Research paper

The effects of complementarity of knowledge and capabilities on joint innovation capabilities and service innovation: The role of competitive intensity and demand uncertainty

Nelson Oly Ndubisi[a], Mumin Dayan[b,*], Volkan Yeniaras[c], Mohammad Al-hawari[d]

[a] College of Business & Economics, Qatar University, PO Box 2713, Doha, Qatar
[b] College of Business & Economics, United Arab Emirates University, PO Box 15551, Al Ain, United Arab Emirates
[c] School of Business Administration, American University of Sharjah University City, PO Box 26666, Sharjah, United Arab Emirates
[d] College of Business Administration, University of Sharjah, University City, PO Box 27272, Sharjah, United Arab Emirates

ABSTRACT

Service innovation has become increasingly important for the growth of developed and developing countries. Despite an extensive body of literature on the role of joint innovation capabilities in improving a firm's innovativeness, the multivariate influences of operant resources and joint innovation capabilities, as well as the interplay among these in the prediction of service innovation have not been scrutinized in the context of B2B SMEs in a developing country. This study aims to fill this gap by testing a model that shows the relationships among complementarity of knowledge and capabilities as operant resources, joint innovation capabilities, and service innovation. We derive hypotheses about these relationships and test them using data from a sample of 302 respondents from 151 firms operating in the UAE. The results show that the relationships between complementarity of knowledge and joint innovation capabilities, and between joint innovation capabilities and service innovation, are significant and positive. They also show that the mediation effect of joint innovation capabilities on the relationship between complementarity of knowledge and service innovation is positive and full. This study also tests the moderating roles of competitive intensity and demand uncertainty in the relationship between joint innovative capabilities and service innovation and finds that their connection is stronger when competitive intensity is high.

1. Introduction

According to a report published by Deloitte in July 2018,[1] the average contribution to GDP and value added from services has increased not only in high-income countries (where value added accounted for 74% of GDP in 2015, up from 69% in 1997), but also in low- and middle-income countries (57% in 2015, up from 48% in 1997). In this growing sector, the approach taken by enterprises to the nature and process of innovation has changed dramatically in the past decade (Lusch & Nambisan, 2015). Firms no longer rely on their internal resources but use the joint action of a network of actors ranging from suppliers and distributors to customers and collaborators (Chesbrough, 2003). The literature accentuates the importance of developing collaborative competencies (Zacharia, Nix, & Lusch, 2011), such as joint innovation capabilities in service innovation (Baker,

Grinstein, & Harmancioglu, 2016) and in company performance in general (Ordanini & Parasuraman, 2011). From the resource-based view (RBV), the value of inter-firm collaboration comes about when two companies hold asymmetric management productivities in relation to the ownership of a resource (Ndubisi, Ehret, & Wirtz, 2016). Relational governance mechanisms empower both parties to unlock the value propositions of collaboration, such as joint learning and value co-creation.

According to the RBV, a firm consists of a persistent bundle of resources (Amit & Schoemaker, 1993) that either augment or impede firm-level performance (Wernerfelt, 1989). Accordingly, the accumulation and development of valuable, rare, inimitable, and non-sustainable (VRIN) resources is the foundation of both economic rent and competitiveness (Lin & Wu, 2014; Peteraf, 1993). In line with Terziovski (2010), who demonstrated how small and medium

* Corresponding author at: College of Business & Economics, United Arab Emirates University, PO Box 15551, Al Ain, United Arab Emirates
E-mail addresses: olynel@hotmail.com (N.O. Ndubisi), mdayan@uaeu.ac.ae (M. Dayan), vyeniaras@aus.edu (V. Yeniaras), malhawari@sharjah.ac.ae (M. Al-hawari).

[1] https://www2.deloitte.com/insights/us/en/economy/issues-by-the-numbers/trade-in-services-economy-growth.html (accessed 12.04.2018).
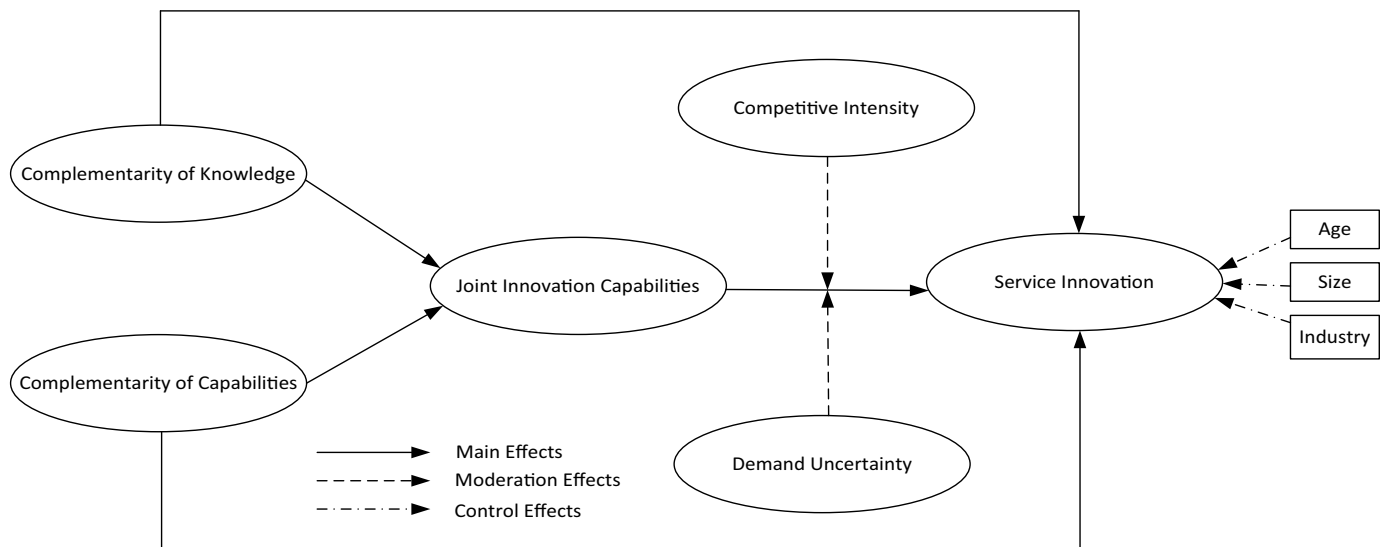
Fig. 1. Conceptual framework.

enterprises are similar in this respect to larger firms, the accumulation of VRIN resources has become essential to both academic and strategic thinking (Lin & Wu, 2014). Rumelt (1984) puts forward the argument that intra-industry differences in firm performance levels exceed inter-industry differences, and suggests that the explanation lies not in industry effects but in variations in the bundles of resources possessed by firms.

The goods-centered view of marketing focuses on physical operand resources, such as raw materials and physical products (Edvardsson, Tronvoll, & Gruber, 2011). Alternatively, the service-dominant (S-D) view implies that firms endeavor to make better value propositions than their competitors via an uninterrupted succession of social and economic processes, for which they depend on operant resources (Vargo & Lusch, 2004). Operant resources encapsulate people's knowledge, skills, expertise, capacity, and time, and in the context of S-D logic, relate to both parties in the co-creation of value (Hilton & Hughes, 2008). Operant resources, unlike operand resources, are dynamic and infinite, and they facilitate a firm's efforts to achieve effective production or an offering for specific market segments (Madhavaram & Hunt, 2008).

