various external environmental factors, poses a challenge for firms. In practice, the experience, information, knowledge, and contact points with customers possessed by different employees are not the same. Therefore, it is more conducive to fully understanding the market information by sharing knowledge among employees. To break the formulaic service preparation process and supply, provide guests with innovative services, and ultimately enhance the individual service innovation performance. Thus, the following hypotheses are developed.

H6: Market turbulence positively affects knowledge sharing.
H7: Knowledge sharing positively affects service innovation performance.
H8: Knowledge sharing mediates the relationship between market turbulence and service innovation performance.

2.5 Role of Information Literacy between Technological Turbulence and Service Innovation Performance

According to contingency theory, technological turbulence is an external environmental change factor that requires corresponding changes or adjustments within the firm to match the external environment. As various new technologies are applied in the industry, product and service offerings have shorter life cycles, and firms need to develop new products or services continuously to meet the challenges (Glazer & Weiss, 1993).

In the context of technological turbulence in T&H, many new services are being produced that depend on the latest technologies. The new services developed require employees with high information literacy to operate and deliver to customers better. The development of new services relies on employees with high information literacy to realize. In addition, technological turbulence

also means that technological change creates many opportunities for the industry (Jaworski & Kohli, 1993). These opportunities depend on employees with high information literacy to identify more accurately and quickly. When employees identify these opportunities, they take actions and steps to capitalize on them (Ahmad, et al., 2020). These actions are employee service innovation behaviors in T&H. Therefore, this study concludes that the effect of employee's perceived technological turbulence on their service innovation performance in T&H, which has extensive new technology applications, can be realized through information literacy. Considering this, the following hypotheses are developed.

H9: Technological turbulence positively affects information literacy.

H10: Information literacy mediates the relationship between technological turbulence and service innovation performance.

2.6 Role of Knowledge Sharing between Technological Turbulence and Service Innovation Performance

As mentioned above, when an industry is in a high technological turbulence environment, it represents a high speed and degree of technological innovation in the industry, product life cycles become shorter, and firms are more inclined to develop new products (Jaworski & Kohli, 1993). Since technology includes a broad category, and given the influence of information technology on T&H, the technology mentioned in this study refers to IT. On the one hand, the rapid development of IT enables more diversified facilities and equipment for knowledge sharing and information exchange, providing various platforms and facilities for knowledge sharing; on the other hand, the uncertainty caused by technological turbulence can stimulate knowledge sharing among individuals to reduce the challenge of technological turbulence. Thus, it is inferred that technological turbulence positively affects knowledge sharing.

Previous literature has proved the positive impacts of knowledge sharing in firms at different levels, including the organizational, team, and individual levels. At the individual level, knowledge sharing can improve employee innovative behavior (Kim & Lee, 2013), knowledge level (Hu, et al., 2009), job effectiveness (Lin, et al., 2010), creativity, and job performance (Wu, 2018), etc., and all of these affected factors are closely related to innovation performance. Moreover, knowledge sharing directly impacts individual innovation performance (Qiu, et al., 2015) and individual service innovation performance (Guan, et al., 2017). Considering this, we hypothesize the following.

H11: Technological turbulence positively affects knowledge sharing.

H12: Knowledge sharing mediates the relationship between technological turbulence and service innovation performance.

2.7 Information Literacy and Knowledge Sharing

The two critical parts of environmental turbulence, market turbulence, and technological turbulence, are uncontrollable external firm factors that can affect the industry, firm, and, ultimately, the individual. Thus, how external turbulent environments in T&H can eventually affect individual service innovation performance by affecting the industry and firm is a complex process.

In the information era, individuals in daily life and the workplace have significantly increased their information literacy levels. From a firm's perspective, the rapid development of IT has led to an increase in IT facilities and equipment applications. Information literacy staff are necessary to operate and use these IT equipment. Therefore, the construction of IT facilities promotes staff improvement in information literacy (Chen, et al., 2022). Especially after the pandemic, T&H firms have increased the application of IT equipment. IT has become a buffer for firms to counter the pandemic. From an individual perspective, people increasingly rely on various social platforms for daily life and work communication, and social software use contributes to enhancing information literacy (Keshavarz, 2022). Workplace information literacy refers to employees' ability to search, acquire, organize, evaluate, use, and create information to solve complex problems and tasks. It is an essential information processing skill that enables employees to navigate the demands of their work environment effectively (Lloyd, 2006). The ultimate purpose of these abilities to interact with information is to solve workplace problems and accomplish work tasks. Compared to academic and educational contexts, collaborative teamwork skills are valued more in the workplace context (Lloyd, 2006). As a result, knowledge, experience, and information are shared and exchanged among employees to solve workplace problems. Employees with high information literacy are more likely to collect, evaluate, use, and share such knowledge, experience, and information. Based on the above, it is inferred that information literacy in the workplace positively affects knowledge sharing.

