The effects of customer orientation on service/product innovativeness and performance: a comparative study

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Abstract
We empirically investigated the impact of customer orientation on service/product innovativeness and performance through the mediating effects of firm resources, based on data from service firms and manufacturers. Both the total effect and mediation effects were compared between two datasets. Findings contribute to understanding of service innovation versus manufacturing innovation.

Keywords: Service/product innovation, Customer orientation, Comparative study

Introduction
Despite the growing importance and dominance of the service sector and its increasing GDP share in most developed and developing economies, and the increasing focus on service research (Menor et al. 2002, Spohrer and Maglio 2008, Zomerdijk and Voss, 2011), there is a scarcity of empirical studies to address the differences and/or similarities between manufacturing and service (Ettlie and Rosenthal 2011, Song et al. 1999). This paper seeks to contribute to our understanding of these differences and similarities through empirical study of innovation in services and manufacturing.

Song et al. (1999) argued that comparing manufacturing and services is important because of the great differences between services and manufactured goods. Ettlie and Rosenthal (2011) investigated how service innovation differentiates from manufacturing innovation and results indicated real differences between manufacturing and services in terms of innovation process, primarily due to the fact that manufacturing and service organizations formalize development of new offerings in different ways. To examine this further we explore and compare the impact of customer orientation on innovation and business performance in a sample

of manufacturing and services firms.

This study seeks to employ a service-dominant logic (SDL) and resources-based view (RBV) of the firm to empirically investigate the effects of customer orientation on innovation performance and firm performance in both manufacturing firms and service firms. Such effects are potentially mediated by a number of factors and we recognize two important firm resources as mediators: supplier collaboration and technological capability. We address two research questions:

RQ1: Does customer orientation positively relate to both service and product innovativeness and how does this effect differ between service and manufacturing firms?

RQ2: Do supplier collaboration and technological capability mediate the relationship between customer orientation and innovativeness differently in manufacturing firms and service firms?

Theoretical Framework and Hypotheses

We draw on SDL, an emerging theoretical lens proposed by Vargo and Lusch (2004) to understand both the manufacturing firms and service firms. Michel et al. (2008) suggest that SDL is appropriate for studying service innovation because it moves away from perspectives traditionally rooted in technological product inventions. Ordanini and Parasuraman (2011) also advocate the use of SDL to study service innovation as it is an overarching perspective which can leverage (instead of competing with) various research streams that have investigated service innovation.

Arnould (2008) points out the need to link the SDL with resource theories, especially with resources based theory of the firm. Therefore, it is suggested that customer centric models of firm resources need to be developed in that from the perspective of SDL, "a service-centered view is inherently customer oriented and relational" (Vargo and Lusch, 2004, 2008). Customer orientation is "the sufficient understanding of one's target buyers to be able to create superior value for them continuously" (Narver and Slater, 1990). For both manufacturing and service firms, the voice of customer is of importance to new product development (NPD), as well as new service development (NSD). Being close to the customer can benefit a firm's innovation and competitive advantage (Adams et al., 1998). Manufacturing firms and service firms both innovate to satisfy customer needs and the importance of customers as sources of ideas for both new services and new products has been acknowledged by previous research (Ettlie and Rosenthal, 2011).

The direct impact of customer orientation on firm performance has been investigated by previous studies (Deshpande et al. 1993, Kirca et al. 2005, Narver and Slater 1990). Innovation has been suggested as a 'missing link' between customer orientation and firm performance (Agarwal et al. 2003, Han et al. 1998). However, we still do not fully understand the mechanisms that customer orientation influences innovation performance; how exactly customer needs and requirements lead to firms' reactions and responses, then make the firms more innovative in return. Therefore, in order to investigate further the effect of customer orientation on innovation, mediating effects may need to be examined. Customer orientation may lead to some mediating variables related to development activities of new service or product, which in turn lead to innovation performance.

This study incorporates both the relational aspects suggested by SDL and the traditional perspectives rooted in technological product inventions. Service firms are traditionally deemed as not characterized by major R&D departments (Djellal and Gallouj, 2001) and service

innovation involves the development of new procedures and concepts rather than new core technologies (Preissl, 2000). Based on Pavitt's (1984) taxonomy of patterns of innovation, de Jong and Marsili (2006) suggested that sources of innovation include customers, suppliers, and scientific development (which is related to the development of new technologies). In order to study and compare the effect of customer orientation on innovation performance in both manufacturing and service firms, we propose that customer orientation is positively related to innovativeness of offerings for both manufacturing firms and service firms, mediated by the collaboration with suppliers and the development of technological capabilities, but the relative magnitudes of mediation effects are different across manufacturing firms and service firms. The conceptual model based on this is shown in Figure 1, followed by detailed hypotheses.

