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The Impact of Market Orientation on Innovation Performance: Does Service Innovation Matter?

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Abstract
The market orientation has been found to be a major driver of innovation performance in service contexts. This issue raises questions concerning the extent to which the relationship market orientation-innovation performance link holds in the high-tech industry. Relatively litter research has examined how market orientation contributes to innovation performance through service innovation. We report an empirical study of 235 Taiwanese high-tech firms to examine the influence of market orientation on service innovation and innovation performance. A surprise finding shows that the impact of market orientation on innovation performance is fully mediated by service innovation. The findings of this study should help managers deliberated the service innovation in high-tech industry.

Keywords: Market orientation, innovation performance, service innovation

1. Introduction

Service innovation (SI), a concept that has long been studied in service management research, is a foundation for different issues in service industry such as customer-involvement (Bendapudi & Leone, 2003), knowledge transformation (Muller & Zenker, 2001), cooperation (Mention, 2011), innovation patterns (Chang, Chang, Chi, Chen, & Deng, 2012), and service-specific measurement (Hipp & Grupp, 2005). Beyond the service industry, researchers have recently begun to examine in high-tech industry within the contexts of co-production (Chen, Tsou, & Ching, 2011), small-and-medium enterprises (SMEs) (Amara, Landry, & Traoré, 2008), and knowledge acquisition (Cassiman & Veugelers, 2006). Service innovation was first discussed by Vandermerwe and Rada (1989), who refer the process of creating value by adding services to product offering. This process is seen as being driven by ever more complex customer demands. Gronroos (1990) define service innovation as the new service product, the new procedure for producing or delivering a service. Service innovation is thus referred to the development of novel ideas and offerings for improving service delivery processes (Sundbo & Gallouj, 2000). Service innovation is of particular importance in high-tech industry because service innovation becomes a major source of competitive advantage for high-tech firms cultivating the ability to use knowledge gleaned from customers, competitors, and their own coordination capabilities to

create meaningful and distinctive services.

The study of service innovation in the high-tech sector is relatively recent and clearly under-represented in the innovation literature. In fact, until the early 2000s, the high-tech sector was largely neglected. Most high-tech firms were mainly concerned with technological innovation, which is believed to be the main engine of firm's growth; furthermore, the high-tech firms were traditionally regarded as being less intensive in service innovation. When service innovation was newly studies by manufacturing industry such Pires, Sarkar, and Carvalho (2008); Santamaría et al. (2012), we noted that service innovation would have been more appropriate for understanding how high-tech firms identify such innovation. Following the logic, we argue that service innovation is equally, if not more, relevant for understanding innovation performance in high-tech industry level. Failing to develop service innovation may result in damage to firm's innovation performance. For example, Google, just seven years after its founding, has achieved a valuation of market performance that surpasses it competitor (e.g., Yahoo). Although the above anecdote clearly illustrates the important role of service innovation in high-tech sector, extant research on service innovation in this area has been scanty and incomplete. This research intended to cover these weaknesses found in the preceding literature.

Along with SI, market orientation (MO) has also been discussed in high-tech firm's innovation (e.g., Aldas-Manzano, Küster, & Vila, 2005; Jiménez-Jimenez, Valle, & Hernandez-Espallardo, 2008; Laforet, 2009). The links between MO and the innovation are far from being fully explained (e.g., Lukas & Ferrell, 2000; Zhou, Kin, & Tse, 2005). The relationships between the three components of MO (i.e., customers, competitors, and inter-functions) and the innovation, in particular, meets very mixed findings and arguments in the literatures. Some scholars suggest that MO leads to successful innovation (Deshpandé, Farley, & Webster Jr, 1993; Slater & Narver, 1994). On the contrary, others argue that MO has negative consequences for innovation performance because it leads to the development of uncompetitive "me-too" products rather than real innovations (Atuahene-Gima, 1996; Gatignon & Xuereb, 1997). Consequently, empirical research has found no evidence of any significant relationship between MO and innovation whether MO facilitates or impedes innovation remains unanswered (Zhou et al., 2005). We thus argued that scholars need to clarify this disparate findings and contention to investigate how MO could possibly influence on firm's innovation performance.

