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Service Innovation Readiness of Health Institutions during COVID-19: A Perspective from the Kingdom of Saudi Arabia*

Nadeem AKHTAR¹, Hassen ALTALHI², Ashfaque AHMED³, Fakhar MUSTAFA⁴, Muhammad Asad MERAJ⁵

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Abstract

The purpose of the research was to explore the factors which affect service innovation in organizations and how the utilization of resources can improve organizational performance, and gain a competitive advantage by adopting numerous innovative practices. This study hypothesizes Service Innovation Readiness (SIR) to consist of Strategic Alignment favoring Service Innovation (SASI) and Empowering Structure for Service Innovation (ESSI), which regulate the organization's preparedness to adopt service innovation changes. Six dimensions were identified and analyzed to understand their effects on SASI and ESSI. A structured questionnaire on a 5-point Likert scale was used to collect data from the selected hospitals of Saudi Arabia. The research results contribute considerably to the subject matter by theorizing SIR and the complex variable settings essential for embracing SI. This research also provides some understanding of the service innovation management dimension through a complete assessment that measures the organization's readiness and attempts to direct organizations' efforts to achieve and sustain competitive advantage. The study conducted is unique in the current geographic limits and has explored numerous SI areas of an organization's readiness to adopt service innovation.

Keywords: Service Innovation Readiness, Strategic Investment, Strategic Orientation, Saudi Arabia

JEL Classification Code: O32, O35, O38

1. Introduction

“Service innovation” (SI) refers to the innovation taking place in the various contexts of services, including the introduction of new services or incremental improvements of existing services. Service innovation is a type of open innovation gaining prominence in recent times. With the growing economic importance of the services sector, service innovation is playing an ever more significant role in driving growth in today's knowledge-intensive economy. This type of innovation responds to increased customer input, interactivity, and specialization; is multidimensional in nature; and includes strategic, productivity, and performance dimensions. Many developing countries have realized the potential of service sector innovation and set aside a long-term plan (Cylus et al., 2018). Many firms have started realizing the potential of innovating in the service sector and are continuously doing so to be competitive, thereby striving to survive and achieve sustainable growth.

Many countries worldwide are experimenting with innovative ways to provide better quality service to sustain their competitiveness (Nolte, 2018). The growth of attention to innovation involving services has been driven by the rising

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¹First Author and Corresponding Author. Assistant Professor, Department of Management Sciences, Yanbu University College, Saudi Arabia [Postal Address: Yanbu University College – Male Campus, Al-Aziziah, Yanbu 46435, Kingdom of Saudi Arabia] Email: muhammadn@rcyci.edu.sa

²Associate Professor, Department of Management Sciences, Yanbu University College, Saudi Arabia [Postal Address: Yanbu University College – Male Campus, Al-Aziziah, Yanbu 46435, Kingdom of Saudi Arabia] Email: altalhih@rcyci.edu.sa

³Assistant Professor, Department of Management Sciences, Yanbu University College, Saudi Arabia. Email: pinitoda@rcyci.edu.sa

⁴Lecturer, Department of Mathematics, COMSATS University Islamabad, Sahiwal Campus, Pakistan. Email: fakhar.m@cuisahiwal.edu.pk

⁵Professor, University of Education, Lahore, Multan Campus, Pakistan. Email: asad@ue.edu.pk

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significance of service activities in industrial societies and around the world, as well as the emphasis on service in the competitiveness of firms of all types (Hanif & Asgher, 2018). Hence, it becomes imperative for organizations to assess the service-oriented innovation approach's preparedness before studying and considering contemporary factors affecting service innovation.

A detailed literature review reveals that the firm's preparedness or readiness is not new. Numerous prior studies demonstrate various aspects of willingness to adapt IT, SI, or any technology. Organizational readiness for change in healthcare settings is an important factor in the successful implementation of new policies, programs, and practices. However, research on the topic is hindered by the absence of a brief, reliable, and valid measure. Until such a measure is developed, we cannot advance scientific knowledge about readiness or provide evidence-based guidance to organizational leaders about how to increase readiness. There are many attributes like top management attitude, organizational characteristics, environmental conditions, and many more to be studied to measure an organization's readiness for such a transformation.

Innovation has several definitions; most of them revolve around three perceptions – uniqueness, dissemination, and value generation – resulting from new products, improvised services, or efficient processes (Oliveira et al., 2017). In general, innovation is the practical implementation of ideas that result in the introduction of new goods or services or improvement in offering goods or services. Innovation is the production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and the establishment of new management systems. It is both a process and an outcome. (Oliveira et al., 2017). Innovation is the multi-stage process whereby organizations transform ideas into new/improved products, services or processes, to advance, compete and differentiate themselves successfully in their marketplace (Sirimanne et al., 2018). In addition to the fact that innovation allows organizations to stay relevant in the competitive market, it also plays an important role in economic growth. The ability to resolve critical problems depends on new innovations and especially developing countries need it more than ever. Innovation is important to the advancement of society as it solves these kinds of social problems and enhances society's capacity to act. It's responsible for resolving collective problems in a sustainable and efficient way, usually with new technology. These new technologies, products, and services simultaneously meet a social need and lead to improved capabilities and better use of assets and resources. (Oliveira et al., 2017).