Although VRIN resources are important to firms in obtaining and sustaining a competitive advantage, capabilities are what link resources to company performance (Day, 1994; Ozsomer & Gencturk, 2003). Amit and Schoemaker (1993) and Teece, Pisano, and Shuen (1997) propose that firms should be able to reallocate, acquire, abandon, and configure their resources to remain competitive in dynamic markets; in highly competitive markets, resources are difficult to obtain (Dagnino & Smith, 2010; D'Aveni, 1994). The literature puts forward absorptive (Cohen & Levinthal, 1990) and combinative capabilities (Kogut & Zander, 1992; to these can be added dynamic capabilities, which relate to organizational and strategic procedures through which firms can reconfigure new resource combinations (Amit & Schoemaker, 1993; Teece et al., 1997). Accordingly, dynamic capabilities help management obtain and sustain a competitive advantage under turbulent market conditions (Eisenhardt & Martin, 2000).

Innovation is the basis of a firm's survival (e.g., Damanpour & Evan, 1984; Hurley & Hult, 1998), and possessing innovation-based capabilities allows firms to strive without interruption toward superior market offerings to retain and/or increase their existing customer bases (Kim & Mauborgne, 1999). Specifically, innovation capability allows an organization to achieve superior innovation performance through a learning-by-doing effect (Cavusgil, Calantone, & Zhao, 2003) that is very difficult for competitors to buy or imitate. Although the use of operand resources in the form of R&D investments may enhance

organizational innovation capabilities (e.g., Choi, Zahra, Yoshikawa, & Han, 2015; Fabrizio & Tsolmon, 2014; Prahalad & Hamel, 1990), heavy R&D investments are not only costly but also inefficient (Oh, 2018) because of the finite and static nature of operand resources.

The growing role of innovation-based competition is forcing contemporary organizations to concentrate on their use of external resources and partnerships to create superior value (Baker et al., 2016). Although firm-level innovation outcomes have been found to be positively related to the strength of business ties (Brown & Eisenhardt, 1995; Ren, Eisingerich, & Tsai, 2015), strong inter-firm relationships may also harm a firm's innovation outcomes, possibly hindering firm performance (Zhou, Zhang, Sheng, Xie, & Bao, 2014), lowering exploratory innovation behavior (Yeniaras & Unver, 2016), increasing organizational inertia, and decreasing knowledge acquisition (Zhou et al., 2014). This harm is due to the strength of the inter-firm collaborations causing a form of blindness that restricts inter-firm knowledge exchange and information flow and increases the risk of opportunism (Zhou et al., 2014).

Firms participate in inter-firm collaborations of processes that substitute or are supplementary to R&D, not only to benefit from inter-firm synergies (Kim, Chiou, & Calantone, 2018), but also to minimize the cost of creating distribution channels, transportation systems, and other vertical supporting activities (Harrigan, 1998) and the risk of opportunistic behavior on the part of the collaborating party (Jean, Kim, Chiou, & Calantone, 2018). Joint learning differs from absorptive learning in inter-firm relationships. In absorptive learning, collaborating parties compete against each other in a race to exploit knowledge and explain benefits. Nevertheless, in joint learning, the mutual aim is the co-creation of value and benefits for both collaborating parties (Fang & Zou, 2010; Jean et al., 2018). Accordingly, we conceptualize joint learning as a dynamic capability that is obtained through relational investments, structures, and capital (Heimeriks, Duysters, & Vanhaverbeke, 2007; Kohtamäki, Vesalainen, Henneberg, Naudé, & Ventresca, 2012). In that respect, we believe that joint learning, namely joint innovation capabilities, depends not only on the strength of the relationship but also on its quality. In this study, we put forward the complementarity of both knowledge and capabilities as operant resources that develop a firm's joint innovation capabilities. We also argue that joint innovation capabilities create superior service innovation, even under conditions of competition and demand uncertainty (Fig. 1).

The model was tested using data collected from over 300 managers in enterprises located in the United Arab Emirates (UAE). The UAE has

become the home or key market to many of the world's most dynamic enterprises, leading to unprecedented growth in services and innovations. Because of its status as the most progressive market in the entire Middle East and North Africa region, the UAE has attracted substantial foreign investments from both international and regional sources, and has consequently transformed into a hub or model for inter-firm partnerships and collaborations. These features make it an appropriate context for testing this study's service innovation model.

The remainder of the paper is structured as follows. We first review the extant literature and develop our hypotheses, drawing upon the relevant literature on RBV. We then set out the research methodology and present the results of the empirical analyses. The study concludes with a discussion of our findings and their implications, the limitations of the study, and directions for future research.

2. Theory and hypothesis development

The past decade of research has shown us that the nature and process of innovation no longer relate solely to the economic rent that is created within the confines of an organization (Lusch & Nambisan, 2015). Rather, the conventional view is that innovation depends on the economic rent created within a network of actors that range from suppliers and partners to market collaborators and customers (Barney, 1991; Nambisan & Sawhney, 2007). Accordingly, the approach evolved toward a value/experience focus in which value is co-created via the resource, capability sharing (Prahalad & Ramaswamy, 2004). The dominant mental model of prior research—or goods-dominant logic—has emphasized the specialization of labor, control, and efficiency in manufacturing standardized goods, and the logistics aspects of business—hence, a very confined approach (Vargo & Lusch, 2008). Subsequent to goods-dominant logic, building on the value/experience focus, the service-dominant logic perspective proposed a framework in which the primary function of the firm is not viewed as the production of value (tangible or intangible) but rather the "exchange of service that occurs by one actor using its skills and capabilities for the benefit of another actor" (Lusch & Nambisan, 2015, p. 156).

Service-dominant logic broadens the conceptualization of services, as well as resources. A goods-dominant approach, however, initially viewed resources within the confines of mostly tangible or natural characteristics that are either fixed or limited in supply. In service-dominant logic, resources are conceptualized as any internal or external factors that organizations may rely on for support in value creation, making resources both dynamic and limitless (Constantin & Lusch, 1994). The dynamic and limitless form of resources (i.e., operant resources) in the service-dominant logic, different from operand resources, allows for a more sustained competitive advantage due to its dynamic nature, which is difficult to transfer or imitate (Lusch & Nambisan, 2015). Accordingly, initial attempts were made to show how the socially complex relational mechanisms (Barney, 1991) may play a role in explaining both innovation outcomes and firm performance in general (Zacharia et al., 2011). In the same vein, the previous literature provides empirical evidence on the value creation effect of relational mechanisms (e.g., Hagedoorn & Frankort, 2008; Sheng, Zhou, & Li, 2011). Operant resources, which act on other resources to produce outcomes (Vargo & Lusch, 2004), relate heavily to relational mechanisms that provide a basis for joint capabilities in buyer–supplier relationships (e.g., Charterina, Basterretxea, & Landeta, 2016).