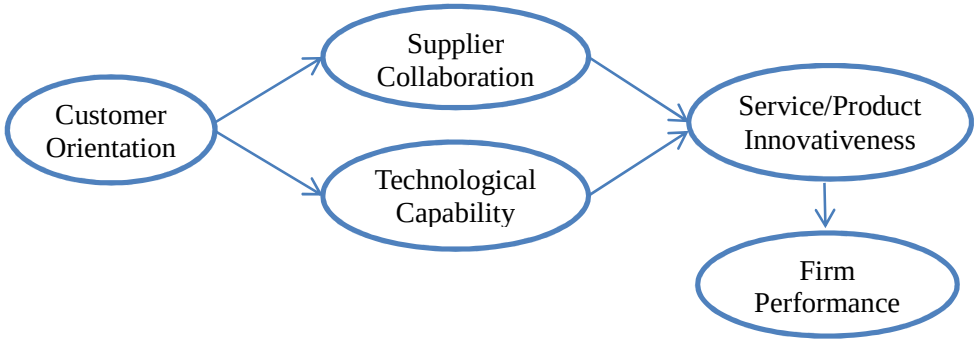

Figure 1- Conceptual Model

H1. Customer orientation is positively related to the innovativeness of offerings (products or services).

H2. Customer orientation is positively related to the innovativeness of offerings (products or services), mediated by supplier collaboration in offering (product or service) development and improvement.

H3. Customer orientation is positively related to the innovativeness of offerings (products or services), mediated by the development of technological capability.

H4. The effect of customer orientation on innovativeness of offerings is stronger in service firms than in manufacturing firms.

H5. The mediation effect of supplier collaboration on the relationship between customer orientation and the innovativeness of offerings is stronger in service firms than that in manufacturing firms.

H6. The mediation effect of technological capability on the relationship between customer orientation and the innovativeness of offerings is stronger in manufacturing firms than that in service firms.

Research Methodology

Measures

Since the current study focuses on the comparison between manufacturing firms and service firms, we reviewed extensive literature and conducted interviews with practitioners and academics to make sure that the measurement items used in this study are appropriate for both manufacturing and service firms. All the measurement items are shown in Appendix.

For all the items of the constructs including customer orientation, supplier collaboration,

and technological capability, responses were recorded on a 6-point scale with a 1 indicating that the firm does not engage in the practice at all and a 6 indicating that it engages in the practice to a very great extent and makes improvement continuously. This study employs a 6-point Likert scale mainly due to the concern that data are to be collected in China. Chinese culture is dominated by Confucianism (Wilhelm et al., 1972) which highly emphasizes "the doctrine of the mean" (Legge, 2009), but this leads to an underlying fact that moderation in all things is the best of rules in China. For Chinese people, it makes them more comfortable to option 4 out of a 7-point scale, and 3 out of a 5-point scale, and this may impair the normality of sampling distribution. To be consistent, product/service innovativeness and firm performance were also on a 6-point scale, with a 1 indicating significantly worse than competitor and 6 indicating significantly better than competitor.

Sampling and data collection

The model was tested using cross-sectional data, drawing the respondents from various industries in both manufacturing sector and service sector. The sampling pool of firms in China consisted of the members of China Association for Quality (CAQ). Emails were sent to all the members of CAQ during July and August in 2007 to notify the questionnaire collection, and respondents were asked to download the questionnaire from the official website of CAQ and send back the finished questionnaire either through mail or email. Unregistered firms which were also interested could also participate in the same way. Follow-up telephone calls were made to improve the response rate, and respondents were contacted to clarify missing data in their responses.

This resulted in 686 usable questionnaires from service industries and 1,646 usable questionnaires from manufacturing industries. A check of normality showed the data to be approximately normally distributed. A wide variety of industries are included, and respondents were top management, general managers, and experienced employees. Service firms come from industries including business services, retail and wholesale trade, transportation and logistics, real estate and property management, hotel and catering, IT and communication services, public utilities, construction, finance and insurance, education, entertainment, and a whole host of other personal and professional services. Manufacturing firms are from the traditional industries including electronics and electrical, metal, mechanical and engineering, chemicals and petrochemicals, textiles and apparel, food, beverage and alcohol, instruments and meters, pharmaceutical and medical, rubber and plastics, IT and communication devices, wood and furniture, publishing and printing, and some other manufacturing industries covered in GB/T 4754-2002, which is the national standard for classification of industries in China.