Regardless of technological turbulence caused by technological change in the industry or market turbulence caused by the characteristics inherent in T&H and service products, they are all external environmental turbulence. Contingency theory states that external environmental changes require corresponding adjustments within the firm to adapt to new environments. As mentioned in 2.2.3, 2.2.4, 2.2.5, and 2.2.6, firms' knowledge can quickly become obsolete in highly turbulent market environments. There is an urgent need for firms to seek out new knowledge and gather more market information to satisfy new customer needs or to gain a competitive advantage by developing new service offerings. In a highly turbulent technological environment, the speed of emergence and obsolescence of new products/services is accelerating, which can put pressure on firms to innovate services. Therefore, the pressure from environmental turbulence will affect individual employees through the firm to cope with external environmental turbulence by improving their information literacy and knowledge-sharing behaviors. This will facilitate the generation of individual service innovation performance. So, the following hypotheses are developed.

H13: Information literacy positively affects knowledge sharing.

H14: Information literacy and knowledge sharing are chain mediators in the relationship between market turbulence and service innovation performance.

H15: Information literacy and knowledge sharing are chain mediators in the relationship between technological turbulence and service innovation performance.

Based on the above discussion, this study proposed the conceptual model shown in Figure 1 below.

Figure 1. Conceptual model
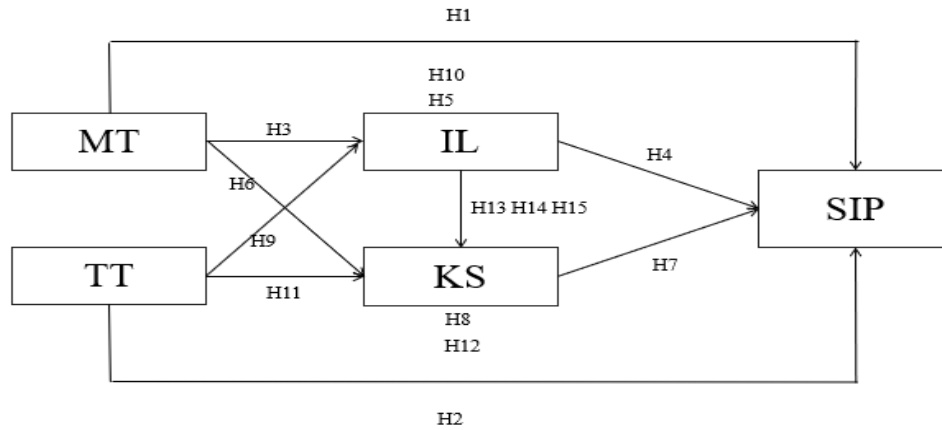
Notes: MT=Market Turbulence; TT= Technological Turbulence; IL= Information Literacy
KS= Knowledge Sharing; SIP= Service Innovation Performance

3. Methodology

3.1 Sample Selection

The study focuses on service innovation performance, a topic within the fields of sociology and management that applies to structural equation modeling (SEM). SEM can be classified into two types: covariance-based SEM (CB-SEM) and partial least squares variance-based SEM (PLS-SEM) (Hair, et al., 2017). CB-SEM is more commonly used for explaining established theories and is a validation type of research, whereas PLS-SEM is more often applied in exploratory studies for developing theories (Hair, et al., 2017). This study is not designed to establish theories but to apply and validate the three theories involved. Thus, CB-SEM is finally chosen as the analytical method.

Hotels, as typical representatives of service-oriented firms, share the characteristics of T&H firms. The research focused on mid- and high-level management employees of high-star hotels (four- and five-star hotels) in China. Specifically, the study targeted supervisors of each department and above in high-star hotels. We collected 330 questionnaire responses from mid- and high-level management of high-star hotels in 16 provinces in China, including Guangxi, Zhejiang, Jiangsu, Guangdong, and Hainan, among others. After excluding 53 invalid questionnaires, we were left with 277 valid responses, resulting in an effective recovery rate of 83.9%.

This study utilizes SEM analysis, normally SEM requires a sample size greater than 200. In addition, according to empirical rules, a sample size of 5-10 times of total question items is sufficient (Kass & Tinsley, 1979; Tinsley & Tinsley, 1987). Since there are five latent variables containing 22 question items in this study, according to the above principle, a sample size of over 220 is sufficient. Therefore, the sample size collected for this study was large enough. Finally, the data was analyzed and processed using AMOS24.0 and SPSS24.0 software.