In this study, following the extant literature, we conceptualize the complementary of resource and capability endowments of a buyer–supplier relationship as operant resources, which produce both joint innovation (dynamic) capabilities and service innovation. Dynamic capabilities are future-oriented processes that provide a sustained competitive advantage (Teece, 2011). The development of dynamic capabilities, which are heterogeneously distributed across firms, incurs high cognitive, managerial, and operational costs (Ambrosini & Bowman, 2009). Nevertheless, we suggest that the complementary

resource and capability endowments acquired through buyer–supplier relationships may facilitate the development of joint innovation capabilities, which translate into service innovation. Although we provide theoretical justifications for these hypotheses drawing simultaneously from RBV and dynamic capability perspectives, we suggest that joint innovation links intangible operant resources (i.e., complementarity of resources and capabilities), as dynamic capabilities establish competitiveness (e.g., service innovation) through reconfiguring resources that are available to the firm (Teece, 2011).

2.1. Relationship between operant resources and joint innovation capabilities

Joint learning refers to the aptitude of collaborators (e.g., in supplier–customer relationships) to cultivate relationship-specific organizational infrastructures and communication channels. In joint learning, these infrastructures and communication channels are used to integrate partners' knowledge, and to co-create and institutionalize a new knowledge base that is specific to the relationship (Fang & Zou, 2010). Joint learning helps translate inter-firm ties into better outcomes by overcoming inertia and reducing the exploitation of knowledge and benefits in the collaboration (Jean et al., 2018). Joint learning can do this because it requires a firm to exchange a variety of knowledge resources with its collaborators to exploit complementarities (Grant & Baden-Fuller, 2004). Consequently, in taking advantage of complementarities, joint learning generates new inter-firm knowledge sets through the integration of knowledge and capabilities (Fang & Zou, 2010; Selnes & Sallis, 2003). Through this exchange relationship obtained by the complementarity of knowledge and capabilities, the parties improve and extend their current innovation knowledge, skills, and processes, and use their knowledge to its full capacity, thus generating more original, innovative ideas (e.g., Jean et al., 2018).

In the literature pertinent to buyer–supplier ties, researchers also emphasize the importance of embedded ties and relate them to enhanced innovation outcomes for partners (e.g., Charterina & Landeta, 2010; Uzzi & Lancaster, 2003), as well as the development of joint learning capabilities (e.g., Charterina et al., 2016). In such relationships, the collaborating parties enjoy the joint use of distinctive and scarce resources provided by each partner, which creates a synergetic effect. In turn, this effect potentially generates greater output than either party could obtain individually (Dyer & Singh, 1998). Nevertheless, for this synergetic effect to occur and translate into joint learning capabilities, complementarities of capabilities and resources are prerequisites (e.g., Charterina et al., 2016; Hamel, Doz, & Prahalad, 1989; Jap, 1999).

A single agent may not always be capable of acquiring all the resources and capabilities that are required to innovate and achieve enhanced performance. The literature conceptualizes both complementarity of capabilities and resources as operant resources (e.g., Charterina et al., 2016; Chung, Singh, & Lee, 2000). In such collaborative exchanges, buyers can obtain additional specialized resources and capabilities that they may not have access to through their suppliers. Because complementarities of capabilities and resources require integration to offer effective solutions, both the supplier and buyer are motivated to communicate regularly to acquire and exploit the right resources (Tushman & Nadler, 1978). Each party also perceives the other as an integral part of current projects, and this helps reduce interferences among co-dependent tasks in which complementarities are ensured (Srikanth & Puranam, 2011). Finally, complementarities trigger commitment and a common understanding between parties, which motivates them to devote more effort to joint tasks (Somech, Desivilya, & Lidogoster, 2009). Accordingly, we hypothesize the following:

H1. : Complementarity of (a) knowledge and (b) capabilities are positively related to joint innovation capabilities.

2.2. Relationship between joint innovation capability and service innovation

Service innovation is a series of activities that improve business operations and services and generates new value propositions. Ranging from the business model, technology, and demand to social-organizational innovation (Chen, Tsou, & Ching, 2011; Mention, 2011), it is essential to a firm's survival. Service innovation leads to the development of new processes, technologies, products, and services that meet market preferences. Previous studies indicate that service innovation can help organizations tap into market trends, and consequently contributes to enhanced company performance (Mention, 2011; Thakur & Hale, 2013; Vladimirov & Williams, 2018; Weissenberger-Eibl & Koch, 2007).

Service innovation has been a focus of interest not only in the marketing domain but also in the information systems, operations, and strategy domains (Lusch & Nambisan, 2015; Mennens, Van Gils, Odekerken-Schröder, & Letterie, 2018; Vladimirov & Williams, 2018). Although the literature points toward a positive relationship between inter-firm collaboration and service innovation (e.g., Kobarg, Stumpf-Wollersheim, & Welpe, 2018; Najafi-Tavani, Najafi-Tavani, Naudé, Oghazi, & Zeynaloo, 2018), there is limited empirical evidence on the extent to which collaborative relationships influence service innovation directly. The literature chiefly assumes that positive collaboration augments service innovation practices because suppliers' inputs promote co-production activities and help businesses collaborate more effectively in the process of developing new products and services.

The RBV posits that a firm delivers value by conjoining and exchanging resources with a partner (Penrose, 1959). Service innovation is a partnership process that cannot be implemented on discrete organizational merits alone (Kobarg et al., 2018; Najafi-Tavani et al., 2018). The RBV is based on the assumption that a firm operating in isolation does not have access to all the capabilities and resources required to create a product or service. This may result in an inability to create innovative products or services internally, or to acquire external resources and capabilities that may be available through collaborations (Chen et al., 2011); that is, the emphasis is on joint value creation and inter-firm joint exploitation of resources between the service provider and suppliers (Chen et al., 2011). Service production requires collaborating parties to share resources, such as information, knowledge, and expertise, with a service provider as a means of accelerating the process by which value is co-created (Kobarg et al., 2018; Najafi-Tavani et al., 2018).

Joint innovation has been common practice within many service-based firms for quite some time (Baker et al., 2016; Tether, 2002). In joint innovation, organizations establish relationships with one another to take a joint, synergetic approach to the creation of value through innovative practices and by merging technologies, knowledge, and other resources beyond each firm's individual means (Smirnova, Rebiazina, & Khomich, 2017). The growing role of innovation-based competition is motivating contemporary organizations to increase their use of external resources and partnerships (Baker et al., 2016). During this process, organizations participate in joint innovation activities as substitute or appendage processes to research and development (Kim et al., 2018). This engagement is driven by the expectation that activities of this nature allow firms to access distinct benefits by tapping into the synergies that are possible through knowledge exchange and cross-organization learning (Kim et al., 2018).

Through joint innovation, businesses can recognize and anticipate market needs before their competitors, and bridge their capabilities and the external environment to mold distinct capabilities and foster sustainable competitive advantages (Tsai & Yang, 2013; Wang, Dou, Zhu, & Zhou, 2015). As such, collaborative innovation can generate more advanced market knowledge, which, in turn, is known to be a key resource that can help businesses to respond better to market requirements and fuel profitable growth. Collaborative innovation represents a mechanism by which organizations can gain insights from customers

and competitors to develop a better understanding of how they can deliver value to their target market. Accordingly, we hypothesize the following:

H2. : Joint innovation capabilities have a positive effect on service innovation.

