Asia Pacific Journal of Information Systems
Vol. 30 No. 4 (December 2020), 758-784

ISSN 2288-5404 (Print) / ISSN 2288-6818 (Online)
https://doi.org/10.14329/apjis.2020.30.4.758

The Effect of Interactivity between KIBS Firms and Customers on Innovations in KIBS Firms

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ABSTRACT

In today's dynamic and hypercompetitive business environment, knowledge and innovation have emerged as bases for sustained competitive advantage. This paper addresses two specific research questions. First, we ask, "What is the effect that firm interactivity has on various types of innovation?" As we address this question, we explain that interactivity helps firms create knowledge, which then promotes and enables innovation. Second, we ask, "How do the various types of innovation impact firm performance?" We develop a research model and a set of hypotheses from the basis of organizational knowledge creation theory and the knowledge-based view of the firm. We test this model using survey data, and find that interactivity is positively associated with innovation. We also find that several types of innovation, including service innovation, process innovation, and organizational innovation have a positive impact on firm performance.

Keywords: Innovation, Interactivity, Knowledge Creation, Performance

Ⅰ. Introduction

The modern business environment evolves and changes rapidly. Globalization, technological innovation, shifting industrial boundaries, and changing government regulations are some of the forces that have given rise to unstable market conditions. In this dynamic and hypercompetitive environment, knowledge, innovation, and firm-specific skills have emerged as bases for sustained competitive advantage (Alavi and Leidner, 2001; Grant, 1996a; Nonaka, 1994). In such an environment, discovering the core mechanisms for knowledge creation and understanding the potential impact of that knowledge on innovation and firm performance is vital.

This paper addresses two specific research questions. First, we ask, "What is the effect that firm interactivity has on various types of innovation?" As we address this question, we explain that interactivity creates knowledge which promotes and enables innovation.

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These innovations may include service, process, or organizational innovations, each of which is valuable to a firm. It is not enough to simply identify evidence of innovation, however. It must also be shown that this innovation is indeed valuable in the business world. Therefore, our second research question is, "How do the various types of innovation impact firm performance?" And as we address the second question, we explain that innovation is one of the bases for improved firm performance, and we endeavor to show how innovation can lead to competitive advantage.

This research study makes three contributions to IS literature. First, by coupling our arguments and our empirical findings with extant research, we refine and bring clarity to the concept of firm interactivity. Specifically, we describe three different dimensions of interactivity: knowledge service standardization, interactive learning, and innovation participation. Second, we identify three different types of innovations that can emerge from firm interactivity: service innovations, process innovations, and organizational innovations. Third, we examine the effect of innovation on firms' performance, revealing its positive impact.

The paper proceeds as follows. We begin by briefly reviewing the theoretical background for our study, including organizational knowledge creation theory, and the knowledge-based view of the firm. We explain that interactivity fosters the dynamic process of knowledge creation. This knowledge can then be used as a basis for innovation. We then describe our research model as we develop our hypotheses about how the knowledge that is created from interactivity fosters firm innovation. Innovation, then, improves firm performance. As we describe this model, we also discuss how both tacit and explicit knowledge affect innovation. The subsequent method section describes our survey data, which is drawn from knowledge-intensive business service firms (KIBS), a context where the creation of knowledge is highly important and should be clearly observable. Because, organizational knowledge creation is context dependent (Nonaka et al., 2006). A central point of organizational knowledge creation theory is to identify conditions enabling knowledge creation in order to improve innovation (Nonaka et al., 2006). We also discuss the operationalization of our research variables, our tests for validity and reliability, and our PLS analysis. In the results section, we note strong support for our hypotheses. In the discussion section, we highlight the theoretical and practical implications of our work. The limitations of our study, and potential directions for future research appear in the discussion section as well.

Ⅱ. Theoretical Background

2.1. Organizational Knowledge Creation Theory

Nonaka (1994) explains the process of knowledge creation by building upon the distinction between explicit and tacit knowledge. Explicit knowledge can be written or otherwise codified and is easily transmitted from one individual to another. Tacit knowledge is more difficult to transmit between individuals or groups because it is personal or organizational, rooted in action, and is often context-specific (Polanyi, 1958; Polanyi, 1966). These two types of knowledge then allow Nonaka to describe four modes of knowledge conversion: socialization, combination, internalization, and externalization. Socialization is the sharing of tacit knowledge through interaction between individuals. Combination is the use of social processes to combine different bodies of explicit

knowledge. Internalization is the conversion of explicit knowledge into tacit knowledge. And finally, externalization is the conversion of tacit knowledge into explicit knowledge (Nonaka, 1994).

The creation of knowledge takes place through both individuals as well as organizations. In the core of each of the four aforementioned modes of knowledge creation, there is interaction. Human actors participate in the interactions, learn from others, create new knowledge, and can also codify and standardize the knowledge. The knowledge created through these modes leads progressively from individual learning to group learning, organizational learning, and then to inter-organizational learning (Nonaka, 1994).

This learning process fosters service, process, and organizational innovations (Nonaka and Takeuchi, 1995). While Nonaka explains that individuals develop and create knowledge, he also states that organizations such as firms "articulate and amplify" that knowledge (Nonaka, 1994). Organizations provide a context in which individuals can create knowledge through social interaction. These interactions may be informal and emergent, or they may be structured and routine. In sum, this theory of organizational knowledge creation applies both to individuals as well as to organizations.

Organizational knowledge creation theory has been applied in IS research in several ways. It has been used to explain that several aspects of organizational context influence the suitability of knowledge management processes (Becerra-Fernandez and Sabherwal, 2001), and to develop approaches for the valuation of organizational knowledge creation investments (Chen and Edgington, 2005). The theory has also been used to explain ways in which organizations can enhance knowledge management, innovation, and inter-organizational learning (Lee and Choi, 2003; Nambisan et al., 1999; Scott, 2000). It has also been used to explain how interaction between supply chain partners promotes market knowledge creation (Malhotra et al., 2005).

Without understanding the nature of human beings and the complex nature of human interactions, we cannot understand the theory of organizational knowledge creation (Nonaka et al., 2000). Organizational knowledge creation theory developed by Nonaka (1994) is to explain the process of making available and amplifying knowledge created by individuals as well as crystallizing and connecting it with an organization's knowledge system (Nonaka et al., 1994; Nonaka and von Krogh, 2009; von Krogh et al., 2012). Knowledge emerges at an individual level and is expanded by the interaction dynamic to an organizational level and to an inter-organizational level (Balestrin et al., 2008). An organization or an inter-organizational network cannot create knowledge, but it can provide a space for positive and constructive relationships between the actors (Balestrin et al., 2008). Organizational knowledge creation theory explains this process (Nonaka et al., 2006). Organizational knowledge creation theory explains that it is interaction among individuals and organizations that creates knowledge. This new knowledge fosters innovation. If the process for creating knowledge and promoting innovation can be explained, how is this knowledge valuable to the firm? How can a firm capitalize on these key resources? These are precisely the questions that the Knowledge-Based View of the firm addresses, a theory we now describe as an additional theoretical base for our work.