This paper will examine the ways that MO and service innovation both contribute to our understanding of innovation performance in high-tech industry. Empirical research in the link between these three concepts is still scare. In particular, the purpose of this paper is to study empirically the relationships between MO, service innovation, and innovative performance together in a single model. The paper starts with a discussion of MO in the issue of innovation. This is followed by a discussion of the nature of service innovation in the topic of innovation performance in high-tech industry. Next, Figure 1 shows a causal model to explain the relationship between these variables. This is followed by a test of the model using a sample of 235 high-tech firms. Finally, the findings are presented along with the managerial and academic

implications, its limitation and recommendations for future research.

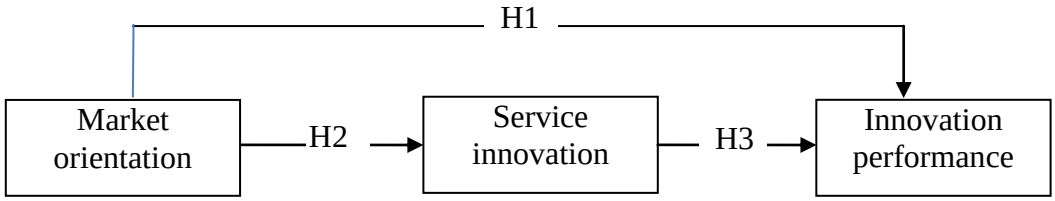

Figure 1. The proposed model

2. Theoretical development and hypotheses

2.1. MO and innovation performance

MO has been constant research focus for the past 20 years. Among the many contributions, two frameworks for studying MO can be distinguished in the literature. On the one hand, the work of Kohli and Jaworski (1990) is founder on the three basic pillars of marketing (i.e., generation, dissemination and responsiveness to market intelligence). On the other hand, Narver and Slater (1990) work stresses the MO is an organizational culture made up of three behavioral components: customer orientation, competitor orientation, and inter-functional coordination. Together with the concept of MO, the concept of MO is referred to the generation and dissemination of market information inter-functional coordination of this information directed at creating value for customer (Aldas-Manzano et al., 2005; Keskin, 2006). In addition, MO as a resources of a high-tech firm to provide a sustainable innovation performance (Augusto & Coelho, 2009), a MO high-tech firm is presumed to have superior market-sensing and customer-linking capabilities, and these capabilities are presumed to assure them higher innovation performance in comparison with firms that are less MO (Baker & Sinkula, 2007).

To facilitate novelty within a high-tech firm, inter-functional coordination entails the collaboration of different units that can facilitate the generation, collection, and dissemination of market intelligence pertaining to innovation development across functional areas (Auh & Menguc, 2005). In addition, developing a new technology requires inter-functional collaboration to solve technical and market issues and to achieve speed (Cambra-Fierro, Florin, Perez, & Whitelock, 2011). It involves sharing of new ideas, resolution of problems, and innovative responsiveness (Akman & Yilmaz, 2008). Thus, rapidly disseminating of new intelligence to functional unit and coordinating the unit's synergistic required in order to create innovation performance.

MO can be viewed as organizational behaviors related to the external market environment (Deshpandé & Farley, 1998). Because of the external focus on developing information about fiercely change market of high-tech industry, MO high-tech firms are arguably well positioned to anticipate and respond to the emerging needs of their customers (Joshi & Sharma, 2004) and may also be more likely to innovate successfully. Competitor orientation can enhance a high-tech firm's ability to analyze and respond to competitor's strategy, thus allowing it to offer innovative products that differ from those of its competitors (Zhou & Li, 2007). Furthermore, scanning competitors can help high-tech firms to identify emerging novel substitutes. This information can be incorporated into innovative strategy in determining the timing of innovative product of market entry. Thus, without competitor knowledge, high-tech firm's managers cannot identify the best courses of action to enhance their innovation performance. Accordingly, we propose the

following hypothesis.
H1: MO has a positive impact on innovation performance.