As discussed earlier, through the process of joint innovation, firms are in a stronger position to recognize and forecast the market needs and trends before their direct rivals. Thus, firms can better match their capabilities with external environment requirements and foster a sustainable competitive advantage. However, a sustainable competitive advantage relies on the relative influence of the market forces that the organization experiences (Porter, 1980). Consistent with the work of Zhou, Yim, and Tse (2005), we break the market forces into two categories—demand uncertainty and competitive intensity—because they reflect the customers and competition, respectively, in the market. Despite previous works noting their impact on organizational performance (e.g., Andrevski, Richard, Shaw, & Ferrier, 2014; Chu, Xu, Lai, & Collins, 2018; Hançerlioğulları, Şen, & Aktunç, 2016), empirical research on how these forces interfere between joint innovation capabilities and service innovation is scarce in the literature. We extend the current research and study how these market forces trigger service firms' innovation performance. The following two parts explain in detail how each of the proposed market forces determines the relationship between joint innovation capabilities and service innovation.

2.3. Moderating role of competitive intensity between joint innovation capabilities and service innovation

Organizations are open systems that may be vulnerable to and affected by their external environments (e.g., Scott & Davis, 2007). Competitive intensity, a factor that adds to environmental hostility (Dess & Beard, 1984; Zahra & Covin, 1995), is the strength of competition in relation to the number of firms operating in a given market and its growth potential (Feng, Huang, & Avgerinos, 2018; Martin & Javalgi, 2016). Competitive intensity is characterized by aggressive price wars, cutthroat rivalry, substantial advertising expenditures, and many competing product offerings (Jaworski & Kohli, 1993). Consequently, the result of a firm's behavior "will no longer be deterministic but stochastic as the behavior is heavily influenced by the actions and contingencies undertaken by competitors" (Auh & Menguc, 2005, p. 1654). Nevertheless, such environments are often associated with an opportunity for firms to expand their market share and achieve superior profits (Andrevski et al., 2014).

When competition is extremely intense, organizations typically turn their attention to differentiation strategies through which they can use their competencies, including joint innovation capabilities, to invest in R&D and service innovation. In such operating environments, organizations progressively rely on joint innovation activities to achieve higher service innovation performance. Joint learning ensures access to external market knowledge and the detection and examination of market development trends, thereby helping organizations meet consumer needs and expectations more effectively (Wang et al., 2015). Firms that actively pursue innovation recognize the importance of external market factors, such as changing customer needs and competitors' management and marketing strategies. Previous studies have found that joint innovation capabilities generate novel insights into an organization's service offerings, processes, and products, resulting in improved alignment with customer and market needs and opportunities (Kim et al., 2018; Wang et al., 2015). Although competitively intense environments are characterized by cutthroat rivalry and price/promotion wars, firms with stronger joint innovation capabilities have better access to market information, external resources, and suppliers' innovation capabilities to deal with such conditions. Accordingly, we hypothesize the following:

H3. : Competitive intensity positively moderates the relation between joint innovation capabilities and service innovation.

2.4. Moderating role of demand uncertainty between joint innovation capabilities and service innovation

"Demand uncertainty" denotes a market environment in which customer requirements and needs are dynamic and unpredictable. In such environments, and where there are fluctuations in demand, firms struggle to predict changing market and customer preferences (Achrol & Stern, 1988). In these markets, organizations must modify their services or products in alignment with varying customer preferences (Chu et al., 2018; Hançerlioğulları et al., 2016). Accordingly, when firms experience demand uncertainty, access to market and technological knowledge to identify and create innovation opportunities becomes critical (Liu & Atuahene-Gima, 2018); that is, in this situation, firms strongly feel the need for new market knowledge regarding customer presences and industry trends.

Under demand uncertainty, customers' needs and preferences change unpredictably. In addition, the competitive landscape is erratic, and dynamic changes in product and production technologies are observed (Chu et al., 2018; Hançerlioğulları et al., 2016). When demand is uncertain, organizations may find it difficult to update their market knowledge through an isolated strategy. An environment with high demand uncertainty thus necessitates effective joint learning processes to trigger innovation outcomes (Roy, Sivakumar, & Wilkinson, 2004). The literature suggests that joint learning with suppliers plays a particularly important role in high demand-uncertainty markets for service-based firms. By collaborating with suppliers, firms may acquire timely market information before their competitors, giving them an advantage in responding more quickly to changes in market and customer requirements and expectations (Auh & Menguc, 2005; Khan, Rao-Nicholson, & Tarba, 2018; Yan & Guan, 2018). As a result, service-based firms that exhibit well-developed joint learning are more likely to bridge changing industry trends and customer presences with service innovations. Accordingly, we hypothesize the following:

H4. : Demand uncertainty positively moderates the relationship between joint innovation capabilities and service innovation.

2.5. The mediating role of joint innovation capabilities between complementarities and service innovation

The resource-based view (RBV) model is used in our study to explain how the complementarities of knowledge and capabilities influence a firm's service innovation. The RBV sees firms as a bundle of recourses and capabilities (Amit & Schoemaker, 1993). Researchers indicate that the interaction between the different resources leads to viable capabilities and benefits (Porter, 1996). These resources and capabilities shape an organization's competitive advantage and performance. The RBV model can help firms gain an innovation advantage by enhancing their knowledge about the types of resources and capabilities that are essential in driving service innovation performance. The model can also show organizations how to maintain and foster the capabilities and resources that are important in an organization's innovation competency (Lee & Wong, 2009). Our study incorporates the influence of complementarity of knowledge and capability resources on a firm's innovative behavior via joint innovation capabilities.

Current studies have indicated that service innovation cannot be enhanced directly by complementarity resources (Wong & He, 2003). In return, resources can be converted into service innovation through joint innovation capabilities (Lin & Wu, 2014). Thus, a firm's joint innovation capabilities act as mediators between complementarity resources and its innovative performance. Complementarities with suppliers provide firms with the knowledge and competence to undertake collaborations.

Such a collaboration enhances a firm's joint innovation capabilities, which, in turn, enhances innovation performance. The two complementarity resources in our proposed model increase a firm's ability to cooperate with external partners in the service innovation process (Somech et al., 2009). Joint innovation capabilities are essential inputs in an organization's innovation developments because they permit the exchange of information and knowledge among collaborative partners (Charterina & Landeta, 2010; Uzzi & Lancaster, 2003). An organization can, therefore, improve its service innovation simply through learning from its partners. In line with this view, Chen et al. (2011) argue that an organization better utilizes resources, learns skills, and obtains knowledge through working with its partners. Following this line of reasoning, this study proposes the following hypothesis.

H5. : Joint innovation capabilities positively mediate the relation of (a) complementarity of knowledge to service innovation and (b) complementarity of capabilities to service innovation.

3. Research methods

3.1. Sample population

To test the web of relationships presented in Fig. 1, a total of 216 firms were selected and contacted. This initial screening resulted in 195 firms opting to join this study. We collected a total of 302 respondents from 151 enterprises located in the Abu Dhabi, Dubai, and Sharjah emirates of the UAE. The participating companies vary in size from 2 to 5000 full-time employees, with an average number of 121 employees. Of the 151 firms, 24 operate in the manufacturing industry (16%), 42 in the service industry (28%), 78 in retail (52%), and 6 in other industries (4%). The average firm age was 11.75 years; the youngest firm was only a year old, and the oldest had been in operation for 33.4 years.

