Proceedings of the First European Academic Research Conference on Global Business, Economics, Finance and Social Sciences (EAR15Italy Conference) ISBN: 978-1-63415-028-6
Milan-Italy, June 30-July 1-2, 2015, Paper ID: I517

Service Innovation Practices and Competitive Advantage: The Case of Manufacturing Firms

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Abstract

Although research acknowledges the importance of supplier–buyer relationships on product innovation, empirical evidence of the extent and nature of the effects of original equipment manufacturing (OEM) supplier–buyer relationships on service innovation remains scarce. Based on a survey of 1000 Taiwan's OEM suppliers in electronics industry, this study concludes that OEM suppliers' interaction orientation as a key factor influencing two competence developments: joint innovation competence and cross-functional information dissemination competence. Based on the open innovation view and competence-based marketing view, these two competencies contribute to exploitative service innovation and explorative service innovation respectively. In other words, this study integrates open innovation view and competence-based marketing view to provide clarity regarding the OEM supplier's service innovation from interaction orientation

Keywords: *interaction orientation, service innovation, competence*

1. Introduction

The gross margin of professional original equipment manufacturing (OEM[1]) suppliers is gradually being reduced as a result of "micro interest" arising from the so-called OEM trap. Hence, many OEM suppliers have transformed themselves into research and development (R&D) and service centers, which in turn focus on service enrichment and enlargement rather than simply low-value manufacturing. For example, IBM transformed itself from a manufacturer into a provider of complete corporate packages. The reason for this is that, in a competitive outsourcing market, manufacturers such as OEM suppliers must innovate more in the service domain, providing their buyers with integrated product-linked service packages, i.e., "total solutions." (Korhonen & Kaarela, 2011) Suppliers who can offer unique value of total (product + service) solutions are more attractive to buyers than their competitors(Berghman, Matthyssens & Vandenbempt, 2006; Li, 2011). Hence, innovative service offerings should be considered as a way to capture new revenue streams and increase competiveness when companies face commoditization, slowing growth, and declining profitability in product manufacturing markets (Fang, Palmatier, & Steenkamp, 2008; Spohrer & Maglio, 2008; Spring & Araujo, 2013).

The service of OEM suppliers is a type of outsourcing where the buyer company has formerly done itself and then outsources it to a supplier who has specific competence to provide it as a service. In this paper, the service of an OEM supplier will be referred to as product-linked services; these are designed to ensure proper functioning of the product and/or to facilitate the buyer's access to the product in an outsourcing relationship (Mathieu, 2001). For example, traditional OEM suppliers that had accumulated skill in manufacturing low-cost products began to provide manufacturing services to international companies, who required product manufacturing across borders. As OEM suppliers continuously learned and grasped the lessons of their prior experiences and the best practices of both themselves and their buyers (Hobday, 1995; Collis, 1996; Zollo & Winter, 2002), the scope of their competence-based service could expand from manufacturing only to product design and development, global logistics, and after-sale services.

Therefore, the present study contributes to the literature in three important ways. First, when competitive advantages are driven increasingly often by services and growing service-related intensity among manufacturers, the sustainable competitive advantage of OEM suppliers must be rooted in competence in service innovation rather than competence in

[1]OEM (original equipment manufacturing): When a manufacturer follows the buyers' sample specifications and details of a design to assemble all parts into a product and then performs the transaction with the assigned shipping mode (Lee & Chen, 2000).

product innovation only. An OEM supplier's success in a competitive environment will depend on its activities in developing new solutions and responding to new needs of their buyers. To satisfy active buyers' demands and to obtain sufficient information to develop needed services, OEM suppliers must be capable of identifying, recording, and analyzing each transaction. In this regard, an interaction orientation is needed, i.e., a firm must be able to interact with its individual customers and take advantage of information obtained from each individual customer through continuous interactions to achieve valuable and profitable customer relationships (Ramani & Kumar, 2008). Ramani and Kumar (2008) indicated that the ability of firms to interact successfully with individual buyers will differentiate them from their competitors in the future, although they also will need to produce superior products and services, sell smarter, and understand the market as a whole. Despite the importance of an interaction orientation, however, there is no evidence in the extant literature of a link between an interaction orientation and service innovation. The current study advances the literature on interaction orientation in the OEM supplier context by investigating whether an interaction orientation influences service innovation.

Second, according to the resource-based view (RBV), a firm's strategic orientations may contribute to a competitive advantage insofar as they elicit core value–creating capabilities (Slater & Narver, 1994; Han, Kim, & Srivastava, 1998; Atuahene-Gima, 2005). To investigate or explore valid activities effectively with regard to buyers' service needs, this study adopts the following linkages—strategic orientations → organizational capabilities → organizational performance—for the purpose of advancing theory by exploring how interaction orientations influence service innovation(Chen, Li & Evans, 2012). With regard to organizational capabilities, by integrating an open innovation view and competence marketing-based view, this study focuses on two types of competence: *joint innovation competence* and *cross-functional information dissemination competence*.

Third, although some researchers have proposed several service innovation types (Cheng & Krumwiede, 2012), this study investigates two types of service innovation: *exploitative service innovation* and *explorative service innovation*. In the past decade, the issue of "exploitation versus exploration" has been thoroughly discussed in the field of organization management (Teece, 1997; Benner & Tushman, 2003; Yalcinkaya, Calantone & Griffith, 2007; Fang, Fang, Chou, Yang & Tsai, 2011). There are two reasons that innovation is categorized into two types. First, many scholars have researched exploitative and explorative innovation as important constructs and have discussed the antecedents or effects of them

(Fang et al., 2011). However, relatively few studies have further discussed the exploitative and explorative service innovation. Second, March (1991) stated that firms can avoid falling into a failure trap or a competence trap when they adopt these two constructs to align resources in pursuit of long-term competitive advantages. Hence, service-oriented OEM suppliers should include both types of service innovation instead of focusing on only one at the expense of the other.