One might equate the factors responsible for assessing an organization's readiness directly with factors affecting

service innovation. This generalization must be avoided without taking into consideration the characteristics driving service innovation. Hence it is proposed that a service innovation model is adopted, which provides an opportunity for the firm to assess its readiness for service-oriented innovation.

This research is a comprehensive study that delivers some significant additions to the know-how of service-oriented innovations. First, it explores the topic conceptually and then empirically examines various parameters affecting the service innovation implementation in the preferred sector. Second, the study directs the organization towards optimum utilization of resources and resource integration to enhance service innovations. Third, as the research is empirically supported, it leads managers to assess their readiness and establish strategies and resource pools to make the organization conducive to embracing service innovation.

2. Literature Review

2.1. Service Innovation

Services are fast overtaking manufacturing to form a dominant proportion of the world economy. Service innovation is increasingly seen as a vector of sustainable growth and competitive advantage at the firm-, industry- and economy-level. Innovation started evolving as a key discipline of research over the twentieth century. Initially, innovation research was predominantly focused on science and technology and the new product development approach for commercializing ideas and inventions mainly in the manufacturing industry. With the increasing growth of services in today's organizations and economy, the importance of understanding service innovation concepts and practices has been on the rise (Randhawa & Scerri, 2015). Today, service innovation has evolved into a vast field encompassing the study of intangible processes and dynamic interactions among technological and human systems that lead to managerial and organizational change in services. The literature on service innovation is expanding into a diverse and cross-disciplinary body of knowledge scattered across economics, marketing, organizational science, and management perspectives (Randhawa & Scerri, 2015).

Service innovation can be said to be an amalgamation of product innovation, that is, "the introduction of a new product, or a significant qualitative change in an existing product." Innovation in services is an interplay of service concepts, service delivery systems, client interfaces, and technologies, and often entails new ways in which customers view and use the service. Service innovation is an "elevated service offering" that is made up of "new client interface/customer encounter; new service delivery system; new organizational architecture or marketing proposition;

and/or improvements in productivity and performance through human resource management”, further highlighting its multidimensional aspects.

Service firms have fewer product innovations than manufacturing firms do, but the productivity of innovative service firms is very high. Service firms have a low propensity to hold patents, but their holding of trade secrets is comparable to that of manufacturing firms. Innovation is riskier for service firms than manufacturing ones because it is much easier for a competitor to replicate a new service than it is to replicate a new product. The nature of service businesses is mostly abstract and no physical object is traded in service businesses. The high degree of intangibility makes it more difficult to obtain patent protection for newly developed services than products. Manufacturing firms follow more structured innovation processes, which suggest the importance of formal R&D activities, equipment, and blueprints. In addition, the market side for service firms is closely interlinked with the production of services. (Morikawa, 2019).

Innovation can be a source of competitive advantage for companies, either through the improvement of methods and techniques capable of generating new products or services or perfecting existing ones. Along these lines, it is particularly important to measure innovation and discuss the results associated therewith. (Tidd & Hull, 2003). A more dynamic approach is expected to be adopted in the service sector compared to the manufacturing sector. Service-oriented organizations revolve around innovation either in terms of process, technology, or customized solutions. As services offered are mostly perishable (it cannot be stored or resold), service innovation requires efficient technological platforms and outcome-based business processes to enhance demand and plan competence (Cinar et al., 2019). Research findings have demonstrated the diversity and short-lived nature of services have a decisive impact on service innovation.

Innovation in the manufacturing sector is inclined towards new product development and a robust technological framework. It mainly depends on expertise and proficiency. At the same time, the role of cultural capabilities (Audretsch et al., 2018) and human resource competencies such as one-to-one abilities and client-interface and communication talents (Ziaee Bigdeli et al., 2017) are more substantial in the area of service innovation. Numerous findings have emphasized that service enhancement is the most crucial attribute in improvising organizational operations and performance (Faems et al., 2005) ensuring long-term success (Scott et al., 2017). Many researchers have analyzed that innovation positively impacts organizational performance (Hanif & Asgher, 2018; Tajuddin et al., 2015; Tidd & Hull, 2003). These research studies have been conducted across diverse sectors around the world. Tajuddin et al. (2015) described that innovation has a significant role in improving

the organization’s overall performance, thereby gaining a competitive advantage (Menor & Roth, 2007). Therefore, unique innovation allows an organization to react to the environment appropriately, advance its capabilities, and uphold competitive advantage (Salunke et al., 2019).