To determine whether the respondents belonged to our target group, they were first contacted by phone. Next, the survey instruments (two sets of questionnaires) were provided to each business. The same survey instrument was used with both the general manager and a senior logistics manager employed within an enterprise. We collected data from both these categories of respondents to circumvent the problems commonly associated with single-source bias (e.g., Dayan, Zacca, Husain, Di Benedetto, & Ryan, 2016; Zacca, Dayan, & Ahrens, 2015). Complementarity of knowledge/capabilities and joint innovation capabilities were measured using data from the logistic managers, as they were expected to provide more objective and reliable information on these variables. Service innovation, competitive intensity, and dynamic demand were measured using responses from the general managers, as they are more likely than logistic managers to have a macro perspective (Genc, Dayan, & Genc, 2019). A native Arabic speaker who is also fluent in English translated the survey instruments from English to Arabic, and a different bilingual speaker translated the survey back into English. The research team and translators then made the necessary changes in line with Dayan et al.'s study (2016).

Prior to data collection, we conducted a series of pretests. Twelve senior managers selected at random assessed the content and meaningfulness of the items. Subsequently, we contacted four academics from related disciplines to comment on the usability of the scale items, and we revised the questionnaires accordingly. These procedures were carried out to ensure the clarity and accuracy of the instruments (Dayan, Zacca, & Di Benedetto, 2013; Zacca et al., 2015).

3.2. Measures

Complementary competencies are defined as "the degree to which the firms are able to fill out, or complete, each other's performance by supplying distinct capabilities, knowledge, and resources" (Jap, 1999, p. 465). We conceptualize complementarity of capabilities as the degree to which the acquirer and the supplier firm complement each other by

bringing distinct capabilities to the relationship (Jap, 1999), and we capture it using a five-point Likert-type scale (1 = strongly disagree and 5 = strongly agree) and Jap's (1999) three items ("We have both contributed different capabilities to the relationship"; "We have used complementary strengths that have been useful to the relationship"; "We have combined our separate abilities that have enabled us to achieve goals we could not otherwise"). Subscribing to the approach of Jap (1999) and Junni, Sarala, Tarba, and Weber (2015), we conceptualize complementarity of knowledge as the level of interconnectedness between the knowledge bases of the acquirer and the supplier. To that end, we used a five-point Likert-type scale (1 = strongly disagree and 5 = strongly agree) and three items ("We have both contributed different knowledge to the relationship"; "We have used complementary knowledge that has been useful to the relationship"; "We have combined our separate knowledge that has enabled us to achieve goals we could not otherwise").

We conceptualized joint innovation capability as a firm's ability to develop product, process, or service innovations jointly with a supplier, collaboratively engaging in value creation through merging technologies, knowledge, and other resources that are outside of a firm's individual resources (Smirnova et al., 2017). To operationalize and measure the joint innovation capabilities of collaborating firms, we used a five-point Likert-type scale (1 = strongly disagree and 5 = strongly agree) and Martin and Grbac's (2003) four items ("The firm has the ability to engage in joint development of new services with its suppliers"; "The firm has the ability to engage in joint development of new service concepts with its suppliers"; "The firm has the ability to adopt new technology with its suppliers to cater for its customers' new demands"; "The firm has the ability to engage in rapid prototype testing with its suppliers for its customers").

Competitive intensity refers to the strength of the competition in relation to the saturation levels and growth potential of a market (e.g., Feng et al., 2018). As discussed later, we believe that competitive intensity increases the relation of joint innovation capabilities to service innovations. To examine this effect, and following previous studies (e.g., Auh & Menguc, 2005; Yeniaras & Unver, 2016), we measured competitive intensity using a five-point Likert-type scale and five items adopted from Jaworski and Kohli's (1993) study ("Competition in our industry is cutthroat"; "There are many promotion wars in our industry"; "Anything that one competitor can offer, others can match easily"; "Price competition is a hallmark of our industry"; "One hears of a new competitive move almost every day").

Demand uncertainty refers to the unstable, unpredictable, and fast-changing nature of a firm's customer preferences and expectations. The unpredictable nature of customer demand drives firms to offer a more diverse and innovative set of products and services. This may be very difficult to sustain, given the limited nature of a firm's internal resources and capabilities. In this study, we hypothesize a positive moderation effect of demand uncertainty on the relation of joint innovation capabilities to service innovation; that is, we hypothesize that the synergetic effect of an innovation collaboration between an acquirer and supplier may overcome the hindering effects of adverse market conditions. We measure demand uncertainty using a five-point Likert scale and six items adopted from Jaworski and Kohli's (1993) study ("In our kind of business, customers' product preferences change quite a bit over time"; "Our customers tend to look for new products all the time"; "New customers tend to have product-related needs that are different from those of our existing customers"; "Sometimes our customers are very price-sensitive, but on other occasions, price is relatively unimportant"; "We are witnessing demand for our products and services from customers who never bought them before"; "We cater to many of the same customers that we used to in the past").

Subscribing to the approach of Berry, Wall, and Carbone (2006) and Dotzel, Shankar, and Berry (2013), we define service innovation as a new or improved intangible offering that involves the firm's performance of a task/activity targeted to benefit customers. The service innovation measure refers to the degree to which a firm is engaged in expanding into new market services, new company services, new delivery processes, service modifications, service line extensions, and service repositioning (Avlonitis, Papastathopoulou, & Gounaris, 2001). To measure service innovation, we used a five-point Likert-type scale (1 = strongly disagree and 5 = strongly agree) and seven items ("Developed brand new services"; "Improved existing services and promoted the services"; "Repackaged existing services and promoted the services"; "Jointly provided support for our services with other firms"; "Extended existing service lines and promoted the services"; "Introduced new services that competitors do not offer in the market"; "Tried to reduce the risks of failure of new service development"). All measurement items are listed in Appendix A.

3.3. Control variables

We used control variables (firm size, firm age, and industry effects) to partial out the effects of correlates of joint learning and service innovation. Following the literature, which identifies a relation between a firm's age, adaptive capabilities, and service innovation (e.g., Jiménez-Jiménez & Sanz-Valle, 2011; Sorensen & Stuart, 2000), the dependent variables (joint innovation capabilities and service innovation) were controlled for firm age, which was calculated by taking its natural logarithm. To partial out the effect of the economies and diseconomies of scale (Bain, 1968), we controlled the dependent variables for firm size, operationalized as the natural logarithm of total assets. We also controlled for industry effects (different market conditions at a given time) (Lee, 2006). To account for industry affiliation and partial out its possible effects, we asked the respondents to state their main industry of operation. Finally, we controlled the dependent variables for negative affectivity bias (Watson, Clark, & Tellegen, 1988), which does not have a theoretical relation to any of the variables used in our study, to minimize the common method bias effect. The items for the scale of negative affectivity (1 = strongly disagree and 5 = strongly agree) are as follows: "Minor setbacks tend to irritate me too much"; "I often get irritated at little annoyances"; and "There are days when I am 'on edge' all of the time" (Yannopoulos, Auh, & Menguc, 2012). Following Flynn, Pagell, and Fugate (2018), with the inclusion of the negative affectivity bias scale as a control variable, we attempt to minimize the common method bias concerns.