This paper is structured as follows. First, the research objectives of the study are developed based on existing research and motivations. The literature review follows, and a research model based on literature review is presented. Then the research design and methodology are described and the findings presented and analyzed. The paper ends with a discussion, conclusions, limitation and suggestions for future research.

2. Literature Review and Hypothesis Development

Relatively little is known about the underlying mechanism through which an interaction orientation contributes to service innovation. An interaction orientation focuses on the development of effective mutual interaction and cooperative relationships with customers (Kumar & Ramani, 2006). When adopting an interaction orientation, OEM suppliers will learn to coordinate and integrate knowledge or information efficiently in the supplier–buyer relationship. According to the RBV, strategic orientations are path dependent in their capability-based activities (Chen et al., 2012). Hence, by applying the RBV, we propose that an interaction orientation will improve a supplier's joint innovation competence and cross-functional information dissemination competence, which in turn will contribute to the two kinds of service innovation, exploitative service innovation and explorative service innovation. This suggests that a strategic orientation affects organizational capability development and, in turn, leads to superior performance (see Fig. 1).

Insert Figure 1 about here.

2.1 Interaction orientation of OEM suppliers

In an outsourcing relationship, OEM suppliers should acquire a good understanding of their buyers' resources and abilities through interaction so that they can act as strategic partners rather than merely addressing their buyers' short-term interests (Liu, Tsou & Chen, 2013). A higher level of interaction would further provide adequate, timely, and accurate information, which can enable OEM suppliers and buyers to better understand each other's

resources and abilities, along with their strengths and weaknesses. When an OEM supplier finds it easier to investigate or explore valid activities effectively with regard to its buyers' activities or competence (Dubois & Hakansson, 1997), it will have the chance to make its buyers understand their abilities and their potential applications (Danneels, 2007). Their buyer will then be willing to offer suggestions or opportunities for fostering or reexamining the collaborative relationship (Ebers & Grandori, 1997). Therefore, both sides will expand the scope of a single transaction into mutual collaboration through learning and interaction.

OEM suppliers always make tangible and intangible investments in equipment, operating procedures, and systems that are geared toward the requirements of a particular buyer (Zaheer & Venkatraman, 1995). For example, generally OEM suppliers provide specific manufacturing services according to individual buyers' technical specifications or component requirements. Hence, the ability to interact successfully with each individual buyer will differentiate them from their competitors in the future (Ramani & Kumar, 2008). That is, the individual buyer should be at the heart of co-creation, because each buyer's unique character will influence the co-creation process (Prahalad & Ramaswamy, 2004; Etgar, 2008). Accordingly, OEM suppliers should have systems in place that identify and record each transaction and interaction to satisfy individual buyers' demands and obtain information to develop the needed services.

In this regard, Ramani and Kumar (2008) suggested that a firm with an interaction orientation has the ability to obtain information through continuous and effective interaction with its customers, and these continuous interactions can be used by both the customer and the firm to improve the quality of the interaction. Specifically, they suggested that interaction orientation is a composite construct consisting of four components: customer concept, interaction response capacity, customer empowerment, and customer value management. *Customer concept* reflects the extent of a firm's belief that every marketing action and reaction should be analyzed and evaluated with reference to the individual customer. *Interaction response capacity* represents the infrastructure of the firm that provides offerings and relationship experiences successively, differentially, and specifically to heterogeneous customers by dynamically incorporating feedback from the earlier interactive responses of customers. *Customer empowerment* reflects the extent to which the firm obtains the interactive avenues to engage customers in the process of co-creating. Finally, *customer value management* represents the extent to which the firm can dynamically define and evaluate customer values to use as a guide in developing plans for resource allocation.

2.2 Interaction orientation and joint innovation competence

OEM suppliers with a stronger interaction orientation should possess the ability to communicate with buyers efficiently and interactively to maintain their relationship and to provide or update information for their individual buyers in a rapidly changing environment. To acquire qualified information resulting from efficient and effective creation, transfer, integration, and leveraging of knowledge in continuous interactions, the supplier will encourage individual buyers to act as active participants in relational exchanges and become co-producers with the interaction-oriented OEM supplier (Ramani & Kumar, 2008; Chen et al., 2012). Active OEM suppliers who have known individual buyers through continuous interaction are able to play an intermediary role for buyers who believe in them and who wish to jointly seek out new opportunities without additional investment risk or the cost of searching for new suppliers. Hence, when an interaction orientation enables OEM suppliers to both understand and respond to buyer needs, joint innovation competence is developed. This refers to the ability to develop product, service, and process innovations together with a buyer that may improve the value of the supplier's offerings to this buyer in the future, as well as to other buyers (Li, 2011). This competence can enhance the inter-organizational processes of knowledge creation, storage/retrieval, transfer, and application (Lederer, Mirchandani & Sims, 2001).