2.2. Service innovation and innovation performance

Innovation performance becomes difficulty be achieved when innovation that used to create them area easily subject to imitation or substitution by competitor (Laursen & Salter, 2006; Tsai, 2009). Technical change is strongly attributed to innovation performance, and the use of the same definition may fail to capture a majority of innovation performance unless we redefine innovation performance one step further. In this study, innovation performance refers to results for firms in terms of the degree to which they actually introduce new goods or substantially improve services into the market. This definition expends the research limitation of innovation performance in prior studies (e.g., Wang, 2011). In other words, this redefinition on innovation performance in the service innovation sense focuses on both technical aspects of innovation and the introduction of new services into the market.

In line with this logic, to have untimed innovation performance, service innovation must be considered by high-tech industry, since they are always overlooked the service aspects of high-tech products, namely service myopia (Bateson & Hoffman, 2011). For example, the iPhone may view itself as being in the high-tech product and primarily focus on the iPhone itself. High-tech product has very short product life cycle because of their technology is fastly diffusion (Adner & Levinthal, 2001). However, a service innovation view recognizes that it is providing the consumer with a friendly experience that has been deliberately created for the targeted customer (Song, Song, & Di Benedetto, 2009; Tsiotsou, 2010). Interestingly, adding service aspects to a high-tech product often differentiate the high-tech firm from their competitor, and by doing so, increases the innovation performance producing opportunities of the high-tech firm dramatically.

The aforementioned scenario does not evoke service innovation as a principal explanation for the effect of MO on innovation performance. We suggested that service innovation allow high-tech firms to leverage their MO. Firstly, high-tech firms can only makes value propositions; the MO must interpret and co-create that value (Michel, Brown, & Gallan, 2008). Service innovation generally involves many more customer experiences, than do high-tech product. These experiences can directly influence the customer's assessment of value that coverage to create innovation performance (Sin, Alan, Yau, Lee, & Chow, 2002; Voon, 2006). Secondly, we uncovered relates to service innovation integration, specifically, in the high-tech firm's manufacturing and service roles. Innovation performance exists because of the division of labor, so the integration of different knowledge sources must be part of service innovation co-creation. In other words, the distinction between good products and service activities becomes increasingly unnecessary in intra-organization (Armbruster, Bikfalvi, Kinkel, & Lay, 2008; Lay, Copani, Jäger, & Biege, 2010). Indeed, offering service innovation is driving firms to improve their technological-based products which meet the innovation breakthrough in product itself (Santamaría, Jesús Nieto, & Miles, 2012).

Finally, in a fiercely competitive environment, successful high-tech firms must have service innovation sensing abilities that routinely gather new information from a variety of competitor's sources to utilize as input for expanding the strategy mix. Novel service innovation information of competitors allows better prediction of competitor's possibly future strategy. Without this competitive service innovation Knowledge, reduces innovation performance as high-tech firm lacks confidence in accurately predicting competitors'' reactions to possible strategies (Morgan & Berthon, 2008). We thus expect that the simultaneous development of a high-tech firm's MO and service innovation will reinforce a high-tech firm's innovative capability, in turn, to improve its innovation performance (Spohrer & Maglio, 2008). This implies that MO is expected to

positively influence innovation performance via its positive impact on service innovation. Therefore, we posited the following hypothesis.

H2: Service innovation mediates the relations between MO and innovation performance.

2.3. Service innovation and innovation performance

From the perspective of traditional technology innovation theory, it remains difficult to understand what service innovation is. Service innovation differs from the traditional technological innovation in following way (Vargo & Lusch, 2008). Firstly, the service delivery stuff including service providers and contact personnel are part of customer experience and thus part of the innovation (Flint, Woodruff, & Gardial, 2002). The most successful high-tech firms will not be those who focus exclusively on their own competitive advantage (e.g., technological innovation). Quite the contrary, high-tech firms that incorporate customers' experiences into firm's innovation will be strong in innovation performance even in the future (Moller, Rajala, & Westerlund, 2008; Vargo & Lusch, 2004).