2.2. Knowledge-Based View of the Firm

The Knowledge-Based View of the firm (KBV) has emerged from the Resource-Based View of the

firm (RBV). The RBV explains that competing firms possess heterogeneous sets of resources and capabilities (Penrose, 1959; Wernerfelt, 1984; Wernerfelt, 1995). Resources and capabilities that are valuable, rare, difficult to imitate, and difficult to substitute are a potential source of competitive advantage (Barney, 1991). The KBV extends this understanding by explaining that knowledge is among the most valuable resources of a firm precisely because it is valuable, rare, difficult to imitate, and difficult to substitute (Grant, 1996b; Nonaka et al., 2006; Nonaka et al., 2000). Knowledge-based resources have these characteristics because they are socially complex and embedded within firms' organizational culture, business processes, administrative routines, information systems, and also within its employees (Alavi and Leidner, 2001; Grant, 1996a).

These knowledge-based resources are posited to be a basis from which sustained competitive advantage and improved firm performance can be built (Grant, 1996b). This theory is particularly relevant to IS research, because information systems are able to facilitate intra-firm knowledge development and knowledge management (Alavi and Leidner, 2001). Common IT infrastructures and management processes across functional divisions and business units enhance a firm's ability to manage knowledge (Tanriverdi, 2005). Furthermore, the ability to create and manage knowledge using IT has been shown to improve a firm's performance (Pavlou et al., 2005; Tanriverdi, 2005).

We appeal to the KBV because it indicates the importance of knowledge for improved business performance and competitive advantage. Knowledge gives a firm a competitive advantage because it is thorough this set of knowledge that a firm can innovate new products/processes/services (Nonaka et al., 2000). The knowledge-based view of the firm includes strategies for managing knowledge assets (Nonaka and von Krogh, 2009). On the flip side, organizational knowledge creation theory aims not only to explain the nature of knowledge assets and strategies for managing them, but also to complement the knowledge-based view of the firm and the theory of dynamic capabilities by explaining the dynamic processes of organizational knowledge creation (Nonaka and von Krogh, 2009). Dynamic process explains how tacit and explicit forms of knowledge interact to create new knowledge (Nonaka and von Krogh, 2009). The theory is also related to developing a comprehensive view of knowledge that could shed light on organizational creativity, learning, innovation, and change (Nonaka and von Krogh, 2009).

Within KBV research, however, the mechanisms and processes by which knowledge creates competitive advantage have not been thoroughly explored. For this reason, we couple the KBV with organizational knowledge creation theory, a theory that explains how knowledge is created by individuals as well as by organizations. The organizational knowledge creation theory assumes that individuals and organizations have a potential to grow together through the process of knowledge creation. In this perspective, a firm is considered as a dynamic entity that actively interacts with others and the environment (Nonaka et al., 2000). Knowledge is created through the dynamic interactions among individuals and/or between individuals and their environments, rather than an individual who operates alone in a vacuum (Nonaka et al., 2000). Furthermore, organization actively interacts with its environment (Nonaka et al., 2000).

In this paper, we take the position that knowledge is a valuable resource for the firm because it is valuable, rare, not easily imitated, or easily substituted. While researchers have explored how individuals cre-

ate knowledge within a firm, relatively little work has been done on how organizations interact to create knowledge. We explore the ways in which firms' interactivity enables them to create knowledge. We then argue that this knowledge provides value to the firm because it enables the firm to innovate. Innovation is thus a source of competitive advantage that is closely related to knowledge creation. A detailed explanation of this relationship will be provided as we develop our hypotheses.

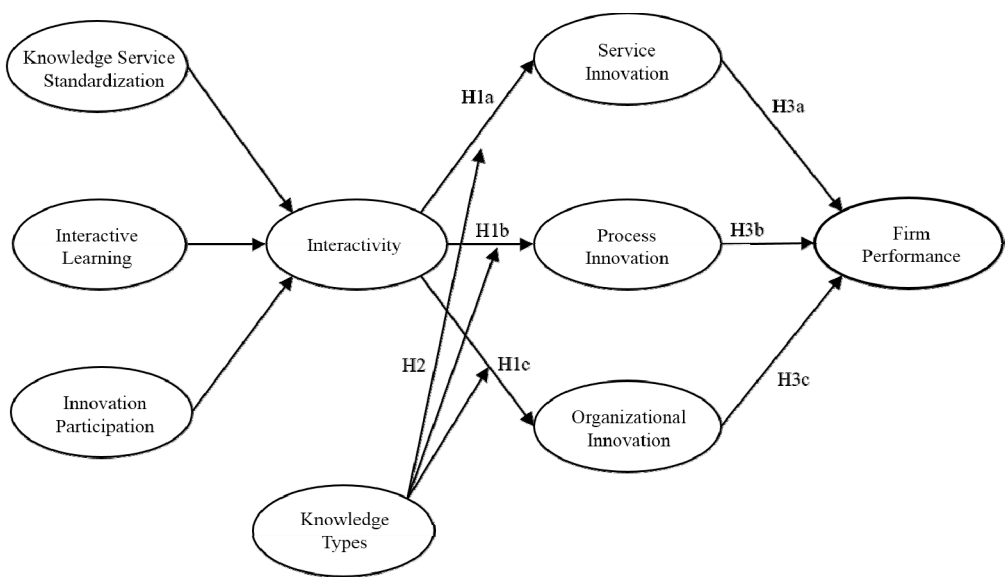
Ⅲ. Research Model and Hypotheses

In this section, we begin by explaining that interactivity is a second-order construct consisting of knowledge service standardization, interactive learning, and innovation participation. We then go on to explain that interactivity enables firms to innovate in three ways: service innovation, process innovation, and organizational innovation. We also explain how the type of knowledge, either tacit or explicit, moderates the relationships between interactivity and the three types of innovation. Finally, we explain how and why innovation improves firm performance. Our research model is depicted below as <Figure 1>. A detailed rationale for our model now follows.

3.1. Interactivity

By interactivity, we mean more than simply interaction. Interaction is the reciprocal action between two entities, such as the exchange of information between individuals or between firms. Examples would include the sharing of information between supply chain partners, or the sharing of market research between a firm and a marketing consultancy.

Interactivity, on the other hand, is the extent or the degree to which something is interactive (Liu and Shrum 2002). The term interactivity is often used to describe consumer technology devices that promote or foster interaction between the user and the device, or between the user and the provider



<Figure 1> Research Model

of the content that is being viewed on the device. Here, interactivity is used to describe the degree to which a firm is able to interact with or promotes interaction with other partner firms. These partners could be suppliers, customers, consulting firms, regulatory agencies, or other similar entities

We regard the construct of interactivity that has been proposed by previous studies (Lundvall, 1997; Miles, 2001; Howell, 2003) as a formative construct, as it consists of multiple dimensions. We suggest that innovation takes place when there is interaction between a firm and its value chain partners. We further suggest that the construct of interactivity is composed of knowledge service standardization, interactive learning, and innovation participation. These three dimensions indicate the ways in which firms can be interactive.

Knowledge service standardization is the extent to which the knowledge services that firms provide to customers are consistent and formalized (Miles, 2001). Standardization of knowledge services results from the frequent interactions between firms and customers, and the need to make products and services easily understood and accepted by customers (Miles, 2001). Standardized knowledge services can be routinized so that the service can be delivered even without directives or guidance (Grant, 1996b). Knowledge service standardization enables customers to readily accept the services that firms render and easily interact with firms when there is any problem with the services. When the transfer of knowledge can be standardized in format and routinized in business processes, firms find it easier to share knowledge. Thus, knowledge service standardization is one dimension of interactivity.