As shown in Table 1 below, of the 277 samples, in terms of gender, 50.90% were female and 49.1% were male, roughly the same gender ratio. In terms of respondents' education and industry experience, 91.34% had a college education or above, and 90.44% had three and above years' experience, which ensured that the respondents had a good understanding of the external market environment of the hotel industry, the hotel operations they worked in, and the questionnaire. These management employees were distributed in different hotel departments, with 49.82% in front-line departments (e.g., housekeeping, F&B, and recreation) and 50.18% in second-line departments (e.g., administrative office, marketing, finance, and HR), which covered all hotel departments in an appropriate proportion. Mid-level management (department supervisors and managers) accounted for 80.51%, and high-level management (department heads, deputy general managers, and general managers) accounted for 19.49%, basically in line with the actual ratio of managerial staff in high-star hotels. In terms of hotel age of the respondents, 6.5% were less than one year, 23.1% were 1~3 years, 23.75% were 4~7 years, 25.63 were 8~15 years, and 21.3% were more than 15 years, which covered different hotel ages and represented the service innovation situation in different aged hotels.

Table 1. Descriptive statistics of respondents

Variable	Item	Frequency	Percentage
Gender	Male	136	49.10
	Female	141	50.90
Age	≤25	50	18.05
	26-35	124	44.77
	36-45	73	26.35
	≥46	30	10.84
Education	High school and below	24	8.66
	Junior college	131	47.29
	Bachelor's degree	105	37.91
	Master's degree and above	17	6.14
Experience	2 years and below	29	10.47
	3-5 years	70	25.27
	6-8 years	57	20.58
	9-15 years	75	27.08
	15 years and above	46	16.61

Variable	Item	Frequency	Percentage
Department	Rooms (Front Office, Guest Room, Housekeeping)	78	28.16
	Food & Beverage	54	19.49
	Marketing	33	11.91
	Human resources	55	19.86
	Recreation / Engineering / Security / Finance / Loss Prevention / Executive office /Others	57	20.59
Position	Department supervisor	102	36.82
	Department manager	121	43.68
	Department director	34	12.27
	Deputy general manager and above	20	7.22
Hotel age	<1	18	6.50
	1-3	64	23.10
	4-7	65	23.47
	8-15	71	25.63
	>15	59	21.30
	Total	277	100.0

3.2 Measurement

The questionnaire was measured using a 7-point Likert scale from 1-7, representing 1-totally disagree to 7-totally agree; the five latent variables involved in this study are as follows:

Service innovation performance. To measure hotel employee service innovation performance in two dimensions, a combination of Al-Ababneh (2014) and Hu, et al. (2009) studies was used: ESIB (employee service innovation behavior) and NSD (new service development). There are six items, such as "At work, I come up with new and innovative ideas and promote them to my colleagues" and "My hotel is efficient in terms of time, resources, and processes for developing new services". The Cronbach's alpha coefficient for this scale in the study was 0.904, KMO value was 0.825.

Market turbulence. The scale developed by Jaworski and Kohli (1993) was used and modified with statements in the hotel industry context. There are four items in total, such as "In the hotel industry, customer preferences for service change rapidly." The Cronbach's alpha coefficient for this scale in this study was 0.898, KMO value was 0.827.

Technological turbulence. The scale developed by Jaworski and Kohli (1993) was adopted and modified with statements in the hotel industry context. There were three items in total, such as, "Information technology changes have provided a great deal of opportunities in the hotel industry."

The Cronbach's alpha coefficient for this scale in this study was 0.856, KMO value was 0.719.

Information literacy. The scale development incorporated references to studies by Chang and Hsu (2015) and (Wang & Jiang, 2020). There are four items in total. For example, "In our hotel, I can efficiently obtain the information I need to accomplish my job tasks". The Cronbach's alpha coefficient for this scale in this study was 0.907, KMO value was 0. 844.

Knowledge sharing. The scale developed by Wang and Zhu (2012) was used, which is based on the research context of Chinese enterprises, the target respondents are the management staff of enterprises, and knowledge sharing was measured in two dimensions: knowledge sharing ability and sharing intention. There are five items, such as "I am willing to share my knowledge, experience or skills related to hotel work with others" and "I will express my opinions in a way that is easier for others to understand". The Cronbach's alpha coefficient for this scale in the study was 0.938, KMO value was 0. 881.

Demographic variables. This study has seven questions based on the characteristics of the hotel to obtain information about the respondents and hotels, including gender, age, education level, experience in the hotel industry, department, current position, and hotel age.

4. Results Analysis

4.1 Measurement Model Validation

The measurement model is based on the maximum likelihood method and the estimated parameters include standardized factor loadings, reliability, convergent and discriminant validity. The following tables provide the unstandardized factor loadings, standard errors, significance tests, standardized factor loadings, composite reliabilities and average variance extractions.