H1: *An interaction orientation has a positive effect on joint innovation competence.*

2.3 Interaction orientation and cross-functional information dissemination competence

An interaction orientation will push an OEM supplier to interact with individual buyers to discover and analyze what buyers want and then provide customer-centric information effectively and efficiently. An ongoing process of collecting, constructing, articulating, and redefining shared knowledge among various functional units in a firm through formal processes and structures is required to obtain valuable customer-centric information that incorporates customer feedback (Huang, Newell & Pan, 2001). The firm might eliminate organizational barriers by utilizing pools of different resources led by project teams. These project teams would include members from across the organization, including design, operations, product management, materials, quality control, and suppliers, to collaboratively develop or launch new innovative services. Therefore, the interaction-oriented OEM supplier will develop cross-functional information dissemination competence; this refers to the ability to share market and customer information internally across different functional areas of the organization (Matsuno, Mentzer, & Ozsomer, 2002; Martin & Grbac, 2003).

H2: *An interaction orientation has a positive effect on cross-functional information dissemination competence.*

2.4 Service innovation of OEM suppliers

Studies of service innovation have tended to focus on a specific service sector, such as banking or consumer services. Sectors such as transportation, telecommunications, and wholesale products have also been well researched (Jong & Vermeulen, 2003). However, outcomes in these sectors might not be generalizable to a broader service context. For example, there has been little in-depth research and management emphasis on the development of new services by OEM suppliers, although this concept is important to many Asian OEM suppliers. In the face of intense international competition, rapid evolution of technology, and buyers' individual expectations, it is critical that OEM suppliers adopt a service innovation orientation.

The present study divides service innovation among OEM suppliers into two categories: exploitative service innovation and explorative service innovation. *Exploitative service innovation* pertains to innovation activities aimed at improving existing services to meet the expressed needs of customers through refining and extending current skills, resources, and knowledge. It is characterized by improvement in the efficiency and quality of existing services (Benner & Tushman, 2003, Salavou, Baltas, & Lioukas 2004; Atuahene-Gima, 2005; Yalcinkaya et al., 2007). For example, adoption of advanced information technology increasingly may remove the person-to-person interaction as a service is provided. New information systems allow buyers to monitor and control inventories and supplier relations more efficiently than their competitors. In contrast, *explorative service innovation* refers to innovation activities designed for new or emerging services that are distinct from existing services. The focus is on introducing new services and creating new service positions to meet buyers' latent needs in the outsourcing market (Calantone, Cavusgil & Zhao, 2002 ; Salavou, Baltas, and Lioukas, 2004; Atuahene-Gima, 2005; Yalcinkaya et al., 2007). For example, Taiwanese company Hon Hai explored new integrated services by providing electronic manufacturing services (EMS) and component module moving services (CMMS), which are different from traditional OEM services (see Figure 2). Satisfying buyers' needs by providing different combinations of services in the production value chain might be an option for OEM suppliers with respect to explorative service innovation. In this paper, service innovation is the result of understanding and reacting to buyers' preferences and behaviors (Jaworski, Kohli & Sahay, 2000).

Insert Figure 2 about here.

2.5 Joint innovation competence: Cross-functional information dissemination competence and service innovation

In highly unstable markets, every company faces an unpredictable environment. All firms must cooperate with other companies and explore or exploit other companies' ideas to respond as quickly as possible to the environment. Innovation and speed to market are crucial to survival and success in today's highly competitive market (Sarin & Mcdermott, 2003). According to the open innovation view, Chesbrough (2003) stated, "Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively." He noted that companies must move from a closed to an open innovation model because they cannot afford to rely entirely on their own research. This opening up of innovation reduces the cost and time to market of developing products, services, solutions, and processes because the firm absorbs and assimilates knowledge it has gained from the other party. In the paradigm of service innovation (Prahalad & Ramaswamy, 2004), the buyer and the OEM supplier will co-create service innovations, including new service processes, service styles, organizational structures, and administrative systems.

In fact, a great number of industrial companies have difficulty in persuading customers to take on new services (Korhonen & Kaarela, 2006). In this regard, a competence-based marketing view posits that a supplier's strategic orientation should focus on competence-based services that will be needed in the buyer's future business processes. OEM suppliers should realize that, although the development of core competencies is an important step, the communication of these competencies to buyers is even more important (Ritter, 2006; Golfetto & Gibbert, 2006; Zerbini, Golfetto, & Gibbert, 2007). When buyers perceive a strong benefit of a competence-based service, the buyers might apply the supplier's new competence-based service to their processes (Zerbini et al., 2007). Moreover, in contrast to a relational approach to value creation, competence-based marketing can be applied not only to the use of competencies within the existing relationship, but also to a different approach, i.e., a focus on the role of a supplier's competence in selecting and re-confirming the supplier, thus covering both existing and new relationships between suppliers and buyers (Zerbini et al., 2007, Li, 2011). In other words, OEM suppliers need to develop competence-based services

that are relevant for their buyers to renew extant business relationships and to gear thebuying behavior of prospective buyers.

Based on the open innovation view and the competence-based marketing view, we indicated that joint innovation competence and cross-functional information dissemination competence developed from interaction orientation will affect OEM suppliers' service innovation. These two competencies play key roles in the appropriate adaptation, integration, and reconfiguration of internal and external organizational resources and the functional competence of OEM suppliers to match the changing service needs of buyers.

2.6 Joint innovation competence and service innovation

The content of a service can include a product, a service process, people, or physical equipment with a system, interface, protocol, procedure, function, method, and/or activity. Hence, a service supplier typically has many distinct issues to consider when deciding to develop a new service. OEM suppliers who have the ability to engage in joint innovation can identify and define their buyers' existing needs and combine various activities to satisfy their buyers. During the joint innovation process, OEM suppliers and buyers can adapt to specific organizational needs by dynamically modifying competencies to suit the requirements of each other (Hallen, Johanson & Seyed-Mohamed, 1991). Such a process might mean that OEM suppliers meet buyers' requests on time, increase their degree of familiarity, and reduce the chances of bad communication, characteristics that result in relatively high-quality service by reducing the costs and expenses associated with arranging, managing and monitoring service during the delivery process. It is expected that joint innovation would result in a better fit between suppliers and buyers and improve the performance of both. Hence, we suggest that joint innovation competence in an OEM supplier leads to exploitative service innovation.