Interactive learning represents how easily firms and customers can exchange their knowledge with each other (Lundvall, 1997; Miles, 2001). In this sense, interactive learning represents the two-way learning between firms and their partners that allows both sides to communicate and combine their knowledge and create new knowledge and innovations (den Hertog, 2000; Ko et al., 2005; Nonaka, 1994). In particular, firms that possess general knowledge about markets can benefit from the exchange to build domain knowledge and innovate to better support their customers (Lundvall, 1997). When firms are able to learn about technologies, about the competitive environment, about advances in business processes, about new ways to engineer products and services, and when they share that knowledge, they are being interactive and creating opportunities for knowledge creation and innovation.

Innovation participation also constitutes a dimension of interactivity. Innovation participation represents the degree to which firms allow customers or other business partners to take part in creating service innovations (Howells, 2003). Prior research has suggested that frontline innovation participation is critical to successful innovation implementation, especially in service contexts (Susan et al., 2009). Thus, we can regard that the motivation to participate in implementation efforts of innovation, which can be the frontline of interactivity, may lead to the successful implementation of innovation.

Based on the arguments presented above, we model the construct of interactivity as a multidimensional formative construct. One example of a firm that demonstrates interactivity in several ways is Swedish furniture-maker IKEA. IKEA demonstrates knowledge service standardization by allowing customers to construct and configure their furniture by ordering from catalogs and websites. The flows of information both to and from the company thus are standardized. This same ordering and configuration process also demonstrate frequent interaction between customers

and the company. In these ways, IKEA can be seen as demonstrating interactivity.

3.2. The Effect of Interactivity on Innovation

Recent studies emphasize the importance of interaction with customers as the basis for co-creation of value in service provision (Michel et al., 2008; Payne et al., 2008; Prahalad, 1999). We argue that the interactivity of firms, that is, the degree or extent to which they interact with partners, helps them create knowledge and innovate in both products and services.

If high levels of firm interactivity foster the sharing of information between firms, then this information sharing can lead to the creation of new knowledge and innovation. Indeed, knowledge conversion through socialization, combination, internalization, and externalization leads to knowledge creation (Nonaka, 1994). As individuals become aware of knowledge that was once available only to other individuals, groups, or firms, learning takes place. This learning process fosters service, process, and organizational innovations (Nonaka and Takeuchi, 1995). Thus, interactivity has the potential to foster innovation.

Innovation is defined as production or adoption, assimilation, and exploitation of new idea or novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems (Adams et al., 2006; Bon and Mustafa, 2013). Innovation is widely recognized as a key driver of economic growth and plays a crucial role in competition at both a national and firm level (Hogan et al., 2011). Despite the importance of innovation to all organizations, prior research has mainly focused on high-technology and manufacturing industries (Hogan et al., 2011). Accordingly, understanding of innovation in service industries is less well understood (Hogan et al., 2011). Organizations need to innovate in response to changing customer demands and lifestyles and in order to renew the value of process in any organization (Rowley et al., 2011). A key concept in the literature of innovation is relevant to the exploration of types of innovation. Yet, a lot of models, frameworks, classifications, and definitions of types of innovation make it difficult to understand the different innovation types used by various researchers (Rowley et al., 2011). However, differentiation between types of innovations is essential in developing realistic theories of organizational innovations (Rowley et al., 2011). Thus, it is important to identify types of innovations and to make clear the differences between them (Rowley et al., 2011).

Existing research indicates the possibility of a link between interactivity and the innovation of specific products or services. Product or service innovation involves the introduction of new concepts and addition of new features to existing products and services (Hipp et al., 2000). Studies suggest that the key characteristic of product and service innovation is the tight interaction between service supplier and customer (Liu and Chen, 2007). Others similarly note that service innovation often emerges as a result of co-production between service providers and their customers (den Hertog, 2000; Michel et al., 2008; Prahalad and Ramaswamy, 2004).

Innovations that arise from interactivity are not, however, limited to product and service innovations. Process innovations have been identified as well (Hipp et al., 2000). Process innovation relates to the adoption of new service production, delivery, maintenance, and monitoring processes. Several of these different process innovations have been described as necessary to improve firm performance. These process innovations often take the form of soliciting

customer feedback and co-creating value with them foster the innovation of new processes (Michel et al., 2008). This new perspective on interacting with customers to innovate has even given rise to a new perspective on business strategy and marketing, what is referred to as the service-logic perspective (Michel et al., 2008; Vargo and Lusch, 2004). This new perspective is based on the idea that customers and businesses can collaborate to create innovative new ways for customers to service their personal needs and wants. Examples of firms that have developed new, interactive processes with customers include Google, where search "customers" create the rankings that make its search results useful, and Netflix, where a new process for movie rentals is created, one that allows customers to play a larger role in determining what content Netflix provides (Anderson, 2006; Michel et al., 2008). In sum, increased interactivity with customers has been identified as a key way to innovate in the area of business processes and create value within modern firms.

Yet another type of innovation is organizational innovation, which is defined as the introduction of a new organization structure or a new way of performing work. Some have discussed the reconfiguration of the "value constellation", or the reconfiguration of the network of suppliers, producers, partners, and customers (Michel et al., 2008). One example of a firm that has been able to make such an organizational innovation is YouTube, which has permitted and fostered collaboration with customers to create content that is viewed through the site. They have also changed the revenue-generation process by moving from a model where content creators paid a fee to convert and host video, but now do not have to pay because the service of hosting is free and essentially funded by advertisers on the site (Michel et al., 2008). Thus, interactivity with customers can lead to innovation in organizational structure and in the ways that work is performed.

In sum, each of these three types of innovations – product/service, process, and organizational – are facilitated through the interaction with customers (Michel et al., 2008; Miles, 2001). We argue that interactivity with customers leads to innovation in firms because firms acquire enhanced knowledge about best practices and accumulate domain knowledge (Prahalad and Ramaswamy, 2004). Furthermore, knowledge is accumulated through interactivity and recombined into new forms in the process of organizational learning (Nonaka and Takeuchi, 1995). Each of these outcomes support innovation. Therefore we hypothesize that

H1a: Interactivity positively affects service innovation.

H1b: Interactivity positively affects process innovation.

H1c: Interactivity positively affects organizational innovation

3.3. The Moderating Effect of Knowledge Types

Knowledge refers to a dynamic human process of justifying personal belief towards the truth (Nonaka et al., 2000). Knowledge creation is the search for true belief (Nonaka and von Krogh, 2009). The concept of knowledge has received much attention in recent years and has been asserted to play a critical role in the innovation process (Adams et al., 2006). According to capability theory, sustainable superior performance and competitive advantage come from an ability to deploy a stock of resources such as human or knowledge assets (Hogan et al., 2011). Organizational capability for knowledge creation is a potential source of competitive advantage for firms in today's global marketplace (Nonaka et

al., 1994). Hogan et al. (2011) assert that within knowledge-intensive service contexts, the ability to transform existing knowledge into new knowledge is recognized as an important source of competitive advantage. Knowledge management is concerned with obtaining and communicating ideas and information that underlie innovation competencies, and includes idea generation, absorptive capacity and networking (Adams et al., 2006).