4.1.1. Convergent Validity

As shown in Table 2, the standardized factor loadings ranged from 0.7~0.906, all within the range, indicating that each item has reliability; the synthetic reliabilities of the constructs ranged from 0.858~0.94, all above 0.7, and the average variance extractions ranged from 0.618~0.758, all above 0.5, which are in line with the criteria suggested by scholars (Chin, 1998), indicating that each construct has good convergent validity.

Table 2. Measurement model results analysis (N=277)

Construct	Item	Mean	Std Dev	Std.	CR	AVE
MT	MT01	5.783	1.267	0.838	0.901	0.696
	MT02	5.834	1.234	0.873		
	MT03	5.899	1.215	0.891		
	MT04	5.866	1.170	0.725		

Construct	Item	Mean	Std Dev	Std.	CR	AVE
TT	TT01	5.881	1.217	0.732	0.858	0.670
	TT02	5.708	1.276	0.893		
	TT03	5.899	1.212	0.822		
IL	IL01	6.112	0.811	0.829	0.910	0.716
	IL02	6.040	0.945	0.906		
	IL03	5.931	0.985	0.830		
	IL04	5.957	1.003	0.817		
KS	KS01	6.491	0.899	0.850	0.940	0.758
	KS02	6.477	0.891	0.897		
	KS03	6.487	0.919	0.894		
	KS04	6.433	0.952	0.867		
	KS05	6.339	1.029	0.843		
SIP	SIP01	5.921	1.053	0.816	0.906	0.618
	SIP02	5.968	1.019	0.826		
	SIP03	5.690	1.166	0.809		
	SIP04	5.148	1.538	0.765		
	SIP05	5.296	1.464	0.792		
	SIP06	5.581	1.444	0.700		

Note: Std Dev= Standard Deviation; Std.= Standardized factor loadings; CR.= Critical Ration; AVE = Average variance extracted; MT=Market Turbulence; TT= Technological Turbulence; IL= Information Literacy; KS= Knowledge Sharing; SIP= Service Innovation Performance

4.1.2. Discriminant Validity

Fornell and Larcker (1981) suggested that an AVE square root for each construct greater than the correlation coefficient between the constructs indicates that the model has discriminant validity. As shown in Table 3, each construct's AVE was compatible with Fornell and Larcker (1981) recommendations, suggesting that each construct had good discriminant validity.

Table 3. Discriminant validity

	AVE	MT	TT	IL	KS	SIP
MT	0.696	**0.834**				
TT	0.670	0.581	**0.819**			
IL	0.716	0.365	0.439	**0.846**		
KS	0.758	0.520	0.506	0.443	**0.871**	
SIP	0.618	0.621	0.627	0.612	0.646	**0.786**

Note 1: AVE = Average variance extracted; MT=Market Turbulence; TT= Technological Turbulence; IL= Information Literacy; KS= Knowledge Sharing; SIP= Service Innovation Performance

Note2: Diagonal lines show the correlation coefficients of the variables

Note3: Bold diagonal line is the root mean square of AVE

4.2 Structural Model Assessment

4.2.1. Model Fit

As shown in Table 4, the chi-square value of the Bollen-Stine p-correction analysis is 258.729, while the original ML chi-square value is 808.155. Because the chi-square value calculated by Bollen-Stine became smaller, all fit metrics had to be recalculated, and after recalculation, all metrics met the guidelines for general SEM analysis.

Table 4. Indicators of model fit.

| Model fit	Criteria	Model fit of conceptual model	Bollen-Stine Model fit
MLχ2	The smaller the better	808.238	258.729
DF	The larger the better	199.000	199.000
Normed Chi-sqr (χ2/DF)	1<χ2/DF<3	4.046	1.300
RMSEA	<0.08	0.105	0.033
SRMR	<0.08	0.067	0.067
TLI (NNFI)	>0.9	0.860	0.986
CFI	>0.9	0.879	0.988
GFI	>0.9	0.768	0.951
AGFI	>0.9	0.706	0.943

4.2.2. Path Analysis

As shown in Table 5, market turbulence (b = 0.105, p = 0.033) and technological turbulence (b = 0.259, p < 0.001) significantly affect information literacy. Market turbulence (b = 0.217, p < 0.001), technological turbulence (b = 0.196, p = 0.002), and information literacy (b = 0.265, p < 0.001) significantly affect knowledge sharing. Market turbulence (b = 0.196, p < 0.001), technological turbulence (b = 0.202, p = 0.001), and information literacy (b = 0.395, p < 0.001) with knowledge sharing (b = 0.312, p < 0.001) significantly affect service innovation performance. The explanatory power of market and technological turbulence on information literacy is 21.1%. The explanatory power of market turbulence, technological turbulence, and information literacy on knowledge sharing is 37.6%. The explanatory power of market turbulence, technological turbulence, information literacy, and knowledge sharing on service innovation performance is 65%. The results support the research questions of this model. In addition, the results of the path analysis in Figure 2 below indicate that the direct effect of market turbulence and technological turbulence on knowledge sharing, information literacy, and service innovation performance exists, and the direct impact of information literacy on knowledge sharing and service innovation performance exists.