3.4. Methods

Smart-PLS version 3.2.6 (Ringle, Wende, & Becker, 2015), a variance-based structural equation modeling (PLS-SEM) technique, was used to test the measurement and research models (Hair, Sarstedt, Ringle, & Mena, 2012). There are two commonly accepted justifications for using this technique instead of covariance-based structural equation modeling (Hair et al., 2012), and both reasons apply in this study. First, because of the relatively small sample size, and in accordance with suggestions in recent B2B marketing studies with similar sample sizes (e.g., Mohan, Brown, Sichtmann, & Schoefer, 2018; Zhang & Hartley, 2018), PLS-SEM was preferred on the grounds that it can estimate complex predictive models with greater parameter accuracy and power when the sample size is small. Second, PLS-SEM is an ideal technique for theory development and exploratory research. The focus of our study is on predicting the potential effects of complementarity of knowledge and capabilities on service innovation through joint innovation capabilities in a highly competitive and uncertain context; PLS-SEM is well suited to this purpose because it exploits the explanation of variance in the dependent variable of service innovation (Hair, Hult, Ringle, & Sarstedt, 2013).

This study evaluated two aspects of the research model: the outer model (measurement model) and the inner model (structural model) (Hair et al., 2013). We then applied the resampling procedure of bootstrapping to 2000 resamples (Hair et al., 2013).

Table 1
Outer loadings, reliability, and convergent validity.

	Outer loadings	Composite reliability	AVE	Cronbach's alpha
CompKnow1-CompKnow	0.852	0.906	0.763	0.844
CompKnow2-CompKnow	0.930			
CompKnow3-CompKnow	0.835			
CompCap1-CompCap	0.876	0.924	0.803	0.878
CompCap2-CompCap	0.911			
CompCap3-CompCap	0.901			
JointInnCap1-JointInnCap	0.893	0.916	0.784	0.862
JointInnCap2-JointInnCap	0.903			
JointInnCap3-JointInnCap	0.861			
ServInn1-ServInn	0.805	0.899	0.597	0.865
ServInn2-ServInn	0.819			
ServInn3-ServInn	0.775			
ServInn4-ServInn	0.769			
ServInn5-ServInn	0.743			
ServInn6-ServInn	0.721			

Note: CompCap-Complementarity of Knowledge;
CompCamp-Complementarity of Capabilities;
ServInn-Service Innovation.

4. Results

4.1. Measurement model

Initially, following the recommendation of Bagozzi and Yi (1988), the unidimensionality, validity, and reliability of the measurement scales were tested. Cronbach's alpha, t-values, composite reliability, outer loadings, and average variance extracted (AVE) were all at acceptable levels for reliability and convergent validity of the scales (Table 1). For all constructs, the items loaded significantly as expected, with all loadings above 0.70 (Hulland, 1999). The composite reliabilities of each item were above 0.70 (Gefen & Straub, 2005), and the AVEs of the constructs exceeded the threshold value of 0.50 (Table 1). Consequently, all the constructs possess convergent validity.

Two criteria were used to assess discriminant validity. First, the AVE for each latent variable must be higher than the squared correlation between it and the other latent variables (Table 2) (Henseler, Ringle, & Sinkovics, 2009). Second, the heterotrait–monotrait (HTMT) criterion was required to show values below the liberal threshold of 0.90 (Henseler, Ringle, & Sarstedt, 2015, p. 121), which was not found for any pair. Thus, discriminant validity was confirmed according to both criteria.

4.2. Structural model

Table 2 shows the means, standard deviations, variance inflation factor values (VIFs), and correlations between variables. There are two indications that there is no multicollinearity in this study. First, the absolute value of each correlation is <0.7 (Dormann et al., 2013); second, all the VIF values are <2.5 (Allison, 1999).

Table 3 and Fig. 2 show the results of the hypothesis testing. The relationship between complementarity of knowledge and joint innovation capabilities was statistically significant ($\beta = 0.337$, $p < .01$), but the relationship between complementarity of capabilities and joint innovation capabilities was not significant ($\beta = 0.059$, $p > .05$). Thus, H1a is supported, but H1b is not supported. The results show that joint innovation capabilities were significantly positively related to service innovation ($\beta = 0.582$, $p < .01$), which supports H2.

The results (Fig. 2) show that none of the control variables had a significant impact on service innovation ($\beta = 0.014$, $p > .05$; $\beta = -0.113$, $p > .05$; $\beta = 0.061$, $p > .05$ for firm age, firm size, and industry, respectively).

4.3. Moderation effect

To test the moderation effects of competitive intensity between joint innovation capabilities and service innovation, we split the data into two groups using the average median value, with one group consisting of firms operating under high competitive intensity (80 firms) and the other consisting of firms operating under low competitive intensity (71 firms). A regression analysis was repeated with each group, and the results are shown in Table 4. There was a significant relationship between joint innovation capabilities and service innovation when competitive intensity was high ($\beta = 0.17$, $p < .05$), but the relationship was non-significant when competitive intensity was low ($\beta = 0.02$, $p > .05$). Thus, H3, which proposed that joint innovation capabilities are more strongly related to service innovation when competitive intensity is high, was supported. The results of the multigroup analysis (Table 4) show that there was a significant difference between the two path coefficients (p < .05).

Table 2
Construct means, standard deviations, and correlations among latent constructs.

		1	2	3	4	5	6	7
	Mean	4.196	4.156	3.947	3.874	11.754	141.054	0.520
	SD	0.633	0.635	0.859	0.662	8.20	97.090	0.500
	VIF	1.626	1.489	1.176	–	1.31	1.323	1.032
1	Complementarity of Knowledge	**0.873**						
2	Complementarity of Capabilities	0.565	**0.896**					
3	Joint Innovation Capabilities	0.371	0.249	**0.886**				
4	Service Innovation	0.307	0.237	0.611	**0.773**			
5	Firm Age	0.013	0.028	0.083	0.019	–		
6	Firm Size	−0.049	0.054	0.074	−0.066	0.464	–	
7	Industry	0.020	0.033	0.033	0.093	0.104	−0.069	–

Bold numbers on the diagonal indicate the square root of the AVE.

Table 3
Results of analyses on hypothesized relationships.