We categorize the type of knowledge into tacit and explicit knowledge to examine the effect of knowledge type on the relationship between interactivity and the various types of innovation. Each type of knowledge may have a differential effect on the relationship between interactivity and innovation (Song et al., 2007). That is, even with the same degree of interactivity, tacit knowledge is critical for some innovations, while for other innovations explicit knowledge is more valuable than tacit knowledge (den Hertog, 2000). This is primarily because each type of innovation may require different levels of communication and knowledge representation.

Consider the case of the Toyota production system. Many American companies have made visits to Toyota to learn the lean production system. These American companies have actually applied the knowledge they learned from the benchmarking process to their own company. Few of them, however, have accomplished their intended goals. This is a typical failure in applying tacit knowledge to organizational innovation. The reason is that organization level or process level knowledge is situated in the context so that the knowledge cannot be easily extracted (Grant, 1996b). If the tacit knowledge were able to be effectively exchanged, however, the impact on the receiving firm could be considerable. On the contrary, if a company obtains knowledge about a product or service, it can easily replicate the product or service through reverse engineering. This is the case when explicit knowledge that is gained from interaction is applied to the process of innovation.

Following Nonaka and Takeuchi (1995), we classify knowledge as either tacit or explicit. Tacit knowledge essentially represents "know-how" which is related to subjective knowledge; explicit knowledge represents "knowing-about" and is related to objective knowledge. In general, since explicit knowledge is available in the form of formulas, technical specifications, or embedded in equipment and computer programs, it can be relatively easy to store and transfer. On the other hand, tacit knowledge can be held and deployed on the part of the user (Hales, 1997). It is highly personal and difficult to convert. It cannot easily be codified and can often only be observed through application and acquired through practice and experience.

These two different types of knowledge may have a differential effect on the relationship between interactivity and innovation, because each type of innovation may require different levels of communication and knowledge representation (Song et al., 2007). Tacit knowledge is generally more difficult to obtain than explicit knowledge (Nonaka, 1994). In spite of this difficulty, tacit knowledge is critical for most innovations (den Hertog, 2000). Tacit knowledge can be the most difficult to extract, recombine with other knowledge, and use to develop innovations. Therefore, when interactivity is high, if the knowledge that is exchanged between a firm and a partner is mostly tacit, there will be a greater effect on innovation than when the knowledge exchanged is mostly explicit. Because explicit knowledge is codified and easier to access, share, and understand, it promises less of an increase in innovation, and less of a sustainable advantage. Thus, knowledge is often seen as moderating or mediating variables for more generic

models of performance (Quintane et al., 2011). From a knowledge-based view, knowledge play an important role as an organizational attribute in fostering innovation (Quintane et al., 2011). The knowledge-based view of the firm suggests that creating organizational knowledge can generate more improvements that enhance competitive performance (Linderman et al., 2004). On the other hand, knowledge creation may in fact not lead to significantly improved performance (Linderman et al., 2004). In a similar vein, not all new knowledge should be termed an innovation (Quintane et al., 2011). Thus, it is very important to identify the type of knowledge that can lead to innovation.

Restated, even when tacit knowledge is shared, it may be difficult to separate from its native context, difficult to decode and interpret, and difficult to apply in a new circumstance. However, when firms and partners have high levels of interactivity, and are able to effectively exchange tacit knowledge, this exchange will provide a greater degree of benefit than the exchange of explicit knowledge. Hence, we argue that when firms rely more on tacit knowledge during the interaction with customers, the effect of interactivity on innovation is greater than when firms rely more on explicit knowledge. Therefore, we hypothesize:

H2a: When firms rely more on tacit knowledge during the interaction with customers, the effect of interactivity on service innovation becomes stronger than when firms rely more on explicit knowledge.

H2b: When firms rely more on tacit knowledge during the interaction with customers, the effect of interactivity on process innovation becomes stronger than when firms rely more on explicit knowledge.

H2c: When firms rely more on tacit knowledge during the interaction with customers, the effect of interactivity on organization innovation becomes stronger than when firms rely more on explicit knowledge.

3.4. The Effect of Innovation on Firm Performance

Innovation has been described as the driving force of firm growth for decades (Schumpeter, 1934). While this relationship has been borne out in a host of empirical studies (Baldwin and Johnson, 1996; Barua and Mukhopadhyay, 2000; Deshpande et al., 1993; Fichman, 2000; Han et al., 1998; Ramamurthy et al., 1999; Teece, 1986), some have criticized contemporary innovation literature for emphasizing technical innovations over other types of innovations, noting that the original idea of Schumpeterian innovation was much broader than simply technical or technological innovation (Gallouj and Weinstein, 1997). To address this limitation, researchers have explained and shown that product/service innovation, process innovation, and organization innovation positively affect firm performance (de Vries, 2006; Gadrey et al., 1995). Organizational performance is maximized when it is based on the sharing of knowledge within a culture of continuous learning, innovation and improvement (Haner, 2002).

Most early studies focused on product innovation, but recent studies cover three or four different types of innovation such as service/product, process, organization, and marketing (Cho et al., 2011). Thus, innovation can be seen from product/service, a process or a company-wide perspective (Haner, 2002). In a similar vein, innovation has three levels: a product/service level, a process level and an enterprise level (Haner, 2002). Boer and During (2001) also identified the following types of innovation: product, process, and organizational innovation. Hovgaard

and Hansen (2004) offer three types of innovation: product, process, and business systems. Their concept of business system is close to the concept of organizational innovation (Rowley et al., 2011). Through a comprehensive literature review we can distinguish three innovations: product or service innovation involves the introduction of new concepts and addition of new features to existing products and services (Hipp et al., 2000); process innovation relates to the adoption of new service production, delivery, maintenance, and monitoring processes; and organizational innovation is defined as the introduction of a new organization structure or a new way of performing work (Michel et al., 2008). Product or service innovations aim to present a new or improved product/service for the customers and customers see the impact of such innovation in the products/services they receive while process innovations change or improve the way organization perform (Rowley et al., 2011). However, service innovation and process innovation are directly connected to visible performance related to profit or costs of the service firm (Cho et al., 2011). Meanwhile, organizational innovation is any other change to the way the organization operates such as the introduction of Total Quality Management (Rowley et al., 2011). The original idea behind Schumpeterian innovation was that larger firms were able to innovate, changing the structure of the market from within to suit themselves. He referred to the process of innovation and the subsequent changes to the market "creative destruction", noting that the firms that flourish are those that are able to grasp discontinuities quickly. Thus, firms that can innovate to change the market, or those that can respond rapidly to innovations, are poised to succeed.

In today's knowledge-based economy, the explanation is similar. Firms seek to innovate in order to steal a march on their competitors. When they are able to develop innovations, be they service, process, or organizational innovations, those firms are poised to see superior performance. The RBV, and its extension, the KBV, both posit that when a resource is valuable, rare, inimitable, and non-substitutable, competitive advantage can be built. Knowledge-based resources, in particular, are a basis from which sustained competitive advantage and improved firm performance can be built (Grant, 1996b). Innovations are, by definition rare. They are novel and represent creative approaches to developing new services and products, new processes, or new organizational forms. To the degree that these innovations are potentially valuable, and to the degree that they cannot be quickly copied or substituted for, the firm will realize a competitive advantage over their competitors. Knowledge-based innovations are likely to be a basis on which competitive advantage can be built because knowledge is generally unique to an individual, group, or firm. Such firm-specific resources meet the criteria for being valuable, rare, not easily imitated, or easily substituted. We therefore hypothesize:

H3a: Service innovation positively affects firm performance.