Analysis and Results

Structural equation modeling (SEM) was used to test the hypotheses of our model, following the two-step approach outlined in Anderson and Gerbing (1988). First, we analyzed the measurement model to assess the psychometrics of our constructs using confirmatory factor analysis (CFA). Second, we estimated the structural model to test the hypotheses. AMOS 16.0 and Mplus 6.12 were used to estimate both the measurement model and the structural model.

Reliability and validity

A rigorous process was used to develop and validate the survey instruments. Prior to data collection, content validity was supported by previous literature, executive interviews, and pilot

tests. After data collection, a series of analyses were performed to test the reliability and validity of the constructs.

We followed a two-step method to test construct reliability. First we conducted exploratory factor (EFA) analyses using both orthogonal and oblique rotations to ensure high loadings on hypothesized factors and low loadings on cross-loadings in the data sets. All the items loaded onto the expected factors without significant cross-loadings. Then the reliability of each construct was tested using Cronbach's alpha. Cronbach α values shown in Table 1 are over 0.8 for all constructs in both service dataset and manufacturing dataset, indicating that all constructs are reliable for this research.

Next, convergent validity and discriminant validity were tested using both the service dataset and manufacturing dataset, respectively. Discriminant validity is the degree to which measures of different latent variables are unique, whereas convergent validity relates to the degree to which multiple methods of measuring a variable provide the same results (O'Leary-Kelly and Vokurka 1998). Following Bagozzi and Yi (1988), we also computed composite reliability (CR) scores to assess construct reliability. As reported in Table 2, all factors have CRs greater than 0.70. The AVE values suggested by Fornell and Larcker (1981) for all constructs satisfactorily exceed 0.50.

In the measurement model, generally a construct with either loadings of indicators of at least 0.50, a significant t-value ($t > 2.0$), or both, is considered to be convergent valid. For our model, all the factor loadings are greater than 0.50, and all t-values are greater than 2.0, thus convergent validity is achieved. Further, the squared correlation between each pair of constructs (see Table 2) are smaller than the AVE reported in Table 1 for each individual construct, providing strong evidence of discriminant validity.

Table 1–Construct reliability and validity

Constructs and items	Service Dataset				Manufacturing Dataset			
	α	CR	Factor loading	AVE	α	CR	Factor loading	AVE
Customer Orientation (CO)	0.930	0.946		0.778	0.926	0.948		0.772
CO1			0.878				0.877	
CO2			0.900				0.895	
CO3			0.887				0.873	
CO4			0.889				0.885	
CO5			0.874				0.870	
Supplier Collaboration (SC)	0.881	0.917		0.734	0.849	0.897		0.690
SC1			0.855				0.817	
SC2			0.870				0.871	
SC3			0.864				0.860	
SC4			0.855				0.783	
Technological Capability (TC)	0.903	0.933		0.776	0.892	0.897		0.757
TC1			0.867				0.864	
TC2			0.873				0.838	
TC3			0.894				0.880	
TC4			0.898				0.905	

Service/Product Innovativeness(SI)	0.920	0.943		0.804	0.919	0.897		0.803
SI1			0.880				0.878	
SI2			0.916				0.906	
SI3			0.915				0.908	
SI4			0.887				0.899	
Financial Performance (FP)	0.957	0.965		0.795	0.934	0.887		0.725
FP1			0.858				0.552	
FP2			0.882				0.878	
FP3			0.867				0.857	
FP4			0.899				0.907	
FP5			0.908				0.912	
FP6			0.926				0.908	
FP7			0.916				0.910	

Table 2–Correlation between constructs

Service Dataset	CO	SC	TC	SI	FP
Customer Orientation (CO)	1				
Supplier Collaboration (SC)	0.778	1			
Technological Capability (TC)	0.767	0.809	1		
Service/Product Innovativeness (SI)	0.457	0.586	0.555	1	
Financial Performance (FP)	0.492	0.525	0.531	0.579	1
Manufacturing Dataset	CO	SC	TC	SI	FP
Customer Orientation (CO)	1				
Supplier Collaboration (SC)	0.765	1			
Technological Capability (TC)	0.752	0.789	1		
Service/Product Innovativeness (SI)	0.376	0.451	0.471	1	
Financial Performance (FP)	0.430	0.477	0.518	0.521	1

Hypotheses testing results

In the analysis, AMOS 16.0 and Mplus 6.12 were used following the procedures provided by Lau and Cheung (2012) and the permutation-based multi-group invariance testing provided by Chin and Dibbern (2010) to test and compare the mediation effect. The parameters are estimated using maximum likelihood with a bias-corrected bootstrapping approach. Two thousand bootstrap samples of size 686 and 1646 are taken from the original sample of size 686 and 1646 with replacement respectively. The results are summarized in Table 3.