Hypothesized association		Expected sign	Standardized coefficient	t-Value	p-Value	Status
H1a	Complementarity of knowledge → Joint Innovation capabilities	+	0.337	3.864	0.000	Supported
H1b	Complementarity of Capabilities → Joint Innovation Capabilities	+	0.059	0.596	0.276	Not Supported
H2	Joint Innovation Capabilities → Service Innovation	+	0.582	10.153	0.000	Supported
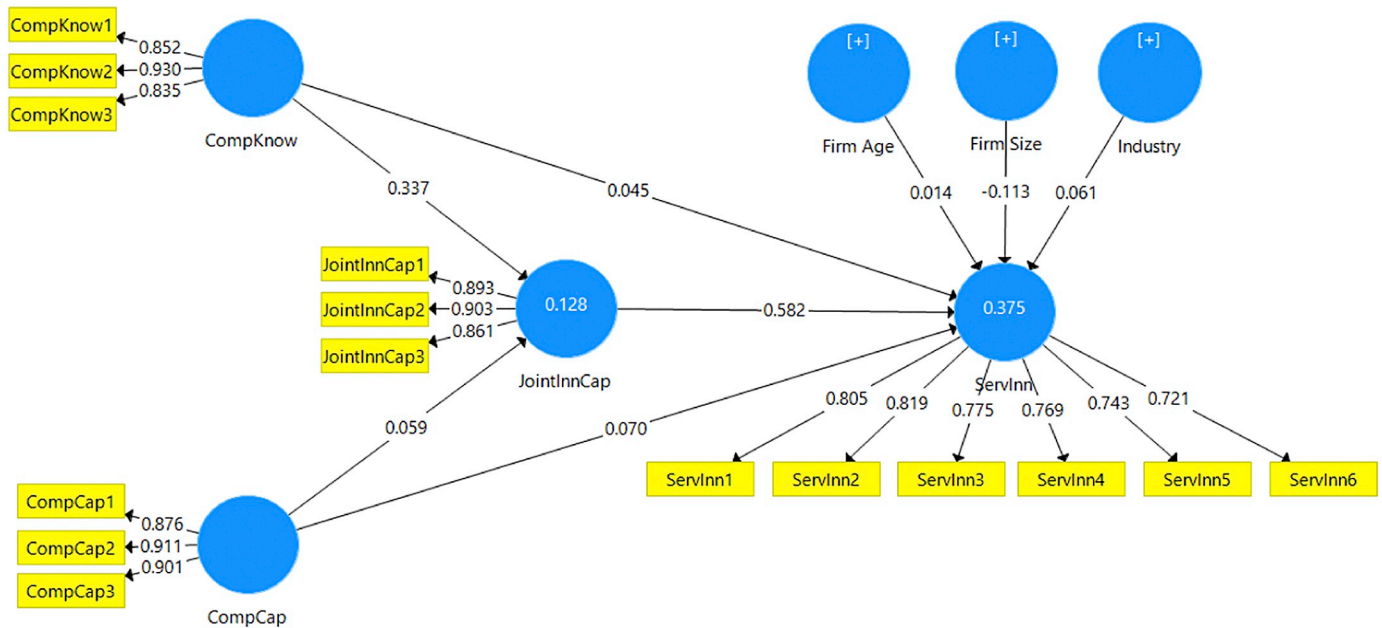
Fig. 2. Fig. 2: Structural paths model.
Note: CompKnow-Complementarity of Knowledge; CompCap-Complementarity of Capabilities; ServInn-Service Innovation.

The same approach was used to test the moderation effect of demand uncertainty on the relationship between joint innovation capabilities and service innovation. The results of the multigroup analysis (Table 4) show that there was no significant difference (p < .05) between the two path coefficients, high demand uncertainty (83 firms) and low demand uncertainty (68 firms). Thus, H4 is not supported, and this relationship was not modified by demand uncertainty.

4.4. Mediation effect

To assess the mediating effect of joint innovation capabilities, we followed the steps suggested by Preacher and Hayes (2008). First, the total effect and corresponding significant value of the impact of each independent variable (complementarity of knowledge, complementarity of capabilities) on service innovation was assessed (Table 5). If it was significant, the indirect effect (the impact of each independent variable on service innovation through joint innovation capabilities) was assessed (Table 6). Finally, the direct effect of each independent variable on service innovation was assessed to see if the mediation effect was full or partial.

Regarding the mediating effect of joint innovation capabilities on the complementarity of the relationship between knowledge and service innovation (H5a), the total effect of complementarity of knowledge on service innovation was positive and significant ($\beta = 0.241$, p < .01) (Table 5). The indirect effect of complementarity of knowledge on service innovation through joint innovation capabilities was also positive and significant ($\beta = 0.196$, p < .01) (Table 6). Thus, there was mediation, either full or partial, and the direct effect between complementarity of knowledge and service innovation was assessed. The path coefficient for the direct effect of complementarity of knowledge

on service innovation after the inclusion of the mediating variable was not found to be significant ($\beta = 0.045$, p > .10) (Fig. 1). These results show full mediation, thus supporting H5a.

Regarding the mediating effect of joint innovation capabilities on the complementarity of the relationship between capabilities and service innovation (H5b), the total effect of complementarity of capabilities on service innovation was not significant ($\beta = 0.104$, p > .10) (Table 5). Thus, it was concluded that there was no mediation, and H5b was rejected.

5. Discussion and implications

Our results, employing a data set of 302 managers from 151 firms, produced several contributions to the literature. First, we provide empirical evidence to suggest that neither complementarity of capabilities nor complementarity of knowledge is directly related to service innovativeness. Second, we show that buyer–supplier complementarity of knowledge positively relates to the joint innovation capabilities of firms. Third, we find a positive relationship between joint innovation capabilities and service innovation. Fourth, we provide evidence of a moderating effect of competitive intensity on the relation of joint innovation capabilities to service innovation. However, the results do not confirm the hypothesized moderating effect of dynamic demand on the relationship of joint innovation capabilities to service innovation.

This study contributes in several ways to the recent literature pertinent to the examination of the embedded ties in buyer–supplier relationships. First, adding to the findings of Charterina et al. (2016), we show that complementarity of knowledge contributes to the development of joint innovation capabilities. We suggest that this complementarity effect can help firms obtain collaborative advantages that

Table 4
Results of multigroup moderation analysis.

Hypothesis	High competitive intensity	Low competitive intensity	High demand uncertainty	Low demand uncertainty	t-Value	p-Value	Status
H3 Joint Innovation Capabilities → Service Innovation	0.17* (2.11)	–	–	–	2.11	0.043	Supported
H4 Joint Innovation Capabilities → Service Innovation	–	0.02	0.08	0.05	0.87	0.254	Not Supported

Note: N = 151.

** $P < .05$.

create a synergetic effect and translate into enhanced collaborative innovation, as suggested in the literature (Charterina & Landeta, 2010; Uzzi & Lancaster, 2003). However, in the present study, complementarity of capabilities was not found to be related to joint innovation capabilities. One possible explanation of this unexpected outcome is in line with the extant literature. Villena, Revilla, and Choi (2011) and Noordhoff, Kyriakopoulos, Moorman, Pauwels, and Dellaert (2011) suggest that buyer–supplier relationships have a dark side as well as a bright side. That is, although a complementarity may exist in capabilities possessed by both parties, problems may nevertheless arise, such as partner opportunism, lack of vertical integration, capability redundancy, or loss of objectivity.

Competitively intense environments are characterized by cutthroat rivalry, price/promotion wars, and a large number of competitive product/service offerings (Wang et al., 2015), making it difficult to meet customer needs. Nevertheless, joint innovation capabilities help firms recognize and anticipate market needs before their competitors, as they provide access to market information, external resources, and capabilities for dealing with such an environment. As hypothesized, we find that competitive intensity enhances the effect of joint innovation capabilities on service innovation. Demand uncertainty, however, does not moderate the relationship between joint innovation capabilities and service innovation. When demand uncertainty is high, joint innovation capabilities with suppliers do not influence service innovation. Under demand uncertainty, customers' needs and preferences change in an unpredictable manner (Chu et al., 2018; Hançerlioğulları et al., 2016), and the joint innovation capabilities of organizations may not be sufficient to identify a fast-paced change in demand. Therefore, reliance on joint innovation capabilities under dynamic demand may not necessarily translate into innovative services.