H3: *Joint innovation competence has a positive effect on exploitative service innovation.*

As OEM suppliers enhance and pay more attention to co-creation with their buyers, there is no doubt that OEM suppliers will have the opportunity to obtain an in-depth understanding of the problems of buyers (Vargo & Lusch, 2004) and might acquire greater insight into their buyers' expressed and unexpressed needs (Chen et al., 2012). Through joint innovation, a firm with a greater ability to explore latent or emerging buyer needs can in turn make more effective and proactive resource allocations to develop their ability to meet future needs in the market. On the other hand, the intensely competitive nature of the electronics industry, the complexity and sophistication of products, the pressure on buyers to reduce production costs, and shorter product life cycles have led to a rapidly growing demand for joint innovation. For

example, unexpressed cooperation in past outsourcing, such as joint product design and development programs and joint marketing programs, will be needed for existing or potential buyers. Because knowledge usually comes from disparate sources, and services generally require multiple sources of knowledge, OEM suppliers who integrate their knowledge with buyers can create more specific new services. In other words, the competence of joint innovation can be seen as a specific competence through which OEM suppliers can align themselves with existing buyers' business processes and, further, to anticipate the development of knowledge that could be sold to potential buyers. Therefore, we suggest that joint innovation competence in an OEM supplier leads to explorative service innovation.

H4*: *Joint innovation competence has a positive effect on explorative service innovation.

2.7 Cross-functional information dissemination competence and service innovation

Firms must be able to handle a vast amount of customer input and use it to create new services that are valuable to the customer. Roberts and Amit (2003) stated that firms depend on the effective use of existing resources to enhance profitability, and they apply innovation to establish their superiority when faced with imitation by competitors. When employees can share new ideas, resolve problems, and provide innovative responses, each can be considered a potential source of service innovation (Gatignon & Xuereb, 1997). Assimilating up-to-date information of customers, their resources, and agreements with them and disseminating this to all involved departments will help to avoid redundant processes and miscommunication and can lead to the detection of cross-department synergies. On the other hand, Johnson et al. (2004) stated that transferability and knowledge spillover effects allow organizations to better understand how they should interact with current customers and meet their needs. Effective communication and coordinating mechanisms among different units will mean that a firms' employees will work with buyers knowledgeably and smoothly to innovate together (Chiu & Lee, 2007). Hence, the ability to disseminate information across different functional units will allow OEM suppliers to pool existing internal knowledge and resources to engage in similar services faster and more efficiently and with better quality (Auh & Menguc, 2005). We suggest that cross-functional information dissemination competenceleads to exploitative service innovation of an OEM supplier through refinement of current routines and techniques to provide high-quality and efficient services.

H5: *Cross-functional information dissemination competence has a positive effect on exploitative service innovation.*

Some OEM suppliers focus on collecting information from buyers about the end-user

experience. They learn why a product design or function is popular with or necessary for end consumers (Liu et al, 2013). The ability to transfer and disseminate this information in a cross-functional way allows OEM suppliers to be constantly aware of market changes, to react quickly to trends and competitors' strategies, and to understand better how they should interact with buyers throughout the organization. In so doing, they gain a deeper understanding of the evolution of trends, which facilitates the tuning of their innovation to future market needs. On the other hand, employees who are in an environment that encourages cross-functional information sharing and coordination may be more satisfied and motivated to create, acquire, and build upon new knowledge (Rubery, Earnshaw, Marchington, Cooke, & Vincent, 2002). Im & Workman (2004) also stated that the cross-functional information dissemination and integration among marketing, R&D, and manufacturing based on the share of buyer and market information will influence the development of substantially new services. Learning and actively searching for information throughout the organization not only enhances the OEM supplier's competence but gives it an opportunity to anticipate and develop new value-added services for existing or potential buyers. Therefore, we suggest that cross-functional information dissemination competenceleads to explorative service innovation of an OEM supplier.

H6: Cross-functional information dissemination competence has a positive effect on explorative service innovation.

3. Data Analysis

We decided to use partial least squares (PLS) analysis because we had a relatively small sample size (n =152). We used Smart PLS 2.0 to perform SEM and to evaluate both the quality of the measurement model and the interrelationships of the constructs (Ringle, Wende & Will, 2005). A bootstrap resampling procedure was conducted, and coefficients were estimated. O'Cass and Sok (2013) identified several advantages of PLS in an empirical study. According to O'Cass and Sok (2013) and their rationale for adopting PLS, this study adopts PLS in the analysis of the result for two reasons. First, PLS is appropriate because the main objective of this study is to maximize the predictive ability of respective constructs as antecedents (interaction orientation) on the development of joint innovation competence, cross-functional information dissemination competence, and service innovation. Second, some research has stated that PLS is appropriate to estimate the causal subsystem sequence of paths when the sample size is small.