H3b: Process innovation positively affects firm performance.

H3c: Organizational innovation positively affects firm performance.

Ⅳ. Method

4.1. Sample and Data

To test our research model and hypotheses, we surveyed knowledge-intensive business service firms

(KIBS). KIBS firms are private organizations that rely heavily on professional knowledge related to a specific (technical) discipline or (technical) functional domain to produce intermediate products and services (Hertog, 2000). Many IT services firms and consulting firms fall into this category. KIBS firms play three important roles (Starbuck, 1992). First, through knowledge creation, application, and preservation, they innovate so that new and renewed knowledge can be applied to new projects. Second, they convert the flow of information into the stock of knowledge. In their interactions with other firms, KIBS firms capture the flow of information from client firms and convert it into their knowledge stock to be subsequently used for further service innovation (Lundvall, 1997). Third, a KIBS firm becomes a single source of knowledge to its client firm(s). The effectiveness of performing the three roles of a KIBS firm relies on the quality of the interaction between KIBS firms and customers (Lundvall, 1997).

The nature of KIBS firms' business means that interactivity with clients, knowledge creation, and innovation are all highly important for success. In such a context, the phenomena that we seek to observe should be clearly observable. For these reasons, we have chosen KIBS firms as the context for our research study.

We developed a survey questionnaire by modifying items from previous studies and creating new items where necessary. The company list of the IT Service Management Forum (itSMF) was used as the source of sampling. The questionnaire was distributed from January to February 2010 by email. Prior to distributing the questionnaire, the purpose of the study was sufficiently explained to the person in charge of the responding in target companies. The questionnaire was mailed to a sample of KIBS firms. In addition, we directly contacted KIBS firms to encourage their participation. Of 230 firms that were contacted for the survey, 96 firms completed and returned the questionnaires (response rate of 41.7%). 5 out of 96 returned survey questionnaires were dropped due to incomplete answers and 91 usable responses were included in the data analysis. The samples collected in this study are not enough. As a matter of fact, it was not easy to collect an enough sample because it is a company unit analysis. We are fully aware of this problem and have mentioned this in research limitations. However, we have shown by using statistical tool (G*Power version 3.1.9.2) that the number of samples satisfies the minimum number of samples. The result shows under conditions where alpha=0.05, power=0.95, number of predictors=7 that the minimum sample size is 89. Therefore, although the number of samples used in this study is not enough, more samples than the minimum sample size were used for empirical analysis. The initial version of the paper has been presented to several conferences (e.g., HICSS, AMCIS, etc.) and has been gradually improved. <Table 1> shows the demographic information of the respondents.

Most of the respondents were mid-level managers. Middle managers play crucial roles for implementing innovations. Thus, a comprehensive understanding of middle managers' role in innovation implementation is important. Organizational knowledge creation theory posits that top- and middle-level managers enable lower-level group interaction by intervening and providing access to critical resources (von Krogh et al., 2012). However, Birken et al. (2013) contend that middle managers have a potentially important yet poorly understood role in innovation implementation. Hornsby et al. (2002) also claim that little research has been undertaken to define the nature of middle managers' contributions to company's innovation.

<Table 1> Demographic Information

Profile Category		Number of Respondents	Percentage of Respondents
Age	20-30	20	22.0
	31-40	39	42.9
	41-50	31	34.1
	51 or Greater	1	1.1
Gender	Male	73	80.2
	Female	17	18.7
Industry Type	CEO/Senior Manager	6	6.6
	Mid-level Manager	33	36.3
	Professional	36	39.6
	Supervisor	2	2.2
	Clerical	5	5.5
	Administrative	2	2.2
	Production	2	2.2
	Etc.	5	5.5
Industry Type	IT services	46	50.5
	Finance/ Insurance	19	20.9
	Communications	17	18.7
	Banking	5	5.5
	Construction	2	2.2
	Education	1	1.1
	Medical Service	1	1.1
Firm Size	Large	19	19.8
	Medium	37	40.7
	Small	36	39.6
Total		91	100%

Middle managers can create an environment in their respective divisions or subsidiaries where innovations flourish (Hornsby et al., 2002). To effectively implement innovations, employees must have information regarding what to do, how and when to do it, and why they must do it (Birken et al., 2013). Middle managers diffuse and synthesize information regarding innovation implementation (Birken et al., 2012). And they give employees this information and the tools necessary to implement the innovation (Birken et al., 2013). Nonaka and Takeuchi (1995) highlight that most innovations emanate from the middle of the organization and the promising ones are then sent to upper management for further analysis and evaluation. Those innovations that meet the rigorous standards set by the top management team and then sent back to middle managers who then communicate them to the employees (Hornsby et al., 2002).

In addition, innovation implementation would be

strongly related to variables representing both external and internal networking (Larsen, 1993). Middle managers would be having a strong external network as well as internal network (Larsen, 1993). Middle managers interact with diverse employees and communicate their ideas for innovations to upper management, thereby creating an opportunity where these ideas are evaluated and considered within the context of the firm's overall strategic priorities (Hornsby et al., 2002). They also actively ad diligently gather innovation ideas initiated by vendors and competitors (Hornsby et al., 2002). And middle managers transfer this knowledge to others in their company (Hornsby et al., 2002).

4.2. Operationalization of Research Variables

We measure interactivity as a second order construct formed by three dimensions of knowledge service standardization, interactive learning and innovation participation. The items for knowledge service standardization were adapted from standardized service measures in earlier research (Blind, 2006; Hipp et al., 2000). We used previously developed items to measure interactive learning as well (Meeus et al., 2001). Innovation participation was measured by adapting the scales that concern the customers' participation in innovation (den Hertog, 2000).

The items for service innovation, process innovation and organizational innovation were adapted from the previous innovation studies (Armbruster et al., 2008; Avlonitis et al., 2001; Ravichandram, 1999). The items for knowledge type were adapted from tacit and explicit knowledge measures (Miles et al., 1995). We measured tacit and explicit knowledge separately and reverse-coded explicit knowledge to combine both measures together. Finally, the items for firm performance were also adapted from previous research (Hipp et al., 2000). For all measurement items, a 5 point Likert scale was used, anchored by "strongly disagree" and "strongly agree." The survey instrument appears in the Appendix.