Table 5. Summary of path analysis results

DV	IV	Unstd	S.E.	Unstd./S.E.	p-value	Std. (Beta)	R²
SIP	MT	0.196	0.051	3.817	0.000***	0.242	0.650
	TT	0.202	0.063	3.229	0.001***	0.210	
	IL	0.395	0.075	5.280	0.000***	0.309	
	KS	0.312	0.074	4.236	0.000***	0.277	
IL	MT	0.105	0.049	2.126	0.033*	0.166	0.211
	TT	0.259	0.062	4.158	0.000***	0.343	
KS	MT	0.217	0.051	4.230	0.000***	0.302	0.376
	TT	0.196	0.065	3.033	0.002**	0.228	
	IL	0.265	0.070	3.763	0.000***	0.233	

Note: ***=$p<0.001$; **=$p<0.005$; *=$p<0.01$ DV= Dependent Variable; IV=Independent Variable; Unstd= Standardized regression coefficient; S.E.=Standard Error; Std.= Standardized regression coefficient; **R²**= Explainable Variance; MT=Market Turbulence; TT= Technological Turbulence; IL= Information Literacy; KS= Knowledge Sharing; SIP= Service Innovation Performance

Figure 2. Results of the conceptual model
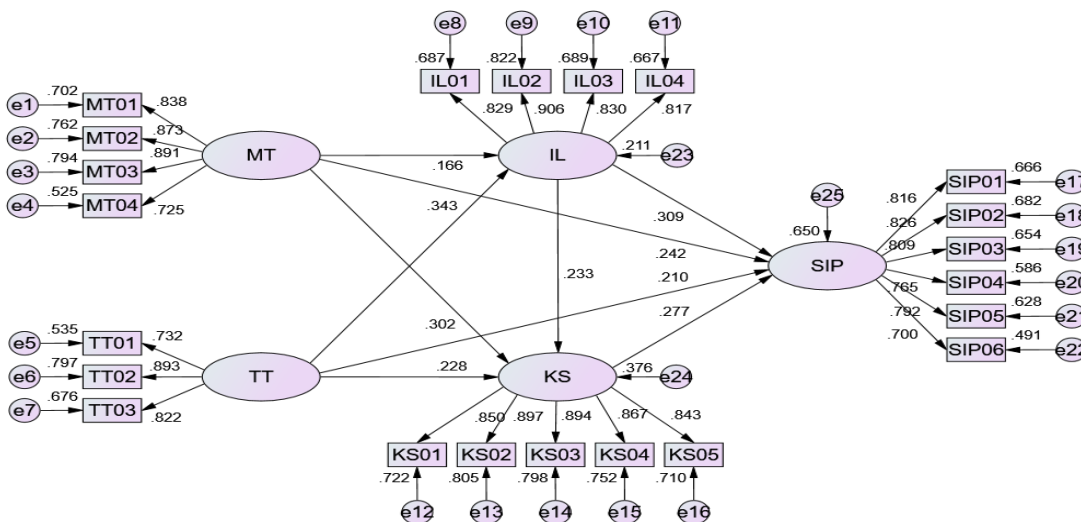
Note: MT=Market Turbulence; TT= Technological Turbulence; IL= Information Literacy; KS= Knowledge Sharing; SIP= Service Innovation Performance

4.3 Indirect and Total Effects

The indirect effect test for the mediating variable in this study was the self-help method of indirect effect testing. The self-help method can generate confidence intervals for indirect effects with statistical power, particularly bias-corrected bootstrapping (Williams & MacKinnon, 2008).

As shown in Table 6, for the specific indirect effect, MT→IL→SIP ($p >0.05$), the confidence interval contains 0 [-0.007~0.183], indicating that this mediating effect is not characterized. For the specific indirect effect MT→KS→SIP, the confidence interval does not contain 0 [0.003~0.264], indicating

the presence of this mediating effect. For the specific indirect effect MT→IL→KS→SIP, confidence intervals not containing 0 [0.001~0.033] indicate the presence of this chain mediation effect. For the specific indirect effect, TT→IL→SIP (p < 0.05) with a confidence interval not containing 0 [0.031~0.248] indicates the presence of this mediating effect. For a given indirect effect TT→KS→SIP, the confidence interval does not contain 0 [0.004~0.193], indicating the presence of this mediating effect. For a given indirect effect, the TT→IL→KS→SIP confidence interval does not contain 0 [0.006~0.076], implying that the chain mediation effect exists. Another finding of this study is that the total and direct effects of MT → SIP are smaller than the total and direct effects of TT → SIP. The findings provide practical insights for managers when making decisions.