3.1 Measurement

This study used a self-administered questionnaire that contained a Likert response scale. All measures were perceptual and the managers of OEM suppliers made the evaluations. All independent and dependent variables are measured using multiple items. The measures used for the constructs in the study are provided in Appendix I. All the measures of the focal model constructs were adopted using a five-point Likert-type scale. The measure of interaction orientation was conceptualized as a reflective, second order construct consisting of four dimensions—customer concept, interaction response capacity, customer empowerment and customer value management (Ramani & Kumar, 2008). Customer concept was measured by three items reflecting the strength of the belief of an OEM supplier in viewing, acquiring and analyzing buyers at the individual level (Ramani & Kumar, 2008). Interaction response capacity was measured by three items reflecting the sophistication of an OEM supplier's system in recording, identifying, accessing and predicting individual-level transactions (Ramani & Kumar, 2008). Customer empowerment was measured by three items reflecting the extent to which an OEM supplier empowers its buyers to provide feedback on its services, with the OEM supplier and other buyers and to actively join in designing services (Ramani & Kumar, 2008). Customer value management was measured by three items reflecting the extent to which the OEM supplier has skills and processes in place to analyze and predict individual-level profits, and records revenues resulting from individual buyer transactions (Ramani & Kumar, 2008). We consider service innovation in terms of an OEM supplier's capability to continuously engage in different types of service innovation instead of concentrating on a single service in outsourcing. The construct of OEM supplier's service innovation consisting of two constructs: exploitative service innovation and explorative service innovation. The scale of exploitative service innovation and explorative service innovation is measured via the 3-item individually. Items to these constructs are built and refined from the work of Calantone et al. (2002); Salavou et al. (2004) and Yalcinkaya et al. (2007). Cross- functional information dissemination competence is adopting selective items from scales developed by Li (2011) with three items, reflecting the firm's ability to share market information internally across different functional areas of the organization. Joint innovation competence is measured by three items reflecting the firm's ability develop product, service and process innovations together with a buyer that may improve the value of the supplier's offerings to this buyer (Li, 2011).

Two control variables are included in this study. Chandy & Tellis (1998) reported that firms with large size are more likely to exploit existing capabilities or develop new ones. Hence, firm size is the used to help control for the potential effect. It is measured by the number of employees. In addition, it has been suggested that inter-firm cooperation can lead to competitive advantage only when firms transcend transaction-based exchange and develop long-term relationships (Dyer & Singh, 1998). Therefore, we also included length of collaboration as a control variable.

3.2 Sample and data collection

The sample population for this paper was Taiwanese OEM suppliers in electronics industries that are listed in the "2008 Top 1000 manufacturing corporations in Taiwan" (published by Common Wealth magazine) and Taiwan buyer's guide (published by Business Express in 2005). We have sought out respondents with the most knowledge of the buyer relationship in their organization. The final version of the questionnaire was mailed to 1,000 firms in Taiwan's electronics industry. Follow-up contacts were made by e-mail, fax, or telephone in order to improve the response rate. The resulting sample consisted of 152 usable questionnaires, representing a response rate of 15.2%. The organizations represented in the sample included those with the average length of collaboration and number of employee (size). A vast majority of the businesses had cooperated with their buyer between 3 years and 5 years. A majority has capital of 101 and 500 employees (see Table. 1). Responders to the first mailing were classified as early (n = 102), whereas follow-up contacts were considered late (n = 50). We used t-tests to examine the representativeness of the sample (both early and late respondents) in terms of number of industry subcategory. The results indicated no significant difference from the sample population in these respects; thus, the sample was representative.

Insert Table. 1 here

Because the data were self-reported (including dependent and independent constructs), we used two methods to determine whether common method bias is likely to be a serious concern. First, we will use Harmon's one-factor test to determine the potential for common method bias. All items used to measure the independent and dependent variables were entered into an exploratory factor analysis. In our analysis of firms, no single factor emerged, and the first factor accounted for 36% of the total variance; the eight extracted factors accounted for

73% of the variance. Not a single factor emerged that could account for the majority of the covariance in the measure. This suggested that there was no common method bias. Additionally, we also use the Lindell and Whitney (2001) recommendation to assess potential common method bias by using the marker variable assessment technique approach. A three-item scale measured the OEM supplier's internationalization (Cronbach's $\alpha = .94$), which is theoretically unrelated to other variables in the study. The results of a partial correlation analysis after controlling for the effect of marker variable show no significant change among the important constructs (see Table. 2). Thus, common method bias is unlikely to be a serious concern.

3.3 Construct reliability and validity

The expected factor structure was obtained in all eight constructs. Scale reliability was tested and the Cronbach alpha values were in the range 0.690 to 0.904 for the eight constructs, indicating a high internal consistency of measure reliability (Nunnally 1978). Composite reliability was then assessed by examining the p_c values for the constructs, all of which were above the suggested threshold of 0.7, indicating that the measures were reliable. The properties of the measurement model are summarized in Table. 2 and the correlation matrix and the statistics of the observed variables are shown in Table. 3. The average variance extracted values (AVEs) were all above the recommended threshold of .50 (Barclay, Thompson & Higgins, 1995) and the square root of those values were all greater than the construct correlations (the off-diagonal entries in Table 3) (Fornell & Larcker 1981). The convergent and discriminant validity tests were both satisfied.

Insert Table. 2 here

Insert Table. 3 here

3.3 Results for direct effects

Fig. 3 shows the results of PLS estimation for the direct effects. A bootstrapping technique was used to determine the significance of the structural paths. The path coefficients for the research constructs are expressed in a standardized form. The predictive power of the research model was assessed by examining the explained variance (R^2) for the endogenous constructs. The path coefficient between an interaction orientation and joint innovation competence and cross-functional information dissemination competence was positive and

statistically significant. Thus, H1 and H2 supported. The results provide an empirical basis to suggest that an interaction orientation facilitate OEM suppliers to develop the abilities of information sharing and collaboration across innovation-related parties in inter-firm and intra-firm relationship, which in turn understand and respond to buyers' current and future service needs. The positive relationship between joint innovation competence and exploitative service innovation and explorative service innovation were significant, thus Hypothesis 3 and 4 supported. This finding shows that joint innovation competence increases the opportunities for both OEM suppliers and buyers to share valuable related information and knowledge, which in turn facilitates service innovation. The positive relationship between cross-functional information dissemination competence and exploitative service innovation and explorative service innovation were also significant, thus Hypothesis 5 and 6 supported. Hence, this result indicates that the ability of efficiently spilling over buyers' needs internally which receives or record through interacting with buyers play an important role in OEM supplier's service innovation. Table 4 and Fig. 3 show the results for individual paths and results.