The conceptual framework and hypotheses indicated an indirect relation of complementarities of both knowledge and capabilities to service innovation through joint innovation capabilities. That is, we put forward the idea that joint innovation capabilities should account for the relation of complementarities on service innovation. Although we could not provide evidence of a direct relation of complementarity of knowledge to service innovation, our examination of the indirect relation of complementarities provides interesting results. We find that joint innovation capabilities explain the relation of complementarity of knowledge and service innovation, but do not account for the relation of complementarity of capabilities and service innovation. These results point toward an indirect-only mediation effect of complementarity of knowledge on service innovation and no mediation effect of complementarity of capabilities on service innovation. In services, complementarity knowledge is critical, as co-creation of synergetic knowledge is used to enhance capabilities for pursuing each firm's interests (Dyer & Singh, 1998). Joint innovation capabilities create value through other resources that are beyond a firm's means (Smirnova et al., 2017) and to which a buyer may not have access individually. Although complementarity of capabilities is itself a resource, the effective management of knowledge complementarity enables a firm to extract all the resources that may be available in this exchange relationship (Nelson & Winter, 1982; Penrose, 1959) for transformation into capabilities.

Our study has several managerial implications. First, it offers the fundamental insight that complementarity of knowledge in buyer-–supplier relationships endows the joint innovation capabilities of a firm. Joint innovation capabilities facilitate the transformation of inter-firm ties into better outcomes by overcoming inertia and reducing the exploitation of knowledge and benefits in the collaboration. Joint innovation capabilities also generate more original, innovative ideas (e.g., Jean et al., 2018). Our findings suggest that the development of joint innovation capabilities in emergent markets rely more on the knowledge aspect of complementarities than on the capability aspect. Accordingly, we advise firms in such markets to choose their partner relationships on the basis of whether the collaborating party can

Table 5
Total effects.

	Path coefficients (O)	Standard deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
CompKnow - > JointInnCap	0.337	0.087	3.864	0.000
CompKnow - > ServInn	0.241	0.089	2.701	0.003
CompCap - > JointInnCap	0.059	0.099	0.596	0.276
CompCap - > ServInn	0.104	0.093	1.122	0.131
JointInnCap - > ServInn	0.582	0.057	10.153	0.000

Note: CompKnow-Complementarity of Knowledge;
CompCap-Complementarity of Capabilities;
ServInn-Service Innovation.

Table 6
Indirect effects.

	Path coefficients (O)	Standard deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
CompKnow - > JointInnCap - > ServInn	0.196	0.053	3.706	0.000
CompCap - > JointInnCap - > ServInn	0.034	0.058	0.592	0.277

Note: CompKnow-Complementarity of Knowledge.
CompCap-Complementarity of Capabilities.
ServInn-Service Innovation.

complement their existing internal and external knowledge. Second, we find that the joint innovation capabilities of a firm are positively related to service innovation. As a single agent may not be capable of developing and offering innovative services independently, we advise managers to engage in joint innovation capabilities; this is less costly but also more efficient than relying on R&D investments (Oh, 2018). Third, we advise managers to develop their firm's joint innovation capabilities to enhance service innovation in competitively intense environments. The positive moderation effect of competitive intensity on the relationship of joint innovation capabilities to service innovation suggests that the cultivation of relationship-specific organizational infrastructures and communication channels help firms enhance their service innovativeness.

6. Limitations and further research

Our study is not without limitations. First, the survey was collected from firms operating in three main industries (manufacturing, services, and retail). The methodological approach of this study helped us control for industry-, maturation-, and size-specific differences that may otherwise have affected the hypothesized relationships. Nevertheless, we do not suggest that the results are generalizable to all industries. Future research may focus on the hypothesized relationships in specific industries, as approaches to service innovation and joint innovation may vary across industries. Second, the cross-sectional design of the survey bounds the suggestions regarding the causality between the variables under scrutiny. Additionally, although complementarity of capabilities has been highlighted as an antecedent to joint innovation capabilities in the literature, the results should be approached with caution, as the two variables may be endogenous. Also, due to resource constraints, we failed to offer a robustness test to minimize such endogeneity concerns. Future research should investigate whether there are temporal effects that hinder or enhance joint innovation capabilities

or service innovation using objective measurements of variables assessed through self-report surveys. That is, idiosyncratic judgments of managers regarding the organizations in which they are currently employed may create biases (Van Bruggen, Lilien, & Kacker, 2002). Although we attempt to minimize such biases with multi-respondent data, the use of objective measurements may further minimize such biases. Finally, our results are relevant to micro, small, and medium enterprises. Further research may test the hypothesized relationships offered in this study for larger, more established firms.

7. Conclusions

In this study, we empirically test the relation of complementarities of capabilities and resources to joint innovation capabilities and service innovation. We also test the interplay of joint learning and competitive intensity to explain variations in service innovation. The findings show that, although complementarity of knowledge increases both joint innovation capabilities and service innovation, complementarity of capabilities does not play a role in the enhancement of joint innovation capabilities or service innovation. We also show that joint innovation capabilities in competitively intense markets may help establish competitive advantages based on service innovation. Specifically, we demonstrate the benefits of basing inter-firm relationships on complementarity of knowledge, rather than on capabilities, in developing joint innovation capabilities that enhance service innovation. Managers can benefit from our findings, which emphasize the role of complementarities and joint innovation capabilities, as well as varying degrees of competitive intensity.

Appendix A. List of measurement items

CompKnow1	We have both contributed different knowledge to the relationship
CompKnow2	We have used complementary knowledge that has been useful to the relationship
CompKnow3	We have combined our separate knowledge that has enabled us to achieve goals we could not otherwise
CompCap1	We have both contributed different capabilities to the relationship
CompCap2	We have used complementary strengths that have been useful to the relationship
CompCap3	We have combined our separate abilities that have enabled us to achieve goals we could not otherwise

JointInnCap1	The firm has the ability to engage in joint development of new services with its suppliers
JointInnCap2	The firm has the ability to adopt new technology with its suppliers to cater to its customers' new demand
JointInnCap3	The firm has the ability to engage in rapid prototype testing with its suppliers for its customers
ServInn1	Developed brand new services
ServInn2	Improved existing services and promoted the services
ServInn3	Repackaged existing services and promoted the services
ServInn4	Jointly provided support for our services with other firms
ServInn5	Extended existing service lines and promoted the services
ServInn6	Introduced new services that competitors do not offer in the market
ServInn7	Tried to reduce the risks of failure of new service development
CompInten1	Competition in the majority of our primary market is cut-throat
CompInten2	There are many promotion wars in our industry
CompInten3	Anything that one competitor can offer others can be matched readily
CompInten4	Price competition is a hallmark in our industry
CompInten5	One hears a new competitive move almost every day
CompInten6	Our competitors are relatively weak
DemUnc1	Customers' product preferences change quite a bit over time
DemUnc2	Our customers tend to look for new products all the time
DemUnc3	Sometimes our customers are very price sensitive, but on other occasions, price is relatively unimportant
DemUnc4	We are witnessing demand for our products and services from customers who never bought them before
DemUnc5	New customers tend to have product-related needs that are different from those of existing customers
DemUnc6	We cater to many of the same customers that we used to in the past

Note: CompKnow-Complementarity of Knowledge; CompCap-Complementarity of Capabilities; JointInnCap-Joint. Innovative Capabilities; ServInn-Service Innovation; CompInten-Competitive Intensity; DemUnc-Demand Uncertainty.

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