Then model with all constructs included (as shown in Figure 1) was tested separately with the two datasets. The total effect of customer orientation on service/product innovation was also significantly positive, with the coefficient of 0.59 and 0.47 in service dataset and manufacturing dataset respectively (both *p*-values smaller than 0.001), which also support H1. H2 and H3 were supported in both datasets, with all direct effects significantly positive. The relationship between service/product innovativeness and final competitive financial performance was also significantly positive (path coefficient: 0.61 in service dataset and 0.56 in manufacturing dataset, with *p*-value smaller than 0.001), which supported the importance of innovation to firm performance. The fit indices for the full model were also better than the commonly accepted threshold values: Chi-square = 1088.58 with Degrees of Freedom = 247, RMSEA = 0.071, NNFI = 0.93 and CFI = 0.95 for service dataset; Chi-square = 2641.21 with

Degrees of Freedom = 247, RMSEA = 0.077, NNFI = 0.92 and CFI = 0.93 for service dataset.

Then the permutation-based multi-group invariance testing was conducted, and results showed substantial difference regarding the total effect of customer orientation on service/product innovativeness in service firms versus manufacturing firms (the difference was 0.098, p = 0.030), which supported H4. Further, for the mediation effect of supplier collaboration, the difference between service firms and manufacturing firms was 0.181 (p = 0.009), thus H5 was supported. However, for the mediation effect of technological capability, the difference between manufacturing firms and service firms was 0.084 (p = 0.339), thus H6 was rejected. The results will be discussed in the following section.

Table 3–Results of hypothesis testing

Path in the structural model		Path coefficient	Outcome
CO → SI	($H1_S$)	0.58^{***}	Supported
CO → SI	($H1_M$)	0.48^{***}	Supported
CO → SC → SI	($H2_S$)	0.89^{***}, 0.43^{***}	Supported
CO → SC → SI	($H2_M$)	0.89^{***}, 0.16^{***}	Supported
CO → TC → SI	($H3_S$)	0.86^{***}, 0.23^{***}	Supported
CO → TC → SI	($H3_M$)	0.85^{***}, 0.38^{***}	Supported
$(CO \rightarrow SI)_{S\text{-}M}$	(H4)	0.098^{*}	Supported
$(CO \rightarrow SC \rightarrow SI)_{S\text{-}M}$	(H5)	0.181^{**}	Supported
$(CO \rightarrow TC \rightarrow SI)_{M\text{-}S}$	(H6)	0.084	Rejected

$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Discussion and conclusion

By examining the influence of customer orientation on innovation performance through the mediation effects of supplier collaboration and technological capability, and the comparison between manufacturing firms and service firms, this study contributes to insights into how customer-oriented firms build up sustained competitive advantage through the development of organizational and physical capital resources, and how service firms and manufacturing firms rely on the two types of firm resources differently.

Firstly, this study supports the positive effect of customer orientation on innovativeness of offerings and firm performance, in both manufacturing firms and service firms, which is consistent with the findings of prior literature such as Atuahene-Gima (1996), Hult et al. (2004), de Jong and Marsili (2006), and Grinstein (2008). Although some scholars criticize the effect of customer-oriented behavior and its effect on innovation, this study empirically shows the significant positive effect of customer orientation on innovation performance and firm performance, using a large-scale sample consisting of both manufacturing firms and service firms from various industries. Further, this study also indicates that this effect is significantly stronger in service firms than in manufacturing firms (H4 was supported). As a major premise of SDL, customer orientation has been found more positively related with innovativeness of offerings in service firms than in manufacturing firms, which implies that SDL would be applicable to both manufacturing and service firms, yet more powerful in guiding service firms.

Second but more importantly, this study reveals one underlying mechanism via which customer orientation affects innovation, by investigating the mediation effects of two imperative firm resources, supplier collaboration and technological capability. Previous literature has suggested that customer orientation may influence innovation performance indirectly rather than directly, but theoretically sound mediators need to be proposed. This study empirically supports

the mediation effect of supplier collaboration and technological capability, from the perspective of RBV. Results of this study indicate that in order to convert the customer needs and requirements into innovative products or services, specific firm resources—both relational capital resource and physical capital resource—have to be developed.