Table 6. Analysis of indirect effects of mediation models

Effect	Point Estimate	Product of coefficients			Bootstrap 5000 times Bias-corrected 95%	
		S.E.	Z-Value	*p*-value	Lower bound	Upper bound
Total effect						
MT→SIP	0.314	0.143	2.190	0.029	0.058	0.582
Total indirect effect						
MT→SIP	0.118	0.065	1.804	0.071	0.018	0.264
Specific indirect effect						
MT→IL→SIP	0.041	0.045	0.922	0.357	-0.007	0.183
MT→KS→SIP	0.068	0.055	1.230	0.219	0.003	0.264
MT→IL→KS→SIP	0.009	0.007	1.175	0.240	0.001	0.033
Direct effect						
MT→SIP	0.196	0.096	2.043	0.041	0.033	0.400
Total effect						
TT→SIP	0.387	0.086	4.499	0.000	0.257	0.622
Total indirect effect						
TT→SIP	0.185	0.075	2.462	0.014	0.053	0.366
Specific indirect effect						
TT→IL→SIP	0.102	0.051	2.013	0.044	0.031	0.248
TT→KS→SIP	0.061	0.042	1.446	0.148	0.004	0.193
TT→IL→KS→SIP	0.021	0.014	1.516	0.130	0.006	0.076
Direct effect						
TT→SIP	0.202	0.080	2.536	0.011	0.041	0.363

Note: S.E.=Standard Error; MT=Market Turbulence; TT=Technological Turbulence; IL=Information Literacy; KS=Knowledge Sharing; SIP=Service Innovation Performance

5. Discussion

This study analyzes how the external environment (technological and market turbulence) affects individual service innovation performance. We collected data from mid- and high-level management in high-star hotels to test the hypotheses and model and came up with the following findings.

5.1 The Relationship between Market Turbulence, Technological Turbulence and Service Innovation Performance

This study finds that market and technological turbulence can positively affect service innovation performance. The results support previous findings that environmental turbulence promotes innovation performance (Mokhtarzadeh, et al., 2022) and that external environmental turbulence is an important context for firms to learn how to innovate (Bodlaj & Čater, 2019). It suggests that external environmental turbulence is an external stimulus that motivates individuals to improve their innovativeness, generate innovative behaviors, etc., and can eventually improve their innovative performance. Thus, to improve the overall competitiveness and service innovation capability of firms, it is effective for firms to take appropriate measures to enhance individual service innovation performance by enabling employees to perceive and understand external market fluctuations and technological changes in the industry.

5.2 Separate Mediating Roles of Knowledge Sharing and Information Literacy

The results show that in the indirect role of market turbulence on service innovation performance, the mediating effect of information literacy is not significant, while market turbulence is significant, suggesting that knowledge sharing is an important mediating variable of market turbulence on service innovation performance. On the one hand, the role between market turbulence and service innovation performance is mediated by knowledge sharing, which is consistent with previous studies, suggesting that market turbulence provides firms with opportunities to gather knowledge and information from different agents and official channels to innovate (Dost, et al., 2019), and that market turbulence among employees leads to the simultaneous updating of both the individual's and firm's knowledge base (Soo, et al., 2002), which contributes to the generation of individual service innovation performance. On the other hand, the mediating role of information literacy in the relationship from market turbulence to service innovation performance is not significant. First, the reason may be that the respondents are the mid- and high-level management of high-star hotels. The management employees are generally better educated, and their information literacy level is generally high. Second, hotels have purchased a lot of IT equipment to cope with the challenges based on China's strict pandemic prevention and control policy, so the improvement of employees' information literacy does not depend on market fluctuations but rather stems from the adoption of IT equipment and relies more on the development and popularization of IT rather than on the market turbulence. Thus, the effect of MT→IL→SIP is not significant in the T&H context.