4.3. Validity and Reliability

Data analysis was performed using the partial least squares (PLS). Unlike covariance-based approaches, PLS requires minimal demands on measurement scales, sample size, and distributional assumptions (Chin, 1998). We used Smart PLS Version 2.0 for

<Table 2> Constructs and Items

Constructs	# of Item	Reference
Knowledge service standardization	6	Avlonitis et al. (2001), Bon and Mustafa (2013), Chen and Edgington (2005), Gallouj and Weinstein (1997)
Interactive learning	5	
Innovation participation	3	
Service innovation	3	Al-Hakim and Hassa (2001), Alavi and Leidner (2001), Barua and Mukhopadhyay (2000), Chen and Edgington (2005), Hoarau and Kline (2014)
Process innovation	3	
Organizational innovation	5	
Tacit knowledge	2	Grant (1996a)
Explicit knowledge	2	
Firm performance	4	Al-Hakim and Hassa (2001), Barua and Mukhopadhyay (2000), Chen and Edgington (2005), Hoowells (2003)

<Table 3> Reliability Measures for Model Constructs and Construct Correlation

Construct	Cronbach's α	AVE	Inter-Construct Correlation						
			STN	IL	IP	SI	PI	OI	FP
Standardization (STN)	.89	64	**(.80)**						
Interactive learning (IL)	.89	.71	.46	**(.84)**					
Innovation participation (IP)	.78	.70	.26	.51	**(.84)**				
Service innovation (SI)	.72	.64	.42	.40	.35	**(.80)**			
Process innovation (PI)	.76	.68	.55	.45	.34	.55	**(.82)**		
Organizational innovation (OI)	.87	.66	.52	.61	.44	.40	.50	**(.81)**	
Firm performance (FP)	.86	.71	.49	.57	.34	.39	.49	.51	**(.84)**

our analysis. Smart PLS is a software application for the design of structural equation models (SEM) on a graphical user interface (GUI). We conducted our analysis in two stages. First, we tested the measurement model to ensure that the constructs had sufficient psychometric validity and then addressed the structural model in which the hypotheses were tested (Please see <Appendix A> and <Appendix B> for confirmatory factor analysis, as well as for item loadings and cross-loadings).

<Table 3> shows that the composite reliability for all constructs is greater than 0.80 and the average variance extracted (AVE) is greater than 0.50. Also, all item-loadings were greater than 0.70; therefore, the level is generally acceptable (Fornell and Larcker, 1981). Furthermore, the square roots of the shared variance between the constructs were higher than the correlations across constructs, thus supporting discriminant validity (Fornell and Larcker, 1981). In this study, AVE for each construct is greater than the correlation between that and all other constructs. These statistics for the reliability of our measures and analysis are summarized in <Table 3>.

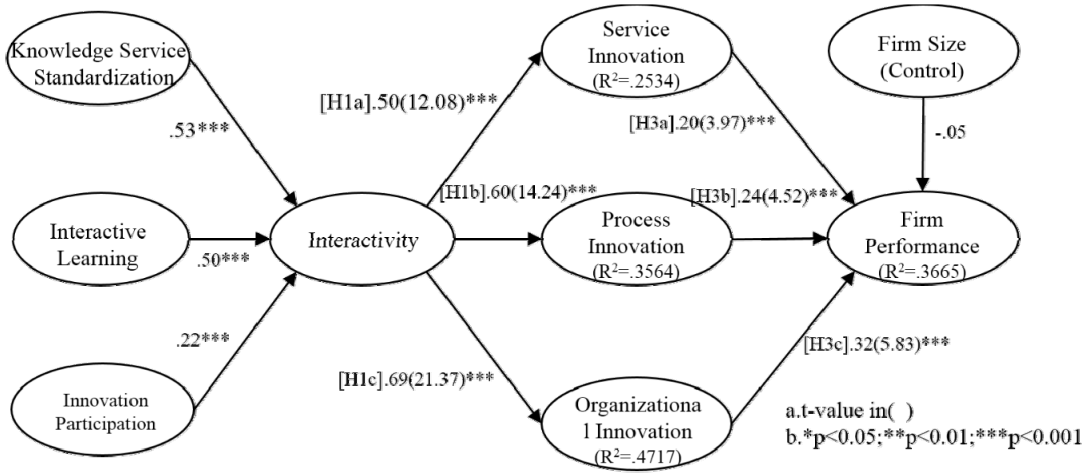
4.4. Structural Model Test

Data analysis examines the significance and strength of each of our hypothesized effects and the results are shown in <Figure 2> and <Figure 3>. We tested two models: one with only main effect of interactivity and innovations (<Figure 2>), the other with the moderating effect of knowledge type on the relationship between interactivity and innovations (<Figure 3>).

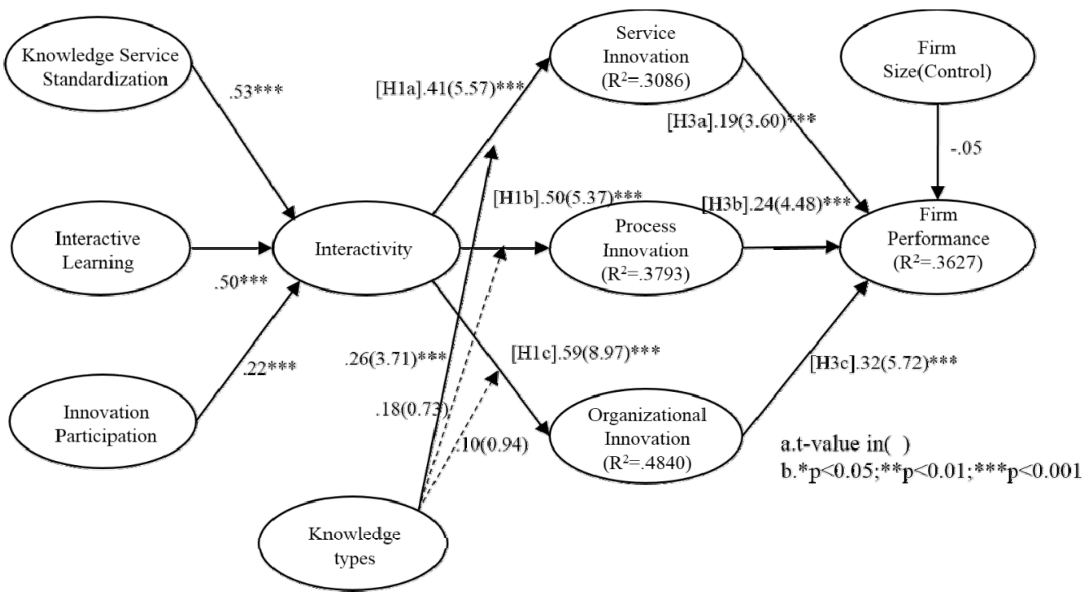
As shown in <Figure 2>, all path coefficients are over 0.1 satisfying both conservative criteria and the suggested lower limits for such relationships. They are also statistically significant at the $p<0.001$ level, which indicates that all hypotheses regarding the direct effect of interactivity on innovations (H1a, H1b, H1c, H3a, H3b, H3c) are supported by the data. Moreover, high R2 values for constructs in the structural model show that this model can be used to predict the effect of interactivity on innovations and firm performance.

We also conducted an additional test where we considered firm size as a control variable. It was not statistically significant, which means that for KIBS firms, firm size may not be important in terms of performance, because the competitive advantage of these firms may come from knowledge and expertise.

We further tested the moderating effect of knowledge type on the relationship between interactivity and innovations. To test moderation of the types of knowledge, we constructed the interaction terms between the types of knowledge and interactivity



<Figure 2> The Estimated Model (Main Effect)



<Figure 3> The Estimated Model (Moderating Effect)

to test the moderating effect of the relationship between independent variable and innovation variables. We followed the procedure suggested by Goodhue et al. (2007). In our results, we found that knowledge types could partially moderate only the relationship between service innovation and interactivity. In other words, when KIBS firms rely more on tacit knowledge during the interaction with customers, the effect of interactivity on service innovation becomes stronger than when KIBS firms rely more on explicit knowledge (H2a). In the cases of process innovation and organization innovation, there is no interaction effect observed (H2b and H2c).