2.2. Service Innovation Readiness

An organization’s adaptability to change is expected to play a vital role in ascertaining its innovation readiness. The service innovation readiness (SIR) evaluates an organization’s competence concerning service innovation. Several aspects pose a challenge in adopting service innovation in the organization; hence, it is imperative to assess the firm’s readiness by determining the most vital factors responsible for fostering true service innovation adaptability. In the healthcare industry, service-oriented innovations are affected by a shortfall in the workforce, updated technological framework, portfolio management, and firm size (Changkaew et al., 2012). Healthcare is a service setting where meeting the needs of customers is uniquely challenging. But the necessity, complexity, cost, and high-emotion nature of the service, as well as technological advances and competitive dynamics in the industry, make the imperative for service innovation in healthcare especially urgent (Changkaew et al., 2012).

In healthcare, service-oriented innovations are classified as either tangible or intangible innovations. Tangible innovation comprises, for example, the development of new medical devices and a drug’s unique composition. Intangible innovations are evolved from the current knowledge and include, for example, the introduction of advanced techniques or manual care protocols. Intangible innovations include workflow management and operations management (Tidd & Hull, 2003). There is no single intervention that will trigger or ensure innovation in health care, as the interaction between the innovation and the context of its introduction is necessarily complex and variable.

The rationale for innovation has a number of strands including improving productivity and efficiency, reducing cost, increasing quality and responsiveness, reducing variation in practice, and increasing access to health services. On closer inspection, however, the concept is both vague and something of a moving target, as innovation can only be understood in relation to context (Najafi-Tavani et al., 2018). Organizational readiness for change is a multi-level, multi-faceted construct. As an organization-level construct, readiness for change refers to organizational members’ shared resolve to implement a change (change commitment) and shared belief in their collective capability to do so (change efficacy) (Jäppinen, 2015). Change readiness is the ability to continuously initiate and respond to change in ways that create advantage, minimize risk, and sustain

performance (Tidd & Bessant, 2020). Helfat and Peteraf (2015) identified specific types of cognitive capabilities that are likely to underpin dynamic managerial capabilities for sensing, seizing, and reconfiguring, and explain their potential impact on the strategic change of organizations. In addition, they discussed how heterogeneity of these cognitive capabilities may produce heterogeneity of dynamic managerial capabilities among top executives, which may contribute to the differential performance of organizations under conditions of change.

The stimulus-response theory is a concept in psychology that refers to the belief that behavior manifests as a result of the interplay between stimulus and response. In other words, behavior cannot exist without a stimulus of some sort, at least from this perspective. Hence, It is imperative that the organization is competent to initiate relevant action when a stimulus is triggered. SIR can be derived by exploring and understanding the stimulus-response model's theoretical framework. To harness this approach, it is proposed to have a model that can outline a firm's SI readiness. First, this model will strategically explore the firm's orientation toward service innovation, further exploring two subdomains. Second, it will enable a mechanism for service innovation evaluating four dimensions of the firm's preparedness. Hence a model proposed will assesses the firm's readiness through a. Strategic alignment favoring service innovation (SASI), b. Empowering structure for service innovation (ESSI).

2.3. SASI Dimensions

2.3.1. Strategic Financing

Posch and Arthur (2020) stated that a well-directed plan facilitates innovation, strengthens internal communication channels, stimulates novel ideas, generates and manages useful information. One of the core components of strategic planning is strategic financing or investments. Strategic financing has a substantial effect on the financial success of the organization. The strategic investment is the primary aspect influencing SASI (Kylaheiko et al., 2016). An innovation strategy outlines the goals of the organization's innovation activities and helps focus efforts on reaching those goals. With a plan in place, diverse groups within an organization will all be working toward common goals rather than pursuing their own individual priorities. (Najafi-Tavani et al., 2018).

Strategic financing or investment is the firm's willingness to strategically focus on service-oriented innovation and allocate a substantial budget to execute the plan (Tidd & Bessant, 2020; Randhawa & Scerri, 2015). Similarly, SI-focused investment plays a pivotal role in resource allocation and strategic alignment with the business strategy to yield better outcomes through service innovation (Nummela

et al., 2018). To have effective results, the organizations must allocate resources methodically to strategize the service innovation systematically. Hence, the organizations acquire higher SASI when they have strategic investments, thereby enhancing its service innovation readiness.

2.3.2. Risk Sensitivity

Risk sensitivity and its tolerance is another vital aspect of SASI; it is the firm's cutoff point between investments and actual or potential losses (Nummela et al., 2018). Though the organizations are well-organized and innovative regarding the services offered, many firms cannot capitalize and explore the opportunities. One of the determinants for a firm's willingness to take measured risk is the firm's preparedness to explore the opportunities and adopt a focused direction. Therefore, firms must be inclined to "cannibalize" their investments (Harmancioglu et al., 2020). A company's willingness to cannibalize on its sales, its capabilities. The concept of willingness to cannibalize refers to a company's inertia to replace existing operating systems and products in the interest of the introduction of new products and services to improve its competitive position, and its prior investments are key to understanding new service development (Dodgson et al., 2015).