The results also indicate that both independent mediating roles of information literacy and knowledge sharing are significant, with information literacy accounting for a larger share, suggesting that information literacy is an important mediating variable in promoting service innovation performance. First, technological turbulence is positively associated with information literacy, consistent with past research findings that when firms adopt more advanced information technology equipment, staff are more aware of technological turbulence in the industry. Firms conduct corresponding training to improve their staff's information literacy so that they can better adapt and master new technologies, which would, in turn, promote individual creativity (Naveed, et al., 2022), work performance (Wu, 2018), innovative work behavior (Middleton, et al., 2018) and other factors that are closely related to individual innovative performance. Second, the study also found that technological turbulence can affect service innovation performance by facilitating market turbulence. On the one hand, technological innovation mainly refers to the development of IT in T&H, which can contribute to better communication among employees and between employees and customers, facilitating knowledge and information sharing. For another, information literacy, as an individual lifelong learning skill, enables employees to adapt to the ever-changing external environment through innovative work behaviors. This is consistent with the strong relationship between information literacy and job performance, and innovative work behaviors as confirmed in previous studies (Naveed, et al., 2022; Wu, 2018).

5.3 Chain Mediation of Market Turbulence and Information Literacy

There are two chain mediation effects in this study, MT→IL→KS→SIP and TT→IL→KS→SIP, and the results confirm that both chain mediation effects hold. That is, information literacy positively predicts market turbulence. Hotel management employees' perceptions of external market and technological turbulence can indirectly impact their service innovation performance through the chain mediation effects of information literacy and market turbulence. This is consistent with previous findings that information literacy is conducive to promoting market turbulence (Keshavarz, 2022), suggesting that hotel management employees' perceptions of external environmental turbulence can contribute to individual service innovation performance through information literacy influencing market turbulence. Thus, the chain mediation formed by information literacy and market turbulence is an important bridge for the external environment to influence individual service innovation performance.

6. Conclusion

6.1 Theoretical Implications

First, few kinds of literature have been found on the impact of information literacy on service innovation performance. This study confirms that information literacy can be an important mediator of the process from the external environment to individual service innovation performance. Research

on information literacy in the past has been mainly conducted in educational and academic contexts, while empirical studies in workplace contexts are rare. Therefore, this study can fill the information literacy gap in the T&H context. In addition, the proven mediating role of information literacy will help future researchers find factors contributing to service innovation performance and provide more ideas for service innovation and innovation performance-related research.

Second, this study develops a conceptual model based on the RBV, the KBV, and contingency theory, confirming the complementary nature of these three theories in exploring innovation performance. Furthermore, the research not only expands the context of these three theories in T&H but also solves the puzzle that a single theory cannot explain well and solve the problems faced by firms in today's complex and changing era.

Third, this study integrates firms' external environmental factors (market and technological turbulence) and internal environmental factors (information literacy and knowledge sharing) to explore the facilitating mechanisms of individual service innovation performance. Unlike many previous studies that only investigated the contribution of firm internal environmental factors to innovation performance, this study enriches the research paradigm of service innovation performance by integrating the effects of internal and external innovation environmental factors on individual innovation.

6.2 Practical Implications

The global economy is uncertain (Kumar & Paramanik, 2022). In the T&H industry, which is highly susceptible to the external environment, business decision-makers, leaders, and managers are required to make scientific decisions to address challenges in the face of unforeseen circumstances anytime (Senbeto & Hon, 2020). This study provides practical implications for policymakers and managerial staff in rational decisions to capitalize on external uncontrollable factors to stimulate individual service innovation performance in turbulent environments.

First, for the mid-and high-level management, it is necessary to routinely communicate the current market situation of the industry, which can collect and obtain market information through OTA and official channels and grasp the updated and changing trends. For the grass-roots managers and front-line employees, HR can carry out regular training, except for the business ability training, and the market situation is one of the basic contents of employee regular training. As for the promotion of perceived technological turbulence, since IT has been integrated into many aspects of daily life (Liao, et al., 2012), people already have a particular perception of technological turbulence. Therefore, for T&H firms, the cultivation of perception of technological turbulence should not be limited to the surface but should go deeper into the training of the status and future trends of IT development related to T&H, such as customer self-service technology, service robots, e-billing, smart rooms, touch screen technology, and Internet of Things (IoT) technology. For mid- and high-level

management, it is important to keep track of technological changes, for example, the status and application prospects of emerging technologies such as meta-universe, cloud technology, AI (artificial intelligence), blockchain, big data, VR (virtual reality), AR (augmented reality), ChatGPT, and other emerging technologies in T&H. For grassroots management and frontline employees, it is crucial to strengthen the training on using IT equipment already purchased by the firm to serve the customers better.

Second, the study results show that information literacy is the most influential variable in the mediating path from technological turbulence to service innovation performance, and it can also contribute to knowledge sharing. This means that in T&H, improving employee information literacy level is crucial for service innovation performance. Previous studies show that information literacy is associated with training (Ahmad, et al., 2020), collaborative learning (Ishimura & Fitzgibbons, 2022), attitudes toward technology (Lloyd, 2005), organization learning (Zhang, et al., 2016), construction of ICT devices (Chen, et al., 2022) and other related factors. Based on the above, this study suggests that T&H firms should strengthen the investment and use of IT equipment, take employees' information literacy as an important part of their professional literacy, train employees through regular information literacy courses, and guide them to solve tasks and problems at work through online collaborative learning. Eventually, management and grassroots employees will fully realize that information literacy has become an essential skill that must be acquired in the information age.