Ⅴ. Discussion

In this study, we set out to investigate the effect of the interactivity on three types of innovations and their subsequent effects of innovations on firm performance. Interactivity has been touted to be critical for new knowledge creation by mobilizing tacit knowledge held by individuals and organizations (Nonaka, 1994). The results of the research model show that interactivity positively affects service innovation, process innovation, and organization innovation. We also examine the moderating effect of knowledge types (tacit or explicit) on the relationship between interactivity and innovations. According to the test results, the moderating effect of knowledge type on the relationship between interactivity and innovations is effective only in the case of service innovation, not in the cases of process and organization innovation.

5.1. Theoretical Implications

From a theoretical perspective, the proposed model provides several insights into the effect of interactivity on innovations. Our results indicate that firm performance is determined by organization innovation, process innovation, and service innovation in that order. Considering the fact that many studies on innovation have focused on service or product innovation as the major source of growth (Baldwin and Johnson, 1996; Deshpande et al., 1993), our results are quite interesting. Intuitively, we may argue that organizational innovation has a wider scope than process and service innovations do; organizational innovation can critically affect firm performance. Future studies need to investigate why organization innovation exerts a greater impact on firm performance than other types of innovation, and in what conditions interactivity affects the different types of innovations described here.

The results of the moderating effect test show that knowledge type affects the relationship between interactivity and innovations only in the case of service (product) innovation. People may perceive service or product innovation as the most complicated because it requires the exchange of tacit knowledge. This may be the reason previous studies on innovation have focused on service or product innovation.

Finally, we propose a three-component-based construct of interactivity including knowledge service standardization, interactive learning, and innovation participation. Knowledge service standardization has the highest loading followed by interactive learning and then innovation participation. The evidence clearly shows that the more standardized the knowledge service is, the easier the customers understand the purpose of the service and accept the service. It is also understandable that interactive learning and innovation participation form interactivity (Howells, 2003). Future studies, however, need to investigate whether this is true when the data are collected from customer firms. In addition, future research needs to identify what other factors may contribute to interactivity in the context of knowledge service relationships.

5.2. Practical Implications

From a practical perspective, the proposed model can help explain the importance of the interaction of firms with customers to improve their innovation and thus their performance. In particular, firms need to pay attention to the fact that organizational innovation may have more impact on firm performance rather than process and service innovation. In addi-

tion, interactivity with customers may promote not only organizational innovation, but also process and service innovation. Hence, firms need to improve the interaction with customers by facilitating their service standardization, encouraging customers' participation in their business processes, and boosting interactive learning with customers.

Contemporary economic systems have become more knowledge intensive than in the past. The emergence of the knowledge and service intensive organization, most employees of knowledge companies are highly qualified educated professionals that is they are knowledge workers. A firm's ability to succeed at innovation is dependent upon the management of human based factors. Thus, ownership of knowledge is a source of competitive advantage (Johannessen et al., 1999).

Knowledge barriers protect knowledge-based resources. Competitors cannot easily obtain or imitate knowledge resources due to causal ambiguity, the specific practices or inputs required for replication are unknown. Knowledge resources include creative or collaborative skills that exist within an organization. These resources represent the tacit dimension of knowledge. Especially, innovation primarily based on tacit knowledge than industries based on codified knowledge. Nonaka and Takeuchi (1995) underlined tacit knowledge as a main source creating new knowledge and continuous innovation. Tacit knowledge is a form of skill, ability and the practical knowledge used to perform a task (Johannessen et al., 1999). In addition, tacit knowledge is in the business context: practical, action oriented, experienced-based, concrete contextual linked and personal (Johannessen et al., 1999). Among other innovations, tacit knowledge plays a pivotal role in service innovation. Within knowledge-intensive business service contexts, the ability to transform existing knowledge into new knowledge is important source of competitive advantage. Hence, better use of existing knowledge and more effective acquisition and assimilation or new knowledge becomes the business imperative.

5.3. Limitations and Future Research

It is worthwhile to note some of the limitations of this study. First, we made use of perceptual measures for firm performance. Objective measures of firm performance may reduce method variance and allow more generalizability. However, it is difficult to collect data about the performance of private firms, and also about the performance of a firm on service metrics, rather than financial metrics. Future research can be conducted that utilizes objective measures for firm performance.

Second, because of the nature of this exploratory study, we drew only a single subject from each organization and only focus on one type of firm, KIBS firms. Our results are limited by the extent to which each respondent can accurately assess his/her organization. One can argue that all participants despite of their job positions are fully engaged and responsible for providing services and creating knowledge. Future studies may incorporate measures taken from multiple members of an organization and convert them to organization level, which may provide better insights. Future studies also need to collect data from the customer side so that the results can be compared with the current study.

The third limitation concerns the scales used to measure the research constructs. We selectively used the measurement items validated by other researchers to measure the research constructs. Although statistically legitimate, this practice may impair content validity by doing away with some facets of each construct. Future studies should incorporate more

facets of each construct to extend the research presented here. The final limitation relates to the type of knowledge and its interaction effect on the innovation. We focus on tacit and explicit knowledge and their moderating effect of knowledge type on the relationship between interactivity and innovation. Future study may include more types of knowledge such as declarative, procedural, semantic, and episodic knowledge and investigate their potential moderating effects.

5.4. Conclusion

The contributions of our research are threefold. First, by coupling our arguments and our empirical findings with extant research, we have helped to refine and bring clarity to the concept of firm interactivity. Specifically, we have described three different dimensions of interactivity: knowledge service standardization, interactive learning, and innovation participation. Second, we have identified three different types of innovations that can emerge from firm interactivity: service, process, and organizational innovations. Third and finally, we have explored the effect of innovation on firms' performance, revealing its positive impact. We believe this work provides useful insights for continuing research into firm interactivity and innovation. We anticipate many opportunities to continue to test and practically apply these ideas.

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<Appendix A> Item Loadings and Cross Loadings