Insert Table. 4 here

Insert Figure 3 about here.

With regard to R^2, interaction orientation explained 20.2% of the variance in joint innovation competence and 22.1% of the variance in cross-functional information dissemination competence. These values were all significant. On the other hand, joint innovation competence and cross-functional information dissemination competence explained 32.8% of the variance in exploitative service innovation; joint innovation competence and cross-functional information dissemination competence explained 26.8% of the variance in explorative service innovation. These values were all significant.

4. Discussion and Conclusion

The output value of service industries has surpassed that of manufacturing industries, and thus the importance of research on service innovation has increased. Very little empirical research has been done on the service innovation of OEM suppliers. Research has addressed in depth the factors that lead to the success or failure of product innovation in the OEM

supplier context (Liu, Liu & Lin, 2008) but has ignored almost entirely those factors that affect service innovation.

According to the RBV, this study provides a deep understanding of the two underlying development capabilities through which an interaction orientation is linked to service innovation by addressing the links between interaction orientation and joint innovation competence and cross-functional information dissemination competence. Furthermore, the present findings lend support to the open innovation view and the competence-based marketing view in that joint innovation competence and cross-functional information dissemination competence can lead to the development of customer-pleasing service innovations, as well as increase buyers' acceptance of new modes of doing business through co-creation between buyers and OEM employees. With respect to these two competencies, the current results suggested that OEM suppliers can increase service innovation by giving suppliers and buyers the shared knowledge to work together and communicate more efficiently (open innovation view). At the same time, buyers are willing to co-create new services with suppliers and will show a preference toward adopting the new services if the OEM suppliers can effectively and flexibly transfer the new idea to buyers (Golfetto & Gibbert, 2006; Ritter, 2006; Zerbini et al., 2007). Also, buyers might have enough information about or more opportunities to determine which kinds of new services OEM suppliers can provide in existing or potential markets (competence-based marketing view). In other words, interaction-oriented OEM suppliers are able to identify buyers' existing and potential needs and co-create with buyers (Ramani & Kumar, 2008), resulting in new services and a robust collaborative relationship.

Some researchers argue that an interaction-oriented firm may narrowly focus its endeavors on its current customers and their stated needs (Chen et al., 2012). Following this, it is critical to explore whether such a narrow focus means that interaction-oriented firms will not anticipate opportunities or threats, thus limiting interaction orientation's ability to create a sustainable competitive advantage. By integrating the competence-based marketing view and the open innovation view, this study suggests that joint innovation competence and cross-functional information dissemination competence derived from an interaction orientation make interaction-oriented OEM suppliers go a step further: from being market driven to driving the market using service innovation to meet the needs of both existing and potential buyers in an intensely competitive arena (Tuominen, Rajala and Moller, 2004; Berghman et al, 2006). This result helps us understand which kinds of organizational

competence are most useful to explain how an interaction orientation contributes to OEM supplier service innovation.

5. Managerial Implications

Buyers, especially large international companies, must consider their potential competition (e.g., the risk of introducing a new product), they may be cautious in their selection of an OEM supplier. Hence, the unique "customer structure" of OEM suppliers will be concentrated (Liu et al., 2008). Based on our findings, the use of a concentrated customer strategy gives an OEM supplier many advantages, such as the ability to respond to individual buyers' requests on time, to maintain long-term buyer relationships by offering relatively high-quality service, and to increase familiarity while reducing the chances of poor communication, which in turn reduces the costs and expenses associated with arranging, managing, and monitoring orders (Child & Faulkner, 1998). Collaborating with fewer unique buyers provides an OEM supplier with an opportunity to learn and to transfer knowledge efficiently and enhances its knowledge through internal investments in accordance with the demands of fewer buyers (Ramani & Kumar, 2008).

With respect to service innovation, the findings suggest that practitioners need to understand the role of inter-firm collaboration and intra-firm information-sharing abilities. Such abilities are essential if OEM suppliers are to work with buyers and employees to develop a suitable solution and when OEM suppliers need to manage pieces of the information, particularly when many of these are provided by partners or internal employees. Hence, the ability to externally interact with buyers, internally discover solutions and manage requirements, and integrate pieces of a complete puzzle is critical to success in new service development.

The standard coefficients and R^2 values shown in Fig. 3 and Table 4 serve as evidence that interaction-oriented OEM suppliers exercise more exploitative service innovation than explorative service innovation. The reason for this might be that, in the outsourcing relationship, buyers adopted outsourcing modes to enhance their cost structure, through which they could achieve a competitive advantage. When such technology or knowledge transference is common within cooperative relationships between buyers and suppliers, these two types of companies may naturally resemble each other. Hence, OEM suppliers and buyers can work together fairly easily to generate ideas to solve problems with existing service, such as efficiency and quality. Nevertheless, this result also reminds practitioners to actively research the potential needs of buyers through continuous interaction to achieve a notion of

"balance" between exploitative and exploratory service innovation in their organization (March, 1991).