This is viewed as an organization's decisive approach in case firms generating significant profits from their existing operations are hesitant to embrace innovation. This might affect the investments, their current competencies, and even their present products to become outdated (Harmancioglu et al., 2020). The more the firms are reluctant to adopt, the less responsive these firms would be to market deviations. The consequences are a lack of innovation because innovation is viewed as a long-term investment process blended with commitment (Dodgson et al., 2013). Firms that are committed are required to strategize their investment and risk tolerance capabilities rather than simply moving forward to merely protect the firm's past position (McGrath & Kim, 2014). Given this, it can be concluded that the firm's superiority in tolerating risk is usually indicated by the organization's "willingness to cannibalize" and promise better levels of strategic emphasis on service innovation.

2.4. ESSI Dimensions

2.4.1. Service Innovation Catalyst

SI catalysts are the enablers in the organization. They are the receptors who always look for innovative concepts and transition these ideas into concrete solutions through collaboration, team management, knowledge management, appropriate direction, and encouragement (Bankins et al., 2017). They are the champions who will enthuse liveliness

and drive into the implementation phase, thereby stimulating innovation (Bankins et al., 2017). SI catalysts are the employee from any organization level. They are observed as the key promoters to nurture the accommodative culture during the innovation implementation process. Usually, multiple catalysts can emerge spontaneously at any level in the organization (Dodgson et al., 2015) and extend their roles and responsibilities to recognize, assist, encourage actively, and uphold the firm's innovations (Van Laere & Aggestam, 2016). There is a high possibility that a service innovation catalyst is from first-line management.

Also, it is a fact that innovative ideas can be derived from all the levels of the organization (Dodgson et al., 2015). The ideas generated at any level of the firm is required to be collated and directed to the relevant decision-makers so that it can be transformed into reality otherwise the opportunity of being translated into workable solution diminishes. Throughout the process, SI catalysts play a vital role in making the work environment conducive for generating innovative ideas, collating them and presenting them to the relevant decision-makers, and ensuring its implementation by creating a positive impact, thereby creating opportunities for the organization and also encouraging others to follow innovation (Bankins et al., 2017). An organization must set up a mechanism to capture such innovative ideas from all levels, offer suitable guidance and extend well-directed coaching efforts to the imitators. The SI catalysts build the knowledge base, thereby enhancing the organization's ability to accommodate such innovations.

2.4.2. Strategic Collaboration

In this vibrant business environment, the most valued customer needs are fulfilled through combined efforts from distinct service providers (Aujirpongpan & Hareebin, 2020). This indicates that collaboration is the key to success; these service providers recurrently try to design and produce an improved set of services with the stakeholders (Audet & Roy, 2016). Referring to in-depth literature reviews, strategic collaboration can be defined as the ability of an organization to work together with its allies on knowledge sharing, react to business dynamics, and progress towards business development soon (Audet & Roy, 2016; Clauss & Kesting, 2017). It is a known fact that collaboration and integration between two or more distinct organizations improve overall performance (Gao et al., 2019; Menor & Roth, 2007). The study of Najafi-Tavani et al. (2018) found that once an alliance is formed, the firm is expected to rejuvenate its existing resources and be more accommodative to service innovation. Hence we conclude that a strategic collaboration indicates the ability to realize and uncover the beneficial opportunities probably due to the alliance. It also readjusts the organization's process to be more receptive to service innovation.

2.4.3. SI Knowledge

It is well established that a relevant knowledge repository drives service innovation (Rajapathirana & Hui, 2018; Randhawa & Scerri, 2015). Every instance generates information that is later transformed into a knowledge base. The world is moving fast from a production-based economy towards a knowledge-based one. As a result, organizations are becoming more knowledge-intensive and are increasingly dependent on innovative knowledge to create value. Therefore, the question of how activities should be organized to generate and exploit new forms of knowledge is very important (Tidd & Bessant, 2020). Therefore, it is imperative to maintain a knowledge base to explore it as and when required by the firm. The above arguments suggest that substantial prior SI knowledge promotes the organization's overall learning capability, which improves the firm's ability to evaluate and utilize the newly acquired cluster of knowledge, thereby fostering the organization's readiness for service innovation (Tidd & Bessant, 2020). Hence, it is proposed that service innovation understanding as one essential attribute of ESSI indicates the organization's scope in diversifying service innovation-related practices.

2.4.4. Information Technology Knowledge

IT is driving sustainable competitive advantage for most of the firms embracing it; the firm's routines operations are systematized and yields better results (Gliem & Hipp, 2016; Yildiz et al., 2013). In large companies such as manufacturing companies, organizational performance is positively influenced by IT (Sapta et al., 2021; Widjaja et al., 2020). Although IT, if not implemented with a purpose and objective, may not certainly result in a sustainable benefit, it is more effective when strategized with competent human resources (Madadipouya, 2015).