Third, knowledge is valued through sharing, realizing the crucial role of market turbulence in individual service innovation performance. The study shows that knowledge sharing is another important environmental turbulence mediating variable affecting individual service innovation performance. Knowledge is limited in its usefulness if it is only held by the individual, and it can only increase in value if it is shared. Management should encourage departments or teams to strengthen information communication and cooperation to enhance service innovation performance and create a platform for knowledge and experience sharing. In addition, it can also bring colleagues closer to each other through various knowledge competitions, skill competitions, group building, and other activities to create a good atmosphere for sharing.

To conclude, resources are limited for any firm. How to utilize limited resources to create more significant benefits is a concern for all managers. In this study, besides the need to enhance employees' knowledge sharing, information literacy, and perception of the external environment. This study finds that technological turbulence has a more significant impact on service innovation performance than market turbulence. The possible reason is that customers are now more accustomed to shopping and making purchasing decisions online, and businesses have increased marketing online accordingly (Karim, et al., 2023). Based on this, the implication for policy and decision-makers is that more emphasis should be placed on enhancing employees' perception of technological turbulence when training time and resources are limited.

6.3 Limitations and Future Research

Although this study has important theoretical and practical implications, it has several limitations. Firstly, it only examines the impact of market and technological turbulence on individual service innovation performance without considering other external environmental factors. Future research should explore the mechanism from different perspectives, such as the political and competitive environments. Secondly, this study selected management of high-star hotels as the target population, as they are expected to understand the turbulent market and technology environment better. Future research should be conducted on grassroots managers and employees to compare their perceptibility of external environmental turbulence. Thirdly, this research model has only been validated in T&H in China. The model could be applied to other countries with developed tourism industries, such as Thailand and Singapore, to verify whether the research findings provide a sound basis for decision-making on implementing innovations in T&H firms in those countries. Lastly, this study is based on the CB-SEM method. Other research methods, such as the analytic hierarchy process (AHP) (Pham, et al., 2018), are used to find the determinants of service innovation performance.

Appendix Questionnaire and Items

Constructs and items	Loading	Source
Knowledge sharing (α = 0.938)		Wang and Zhu
Knowledge sharing intention (α = 0.921)		(2012)
I am willing to share my knowledge, experience or skills related to hotel work with others.	0.850	
I will try my best to answer the questions raised by my colleagues and provide the required information.	0.897	
I find it rewarding to share knowledge, experience or skills with others.	0.894	
Knowledge sharing ability (α = 0.883)		
I will express my opinions in a way that is easier for others to understand.	0.867	
I will use the hotel's existing information technology to share my knowledge, experience or skills.	0.843	
Technological turbulence (α = 0.856)		Jaworski and
Information technology in the hotel industry is changing very fast.	0.732	Kohli (1993)
The changes in information technology have brought many opportunities to the hotel industry.	0.893	
A large number of ideas and thoughts for new services have been made possible by breakthroughs in information technology in the hotel industry.	0.822	
Information literacy (α = 0.907)		Chang and Hsu
In our hotel, I can quickly recognize the information I need to do my job.	0.829	(2015); Wang
In our hotel, I can efficiently obtain the information I need to complete my work tasks.	0.906	and Jiang (2020)
In our hotel, I can accurately analyze the meaning of information.	0.830	
In our hotel, I can use information to implement service innovations or improve service processes.	0.817	
Market turbulence (α = 0.898)		Jaworski and
In the hotel industry, customers' service preferences are changing rapidly.	0.838	Kohli (1993)
New customers in the hotel industry are different from previous customers in terms of their service needs.	0.873	
In the hotel industry, our customers tend to constantly look for new services.	0.891	
In the hotel industry, our customers are willing to accept the new service.	0.725	
Service innovation behavior (α = 0.904)		Al-Ababneh
Employee service innovation behavior (ESIB) (α = 0.889)		(2014); Hu, et
At work, I will put forward new and innovative ideas and promote them to my colleagues.	0.816	al. (2009)
In my work, I will utilize the hotel's existing information technology to seek new service methods or techniques.	0.826	
I consider myself a creative member of the hotel.	0.809	
New service development (NSD) (α = 0.925)		
My hotel has sufficient human resources to develop new services.	0.765	
My hotel is efficient in terms of time, resources and processes for new service development.	0.792	
In the process of developing new services, different departments in my hotel cooperate closely.	0.700	

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