6. Limitations and Future Suggestion

Although this research makes some contributions to the literature on outsourcing relationships, two shortcomings should be noted. First, we used a questionnaire to collect the relevant information; however, future studies should also collect related secondary data (e.g., data on the number of buyers a supplier has, data on buyer characteristics, or an objective index of competence) so that both objective and subjective indicators can be examined. Second, only a small number of samples were returned. Even though we did our best to follow up, the response rate was only 15.2%. Nevertheless, a response rate of 15.2% is over the recommended 12.5% as a minimum to derive meaningful conclusions. We also justify the use of PLS due to the relatively small sample of data obtained.

Innovation in services typically results in increased buyers satisfaction and loyalty. Future research might be needed to investigate the effects of different types of service innovation on the image of the supplier, competitive advantages and the relationship that the buyer and the supplier may have.

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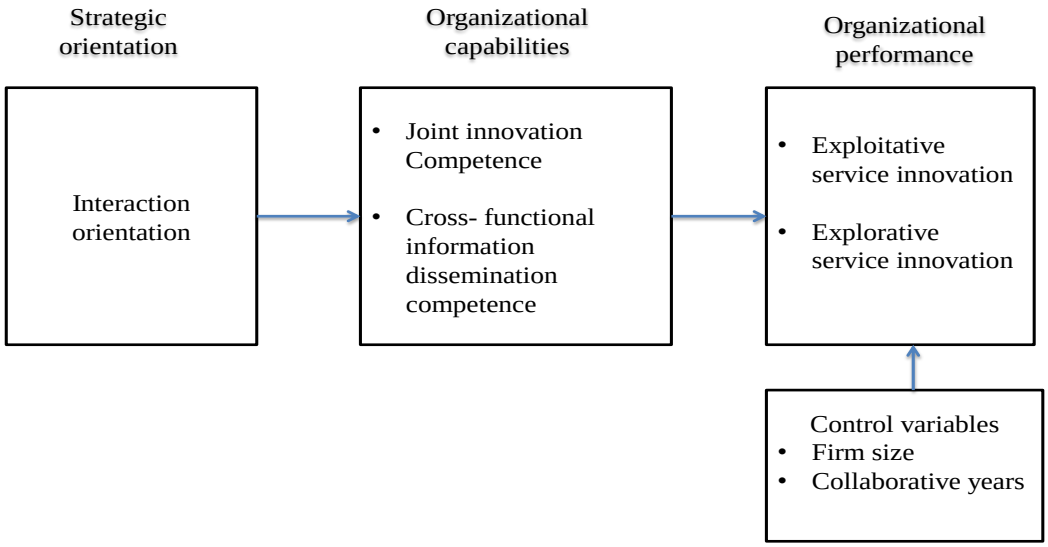