For instance, IT use can accelerate the overall innovation when the core systems framework is harmonious and accommodating (Lee & Xuan, 2019; West et al., 2018). This study reveals that IT contributes to achieving sustainable advantage, and it also couples with ESSI sources to enrich the overall understanding of service innovation, its synchronization, and activities. In general, IT involvement is the organization's ability to extensively use IT to assist implementation of SI by enabling and improvising intra and inter-organization linkages of all the business transactions and data management practices. Widjaja et al. (2020) mentioned that any service-oriented firm's success relies on an information processing capabilities framework powered by robust IT systems. This results in minimizing the impact of uncertainty, and it depends solely on coordination and setting up secure communication channels.

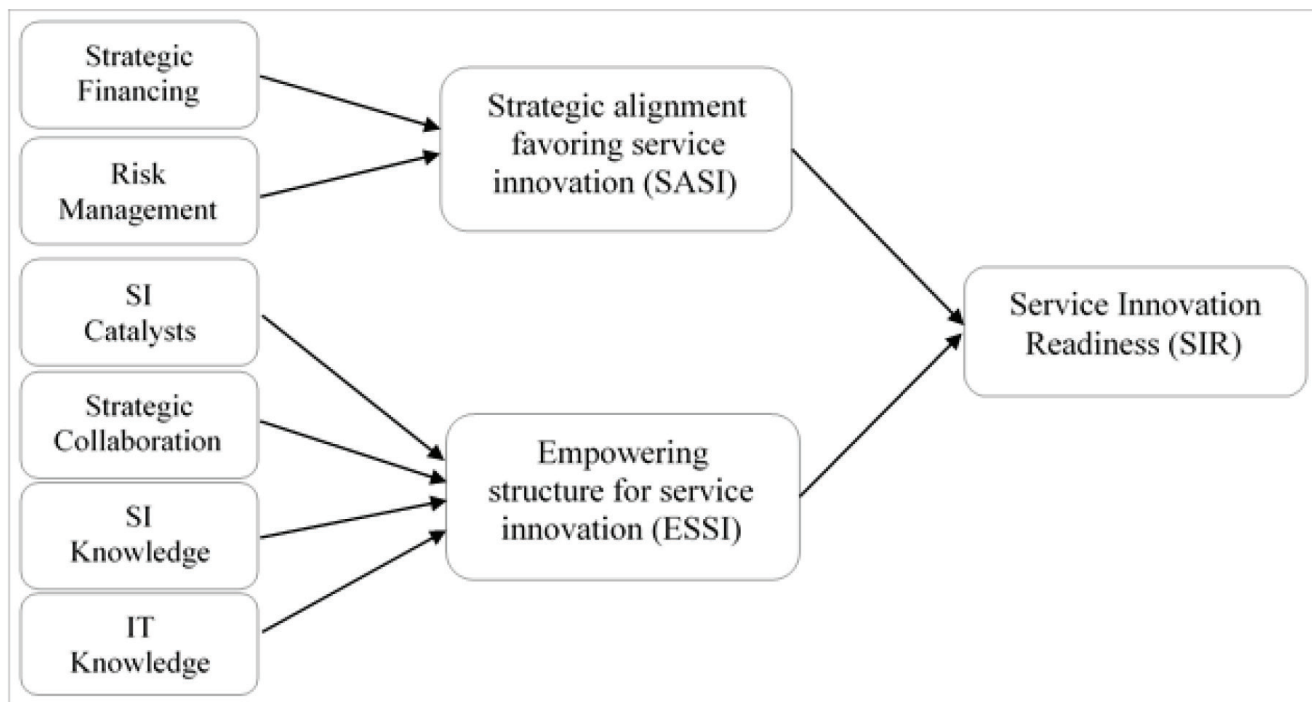


Figure 1: Theoretical Framework

The theoretical framework of the study is developed as in Figure 1.

3. Research Methodology

The study constitutes a set of novel steps to validate the service innovation readiness model proposed. A survey questionnaire was administered to understand the five SI readiness dimensions, and the proposed model was assessed with empirical data.

For this study, we selected hospitals in the Medina region in Saudi Arabia. There are 169 hospitals and primary health care units in the area chosen. Our target population was around 5343 health workers, doctors, nurses, and administrative staff. An invitation email was sent to selected hospitals with a google form link to get it filled by the health workers in their hospitals. We were able to collect over 352 responses. The responses were organized into the preset dimensions as discussed in the literature review section.

All the survey questions were measured using a five-point Likert scale ranging from 1-Strongly disagree to 5-strongly agree. SIR was assessed using two direct items to measure the firm's readiness and adaptability in relation to SIR. SIR scale was originally developed by Yen et al. (2012).