	SI	PI	OI	KSS	IL	IP	EK	EK	FTP
SI1	0.588	0.374	0.326	0.246	0.258	0.199	0.015	-0.110	0.265
SI2	0.825	0.578	0.432	0.465	0.495	0.294	0.457	-0.190	0.432
SI3	0.863	0.506	0.560	0.450	0.606	0.534	0.358	-0.205	0.499
PI2	0.586	0.850	0.476	0.526	0.504	0.226	0.357	-0.181	0.517
PI1	0.597	0.820	0.407	0.500	0.544	0.388	0.280	-0.132	0.462
PI3	0.290	0.714	0.442	0.430	0.402	0.404	0.201	-0.077	0.259
OI1	0.335	0.351	0.575	0.374	0.420	0.310	0.293	-0.169	0.470
OI2	0.492	0.490	0.696	0.417	0.598	0.314	0.427	-0.167	0.395
OI3	0.507	0.533	0.870	0.438	0.574	0.482	0.318	-0.092	0.530
OI4	0.432	0.334	0.683	0.218	0.364	0.310	0.067	-0.018	0.366
OI5	0.482	0.438	0.855	0.392	0.480	0.354	0.405	-0.282	0.496
KSS1	0.411	0.521	0.274	0.800	0.419	0.287	0.337	-0.239	0.448
KSS2	0.334	0.469	0.331	0.831	0.346	0.074	0.364	-0.175	0.469
KSS3	0.432	0.495	0.376	0.782	0.392	0.127	0.303	-0.281	0.599
KSS4	0.458	0.504	0.518	0.794	0.604	0.462	0.370	-0.248	0.564
KSS5	0.442	0.420	0.330	0.845	0.438	0.182	0.374	-0.226	0.528
KSS6	0.386	0.473	0.433	0.420	0.669	0.405	0.476	-0.303	0.525
IL1	0.476	0.434	0.464	0.472	0.807	0.568	0.471	-0.230	0.621
IL2	0.530	0.481	0.473	0.533	0.850	0.533	0.455	-0.267	0.576
IL3	0.577	0.355	0.477	0.214	0.781	0.519	0.392	-0.234	0.451
IL4	0.496	0.499	0.495	0.336	0.822	0.555	0.462	-0.138	0.513
IL5	0.506	0.547	0.613	0.451	0.827	0.492	0.415	-0.072	0.517
IP1	0.435	0.343	0.567	0.209	0.579	0.831	0.501	-0.221	0.365
IP2	0.226	0.370	0.211	0.299	0.434	0.776	0.368	-0.260	0.332
IP3	0.448	0.341	0.425	0.532	0.591	0.501	0.882	-0.425	0.626
EK1	0.271	0.290	0.189	0.253	0.405	0.369	0.882	-0.437	0.312
EK2	-0.252	-0.221	-0.182	-0.285	-0.354	-0.284	-0.919	-0.338	-0.314
TK1	-0.165	-0.090	-0.134	-0.262	-0.130	-0.157	-0.421	0.884	-0.296
TK2	0.450	0.460	0.442	0.409	0.580	0.435	0.463	0.919	-0.477
FP1	0.483	0.423	0.503	0.474	0.544	0.350	0.400	-0.287	0.842
FP2	0.371	0.396	0.444	0.495	0.536	0.378	0.443	-0.174	0.826
FP3	0.436	0.328	0.388	0.422	0.460	0.426	0.428	-0.264	0.679
FP4	0.469	0.463	0.423	0.391	0.472	0.413	0.478	-0.383	0.591

Note: SI: Service Innovation, PI: Process Innovation, OI: Organizational Innovation, KSS: Knowledge Service Standardization, IP: Innovation Participation, EK: Explicit Knowledge, TK: Tactic Knowledge, FTP: Firm Performance.

<Appendix B> Results of Confirmatory Factor Analysis

Constructs		Items	Factor loadings	S.E.	T-statistic	Composite Reliability
Knowledge Service Standardization		KS1	0.744	0.065	11.478	0.914
		KS2	0.800	0.047	16.999	
		KS3	0.832	0.045	18.617	
		KS4	0.782	0.056	14.084	
		KS5	0.794	0.045	17.773	
		KS6	0.845	0.035	24.263	
Interactive Learning		IL1	0.669	0.073	9.157	0.927
		IL2	0.807	0.045	17.907	
		IL3	0.850	0.031	27.348	
		IL4	0.781	0.062	12.660	
		IL5	0.822	0.049	16.932	
Innovation Participation		IP1	0.754	0.067	11.297	0.831
		IP2	0.831	0.043	19.355	
		IP3	0.777	0.067	11.666	
Service Innovation		SI1	0.588	0.127	4.621	0.808
		SI2	0.825	0.035	23.674	
		SI3	0.863	0.029	29.990	
Process Innovation		PI1	0.850	0.031	27.542	0.839
		PI2	0.820	0.047	17.556	
		PI3	0.714	0..087	8.248	
Organizational Innovation		OI1	0.870	0.027	31.874	0.847
		OI2	0.683	0.086	7.964	
		OI3	0.855	0.043	19.759	
Firm Performance		FP1	0.884	0.030	29.653	0.884
		FP2	0.842	0.041	20.469	
		FP3	0.826	0.045	18.213	
		FP4	0.680	0.080	8.500	
Knowledge types	Explicit knowledge	EK1	0.882	0.025	35.108	0.875
		EK2	0.882	0.025	35.108	
	Tactic Knowledge	TK1	0.919	0.020	46.288	0.916
		TK2	0.919	0.020	46.288	

<Appendix C> Measurement Items for Principal Constructs

Knowledge Service Standardization (KSS) (Blind, 2006; den Hertog, 2000; Hipp et al., 2000; Meeus et al., 2001)
KSS1: Our firm provides services repeatedly based on customer requirement.
KSS2: Our firm suggests criteria for helping customers when they evaluate the given service.
KSS3: Our firm implements the system to maintain service quality that customers receive.
KSS4: Our firm provides the service through standardized service process.
KSS5: Our firm provides functionalities to customize services.
KSS6: Our firm makes efforts for customer to receive service anywhere.
Interactive Learning (IL) (Blind, 2006; den Hertog, 2000; Hipp et al., 2000; Meeus et al., 2001)
IL1: Our firm shares our goals with customers.
IL2: Our firm discusses methods improving our services with customers
IL3: Our firm constantly exchanges or transfers knowledge, information and skills to customers
IL4: Our firm shares new ideas with customers for improving service.
IL5: Our firm occasionally contacts customers in order to get their feedback.
Innovation Participation (IP) (Blind, 2006; den Hertog, 2000; Hipp et al., 2000; Meeus et al., 2001)
IP1: Our firm supports customers to make them suggest innovation methods
IP2: Our firm drives customers to participate in designing service process
IP3: Our firm makes a mechanism that drives for customer to participate in evaluation process
Service Innovation (SP) (Armbruster et al., 2008; Avlonitis et al., 2001; Ravichandram, 1999)
SI1: Our firm develops new service based on customer requirement
SI2: Our firm launches the competitive or new service
SI3: Our firm provides new service by combining components in existing services
Process Innovation (PI) (Armbruster et al., 2008; Avlonitis et al., 2001; Ravichandram, 1999)
PI1: Our firm always adopts and develops new service delivery process.
PI2: Our firm always introduce new service design process.
PI3: Our firm always changes following-up process for service.
Organizational Innovation (OI) (Armbruster et al., 2008; Avlonitis et al., 2001; Ravichandram, 1999)
OI1: Our firm has implemented new or changed organizational structures for providing better services.
OI2: Our firm makes the organizational structure be changed through new technology.
OI3: Our firm changes the organizational structure for effectively exchanging information, knowledge and skills.
OI4: Our firm introduces significant changes in relations to other firms such as alliances, partnerships, outsourcing and sub-contracting
OI5: Our firm changes organizational structure with the introduction of a new service
Tacit Knowledge (TK) (Miles, 2001; Nonaka, 1994)
TK1: The extent to which our firm has trouble to sufficiently explain or transfer knowledge to customers
TK2: The extent to which it is difficult to apply knowledge as means of writing such as report, manual etc. within our firm
Explicit Knowledge (EK) (Miles, 2001; Nonaka, 1994)
EK1: The extent to which knowledge related to interaction with customers such as task, method, function, is documented in our firm.
EK2: The extent to which our firm changes knowledge into formal form for delivering e-mail, report, manual to customers
Firm Performance (FP) (Armbruster et al., 2008; Hipp et al., 2000)
FP1: Our firm makes profit through service.
FP2: Our firm increases market share through service.
FP3: Our firm obtains higher competitive advantage through service.
FP4: Our firm increases sales through service.

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Submitted: January 28, 2019; 1st Revision: September 4, 2020; Accepted: October 5, 2020