Figure1: Research framework

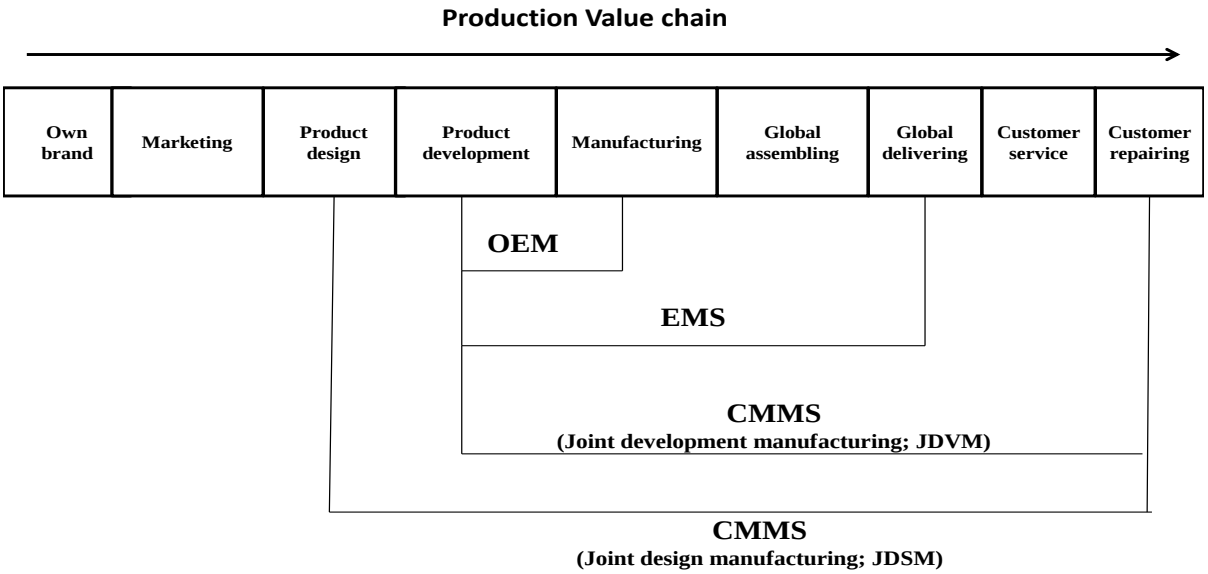

Figure 2. Value-chain and service products among OEM suppliers

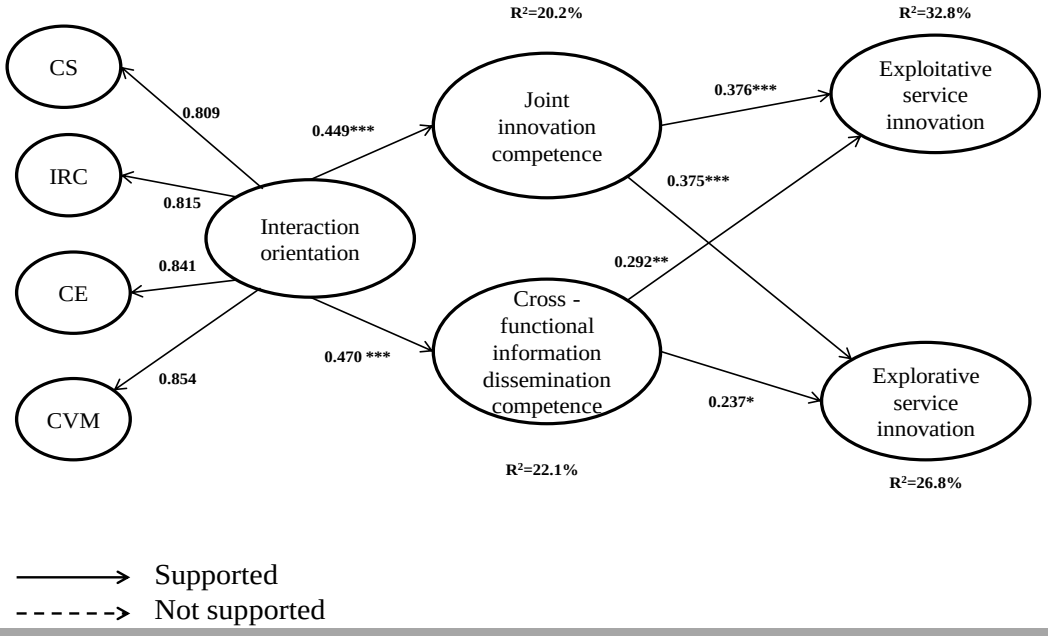

Figure 3. PLS results for direct effects

Table1: Responding company demographics.

Variables	Category	rate
Length of collaboration	1 year and fewer	1.2 %
	Over 1-3 years	37.7 %
	Over 3-5 years	34.0%
	Over 5-10 years	19.8%
	Over 10-15 years	1.2%
Number of employees (people)	100 and fewer	0%
	101-500	4.3%
	500-1000	44.4%
	1000-2000	39.5%
	Over 2000	5.6%

Table2: Results of measurement properties.

	Construct identifier	**Factor loading**	**Composite reliability (ρ_c)**	**AVE**
Exploitative service innovation (ETSI)	ETSI1	0.690	0.77	0.535
	ETSI2	0.755		
	ETSI3	0.749		
Explorative service innovation (ERSI)	ERSI1	0.745	0.85	0.661
	ERSI2	0.844		
	ERSI3	0.855		
Joint innovation competence (JIC)	JIC1	0.887	0.91	0.773
	JIC2	0.904		
	JIC3	0.827		
Cross-functional information dissemination competence (CID)	CID1	0.858	0.89	0.734
	CID2	0.886		
	CID3	0.895		
Customer concept (CS)	CS1	0.809	0.86	0.688
	CS2	0.857		
	CS3	0.820		
Interaction response capacity (IRC)	IRC1	0.789	0.89	0.733
	IRC2	0.868		
	IRC3	0.831		
Customer empowerment (CE)	CE1	0.866	0.88	0.715
	CE2	0.891		
	CE3	0.812		
Customer value management (CVM)	CVM1	0.858	0.86	0.687
	CVM2	0.862		
	CVM3	0.817		

Table3: Results of measurement properties

Construct	Mean	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	**(9)**	**(10)**	**(11)**
ETSI (1)	3.37	.57	**.73**										
ERSI (2)	3.41	.58	.42	**.81**									
JIC (3)	3.47	.55	.50	.46	**.87**								
CID (4)	3.38	.55	.46	.39	.45	**.85**							
CS (5)	3.52	.53	.49	.36	.43	.37	**.83**						
IRC (6)	3.67	.56	.60	.49	.46	.35	.64	**.85**					
CE(7)	3.58	.54	.48	.39	.25	.37	.53	.51	**.84**				
CVM(8)	3.57	.54	.59	.45	.33	.44	.52	.56	.72	**.82**			
Collaborative year (9)	2.80	.82	.12	.04	.17	.16	.16	.02	.11	.16	-		
SIZE (10)	3.49	.68	.02	.04	-.03	.01	-.10	-.07	.049	.09	.285	-	
Marker(Internation)	4.01	.71	-.05	.10	-.007	-.05	-.05	.02	-.02	.02	.16	0.01	-

* P < .05. ** P < 0.01. *** P < 0.001. Note: N=152.

1. Zero-order correlations are below the diagonal; adjusted correlations for potential common method variance (Lindell & Whitney, 2001) are above the diagonal.
2. Figures in shaded diagonal are values of the square root of the AVE.

		Path coefficient (b)	Results
Interaction orientation- Joint innovation competence	H1	0.449***(t=6.468)	Supported
Interaction orientation- Cross-functional information dissemination competence	H2	0.470*** (t=5.966)	Supported
Joint innovation competence –Exploitative service innovation	H3	0.376*** (t=4.191)	Supported
Joint innovation competence –Explorative service innovation	H4	0.375*** (t=3.907)	Supported
Cross-functional information dissemination competence –-Exploitative service innovation	H5	0.292** (t=3.258)	Supported
Cross-functional information dissemination competence –-Explorative service innovation	H6	0.237*(t=2.387)	Supported
Collaborative length-exploit service innovating		0.028	
Collaborative length-explore service innovating		0.08	
Firm size-exploit service innovating		0.006	
Firm size-explore service innovating		-0.08	
* p < .05. ** p < 0.01. *** p < 0.001.			

Table 4. Standardized path coefficients