As discussed earlier, we hypothesize Service Innovation Readiness as a model comprising two-second order

constructs. Precisely, SASI and ESSI, which further comprise two and four parameters, respectively.

We used two existing scales of Li and Atuahene-Gima (2001) and Menor and Roth (2007) to construct a five-item measure of “strategic financing” These items are designed to assess the scope and firm’s strategic focus, especially investments related to SI. Five items of “ Risk Sensitivity” were taken from Nijssen et al. (2006) to measure organizations’ preparedness for SI. Four items for the dimension “SI catalyst” were measured to understand how the team leaders and the managers promote and encourage employees in generating ideas to develop unique services. To evaluate “strategic collaboration,” a set of four items were adapted from Sanders (2007). To gauge “IT knowledge,” four items were adapted from Menor and Roth (2008) to understand the extent to which an organization uses IT to accelerate and strategize information processing of SI allied actions. We measured SI knowledge by formulating eleven items and capturing the required piece of information.

The study was organized through modeling two constructs, SASI and ESSI (Diamantopoulos & Winklhofer, 2001). At first, the weights of both the first-order constructs aligned to the second-order constructs were computed using the principal component factor analysis. A sum of first-order weights was calculated to form the two constructs. Last,

SIR was comprehensively assessed and measured using two items established based on SIR understanding.

4. Data Analysis and Results

4.1. Reliability

To evaluate the SIR model’s efficiency, we followed the recommended approach (Anderson & Gerbing, 1988). First, the measurement model was analyzed, and then we test the structure relationships in the proposed framework. To develop a measurement model, a confirmatory factor analysis (CFA) was performed on the SIR model’s 33 observed items using AMOS 22.0. Most item loadings were found significant ($p < 0.001$), with all values above the threshold of 0.7.

To evaluate SIR scales’ reliability, we calculated Cronbach’s alpha (α), which is found at 0.92, well above the cutoff value of 0.7, representing the consistency in constructs.

4.2. Validity

To evaluate our measurement model’s validity for its construct validity, we considered the suggestions of Hair (2010). Construct validity is used to determine how well a test measures what it is supposed to measure. Construct validity is usually verified by comparing the test to other tests that measure similar qualities to see how highly correlated the two measures are (DeVellis, 1991). Several tests are used to evaluate the construct validity, including convergent and discriminant validity. Convergent validity refers to how closely the new scale is related to other variables and other measures of the same construct. Not only should the construct correlate with related variables but it should not correlate with dissimilar, unrelated ones. Convergent validity is evaluated based on three criteria as recommended by Fornell and Larcker (1981) which are: 1) All factor loadings (provided as Standardized Regression Weights in AMOS), should exceed 0.7 ideally and also be statistically significant, 2) Cronbach’s alpha (α) value should be greater than 0.8, which is used for the reliability purpose, 3) Average variance extracted (AVE) should have a value of 0.5 and higher. All factor loadings of the items, the reliability coefficient, and AVE values were above the cutoff criteria as per recommendations. The AVE values reported for the variables are Strategic Financing = 0.71, Risk Sensitivity = 0.78, SI Catalyst = 0.81, Strategic Collaboration = 0.81, IT Knowledge = 0.90, and SI Knowledge = 0.88, fulfilling the convergent validity standards (Table 1).

4.2.1. Discriminant Validity

Discriminant validity is demonstrated by evidence that measures of constructs that theoretically should not

Table 1: Scaling items for SIR and Measurement Model Statistics

Variables	Factor Loading
Strategic Alignment Favoring Service Innovation (SASI)	
Strategic Financing	($\alpha = 0.85$; AVE = 0.71)
Risk Sensitivity	($\alpha = 0.93$; AVE = 0.78)
Enabling Structure for Service Innovation (ESSI)	
SI Catalysts	($\alpha = 0.91$; AVE = 0.81)
Strategic Collaboration	($\alpha = 0.89$; AVE = 0.81)
IT Knowledge	($\alpha = 0.93$; AVE = 0.90)
SI Knowledge	($\alpha = 0.89$; AVE = 0.88)
SI Readiness	($\alpha = 0.94$; AVE = 0.89)

be highly related to each other are, in fact, not found to be highly correlated to each other. This is observed by comparing two constructs and their AVE estimates through the squared correlation (Hair, 2010). The squared correlation estimate should be less than AVE estimates. Discriminant validity problems arose when cross-loadings between the constructs occurred. In the case of cross-loadings, CFA does not fit well (Hair, 2010). Our measurement model confirms the discriminant validity of SIR scales, as the square correlation estimates for each construct are less than the AVE estimates provided in Table 2.