Third, regarding the comparison between service firms and manufacturing firms, this study has found that the mediation effect was significantly different between manufacturing firms and service firms. Specifically, the mediation effect of supplier collaboration is stronger in service firms whereas the magnitude of the mediation effect of technological capability remains more or less the same in service firms and manufacturing firms (H5 was supported whereas H6 was rejected). Therefore, both similarities and differences have been found between manufacturing firms and service firms, echoing the results of previous studies comparing service innovation versus manufacturing innovation (Ettlie and Rosenthal 2011, Prajogo 2006, Song et al. 1999).

Traditionally we regard technology as less important for services and service innovations do not rely on technology as much as manufacturing innovations do. However, H6 is not supported and the mediation effect of technological capability has been found statistically same across service firms and manufacturing firms. This may indicate that nowadays technological capability becomes a critical competence for both manufacturing firms and service firms, and especially the development of information and communication technologies has changed our way of life as well as how service firms innovate to satisfy unmet customer needs.

We did further analyses for the comparison of mediation effects of technological capability and supplier collaboration within manufacturing firms and within service firms, respectively. Results have shown that for manufacturing firms, the mediation effect of technological capability is higher than the mediation of supplier collaboration (the difference is 0.250, p=0.009), which has to certain extent supported the traditional view. Whereas for service firms, the mediation effect of technological capability is as high as the mediation effect of supplier collaboration (the difference is -0.014, p=0.921), which once again supports the importance of technological capability for both manufacturing firms and service firms.

Finally, this study has suggested that the combination of SDL and RBV provides a useful theoretical angle to understand service innovation versus manufacturing innovation. Further, results also indicate that SDL would be applicable in service context as well as manufacturing context, yet the premises of SDL would show stronger effect in service context because customer orientation has stronger effect on innovativeness in service firms than that in manufacturing firms, and customer-oriented service firms are more relied on relational resource than customer-oriented manufacturing firms.

Although this study has several important research and managerial implications, the following limitations have been recognized, providing opportunities for future research. First, the sample of this study was drawn from China which is still relatively dominated by manufacturing rather than services, compared with the fact that most developed economies nowadays are undoubtedly dominated by services. It would be interesting to see studies that replicate the present study with data from other countries. Second, the current study considers only two critical firm resources as mediators, one organizational capital resource and one physical capital resource. Future research could investigate other mediators between customer orientation and innovation, which will help us to have a more comprehensive understanding of the indirect effect of customer orientation on innovation. Finally, the data used in this study are cross-sectional. It would be interesting to longitudinally trace the process from customer needs to the development

activities and resulting innovations.

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Appendix: Measurement Items

Customer orientation

CO1. Our firm divides customers and markets into segments to better define and understand customer needs.
CO2. We systematically seek to understand customer needs and preferences in different market segments.
CO3. The features of our products/services are designed based on the voice of customers.
CO4. We give close attention to customer services and provide convenience for customers to check information, to make transactions, and to complain.
CO5. We measure customer satisfaction and loyalty systematically and frequently to improve our products/services.

Supplier collaboration

SC1. We maintain intensive communication with suppliers as to the key factors influencing product/service quality and changes in design.
SC2. Our firm actively requires suppliers to participate in our activities to improve the product/service quality.
SC3. We often enquire our suppliers' ideas and opinions about the product/service design.
SC4. Suppliers often participate in our firm's projects during product/service design stage.

Technological capability

TC1. Our firm incorporates new technologies and new knowledge into the design of production/service processes.
TC2. Our firm uses information technology to reform the production/service process.
TC3. Our firm emphasizes the renovation of equipment and timely evaluation of current technologies.
TC4. Our firm continuously improves the technological capability and innovation capability.

Product/Service innovativeness

SI1. The products/services we designed are full of creative ideas.
SI2. The products/services we designed are often new to the market.
SI3. The products/services we designed changed the industry greatly.
SI4. The products/services we designed often involve new technologies.

Competitive financial performance

Please indicate the performance of your company's main products/services compared with your major competitors' during the past three years, with a 1 indicating significantly worse than competitor and a 6 indicating significantly better than competitor.
FP1. Overall profitability; FP2. Sales growth; FP3. Growth of market share; FP4. Return on investment (ROI); FP5. Growth of ROI; FP6. Return on sales (ROS); FP7. Growth of ROS