4.2.2. Validation of Higher-Order Constructs and Assessment of Model

In our SIR model, both SASI and ESSI constructs are associated with multiple dimensions, making them second-order constructs. Second-order constructs also require construct validity to analyze the relationship between variables (Table 3). To determine the contribution and importance of individual dimensions, each dimension’s coefficient to its assigned construct can be used and can be interpreted as validity coefficients. The result shows the significant effect ($p < 0.001$) of (γ_i) dimensions on second-order constructs. A perfect correlation between first-order dimensions is not desirable as the presence of high multicollinearity between dimensions would affect their discriminant validity. Two statistical tests are performed to address this issue, as recommended by Hair (2010). As per Table 3, no multicollinearity is detected as values of tolerance, and its reciprocal, variance inflation factor (VIF), for all constructs, are in the acceptable range (Tolerance > 0.2 and VIF < 10).

Table 2: Correlation Between Constructs and Average Variance Extracted (AVEs)

Constructs	Mean	SD	1	2	3	4	5	6
1. Strategic Financing	4.11	1.85	0.901					
2. Risk Sensitivity	4.56	1.11	0.812	0.81				
3. SI Catalysts	4.63	0.99	0.85	0.80	0.68			
4. Strategic Collaboration	4.88	1.23	0.72	0.75	0.67	0.78		
5. SI Knowledge	4.92	1.42	0.85	0.80	0.66	0.75	0.89	
6. IT Knowledge	4.11	1.25	0.77	0.79	0.62	0.66	0.83	0.88

Table 3: Second-Order Constructs Tolerance and Variance Inflation Factor

2 nd Order	1 st Order	Tolerance	VIF
SASI	Strategic Financing	0.33	3.6
	Risk Sensitivity	0.29	3.2
ESSI	SI Catalysts	0.32	3.4
	Strategic Collaboration	0.39	3.0
	SI Knowledge	0.40	2.9
	IT Knowledge	0.39	3.1

Based upon the SASI and ESSI constructs, this research explains SIR as third-order constructs. The following formula is used to estimate SIR values, which is based upon the path weights (γ) calculated from the SASI and ESSI:

$$SIR = 0.43 \text{ SASI} + 0.61 \text{ ESSI}$$

Correlation between the formative SIR construct and overall SIR assessment is calculated at 0.89 ($p < 0.001$), confirming the construct validity of SIR as a formative variable. We also performed the multicollinearity analysis between SASI and ESSI constructs of SIR to ensure its formative factor structure. No multicollinearity is detected as the values of tolerance and VIF (ESSI and SASI tolerance values = 0.49 and VIF = 3.11) are in acceptable regions.

Model fitting is generally evaluated by the coefficient of determination (R^2), which measures the explained variance. A considerable variation is observed in SIR ($R^2 = 0.86$), indicating that a higher percentage of variation is explained by associated constructs Figure 2.

5. Discussion

Generally, nonparametric tests are considered feasible to evaluate the ordinal data, as it does not assume normality. Non-parametric tests are the mathematical methods used in statistical hypothesis testing, which do not make assumptions

about the frequency distribution of variables that are to be evaluated. The non-parametric experiment is used when there are skewed data, and it comprises techniques that do not depend on data pertaining to any particular distribution. However, non-parametric tests are less powerful because they use less information in their calculation (less power (lower probability) of detecting a real effect). But, in the absence of normality, parametric tests can be used (De Winter & Dodou, 2010). A parametric test is a statistical test that makes certain assumptions about the distribution of the unknown parameter of interest and thus the test statistic is valid under these assumptions.

We used the ANOVA test to evaluate the effect of second-order constructs (SASI and ESSI) on the third-order formative variable (SIR). We calculate values of F statistic for the decision of accepting or rejecting the hypothesis as given below:

H1: Strategic Orientation toward Service Innovation (SASI) positively influences Service Innovation Readiness.

H2: Enabling mechanism for Service Innovation (ESSI) positively influences Service Innovation Readiness.

It is then decided that at $\alpha = 0.05$ significance level, both SASI ($F_{\text{calculated}} = 6.12 > F_{\alpha,1,9} = 5.11$) and ESSI ($F_{\text{calculated}} = 3.68 > F_{\alpha,3,14} = 3.34$) positively influence Service Innovation Readiness.

Further, we also analyzed the direct effects of all first-order constructs on second-order constructs. Keeping all other available factors constant in the analysis, direct effect measures the unmediated effect of variables in the model. All constant factors cease all causal paths between X and Y, except the direct connection of $X \rightarrow Y$. Values of the direct effect of first-order constructs on the second-order constructs, are shown in Table 4.

It is noticed from Table 4 that all first-order constructs are contributing positively to second-order constructs. The direct (unmediated) effect of Strategic Financing (SF) and Risk Sensitivity (RS) on SASI are calculated at 0.342 and 0.491. Due to SI and RS's direct effect on SASI, when

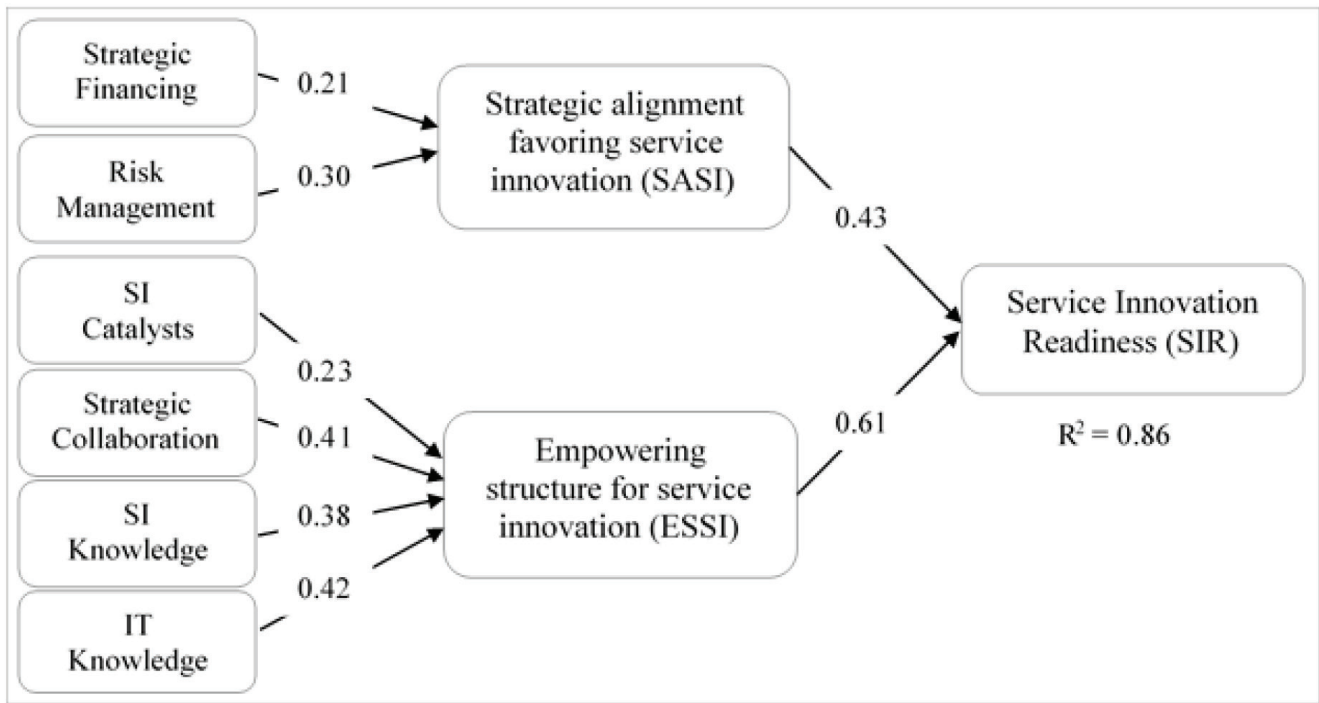


Figure 2: SIR Model Testing Results (N = 352)

Table 4: Direct Effects of First Order Constructs on Second Order Constructs

	Strategic Financing	Risk Sensitivity	SI Catalysts	SI Knowledge	IT Knowledge
ESSI	0.000	0.000	0.190	0.476	0.270
SASI	0.342	0.491	0.000	0.000	0.000

SF and RS go up by 1, SASI goes up by 0.342 and 0.491. Similarly, SI catalyst, strategic collaboration, SI Knowledge, and IT Knowledge constructs positively affect the ESSI construct.

6. Conclusion

Recent trends recognized innovation as a driving force of economies and are overtaking the manufacturing sector rapidly. More specifically, SI is progressively viewed as a direction towards sustainable growth; it offers better prospects to the organizations to achieve a competitive advantage. Discussions, research, and findings on SI are emerging and are advancing to capture ample attention from the industrial and academia fraternity. Nevertheless, despite the upward trends of SI, it has been noticed that SI initiatives either did not capitalize or they failed to sustain competitive advantage. SI has to be introduced and implemented systematically;

the organization needs to prepare to outdo its competitors. To ensure the organization's preparedness to adopt SI, we propose the Service Innovation Readiness (SIR) model with two hierarchical factors SASI and ESSI, further explored into six dimensions to identify factors influencing SIR. This study attempts to empirically evaluate SIR and also add value to the research stream on SI. It has been well-established from our research findings that SASI and ESSI positively influence SIR. It was also noticed that the first-order constructs are positively affecting the second-order constructs. First-order constructs, strategic financing and risk sensitivity contributing to SASI affect SIR. This was also established by Kylaheiko et al. (2016). Even the first-order constructs of ESSI, SI catalyst, strategic collaboration, SI knowledge, and IT knowledge affect SIR, which was also established by Mennens et al. (2018) and Hanif and Asgher (2018). The set hypothesis was empirically tested. It was established that the SASI and ESSR positively influence SIR.

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