Through mutual investments and adaptions, a high-tech firm and a customer can produce more effective solution than existing ones. This service innovation strategy adds value to the existing market solutions. Most service innovation requires a high degree of integration between the high-tech firms and its customers, especially in knowledge-intensive sector. A more new approach is to offer the customer not the technology-based product per se, but rather the goal that the purchase of the high-tech product will ultimately fulfill the functionality it will provide such as Cloud computing (Abramovici & Bancel-Charensol, 2004; Blazevic & Lievens, 2008). For example, Apple iTunes is a digital media player application. The actual value of the innovation comes from the services that allow customers to connect to the online store to download, purchase, and share digital products. Apple has successfully used service innovation to break the traditional modes of the high-tech industry (Paswan, D'Souza, & Zolfagharian, 2009).

Secondly, service innovation can also help increase the demand for a technology-based product, thus making them potentially important for the competitiveness of high-tech firms. These high-tech firms offer new services to improve the acceptability, functionally, and performance of existing goods (Gebauer, Edvardsson, & Bjurko, 2010). In other words, customers are motivated by achieving a positive change in their business or lives through the service innovation offered by the high-tech firms. It leads that customers are willing to pay a premium for new features. Adding new services to a technology-based product is a way to differentiate high-tech firms from competitor's and sustains their innovation performance (Gebauer, Fleisch, & Friedli, 2005). Therefore, we posited the following hypothesis.

H3: Service innovation has a positive impact on innovation performance.

3. Methodology

3.1. Sample and data

The research focuses on the high-tech sector because these high-tech firms involved have been thought to be most required by service innovation. Additionally, the high-tech industry is appropriate because rapid change in market and technological development in these sectors make service innovation in technological-based product exchange particularly salient. The sample data was drawn from the top 1,000 Taiwanese manufacturing firms, which are produced annually by *Commonwealth*. The original observations of 1,000 firms from the *Commonwealth* have been used to support previous research (Chao-Hung Wang 2014; Gatignon & Xuereb, 1997; Jaw, Lo, & Lin, 2010; Zhou, Brown, & Dev, 2009). We exclude the 300 small and traditional manufacturing firms such as foods, beverage, textile and furniture, etc. Since these firms usually lack the innovative activities and formal organizational function. The remain Taiwanese high-

tech firms whose incorporation of service innovation practices into their innovative activities. Thus, the sample is representative of not only the high-tech industry but also businesses in other service industry such as logistics, transportation, etc.

Table 1 summarizes the characteristics of the respondent firms. A total of 700 questionnaires were distributed and 235 responses were received for a response rate 33.5%. We conducted a chi-square test to check for non-response bias by comparing the response with the profile of the sample on characteristics such as industry, capital, and number of employee. These tests showed no significant difference ($p<0.05$), which suggests that non-response bias was not a problem in this study. We further compared early and late respondents in terms of the means of all items using t-test (Armstrong & Overton, 1977). These comparisons did not reveal any significant differences, indicating no systematic differences were found between early and late respondents.

Table 1. Industry-sector distribution of the sample

Industry-sector	SIC code	Number of firms involved in this study	Number of Response
Computer equipment	3571	118	48
Electronic equipment	3641	160	36
Communication equipment	3663	88	30
Machinery equipment	3541	160	32
Semi-conductor and related	3674	52	28
others		122	61
Total		700	235
Response rate			33.5%

If a significant amount of common method bias exists in the data, then a factor analysis of all the variables in the model will generate a single factor that accounts for most of the variance (Podsakoff, 2003). Harman (1976) one-factor test was also performed. The results show that there were several factors with an eigenvalue greater than one using un-rotated factor analysis, and the first factor explained only 17.9% of the variance in the data, which suggests that the data were not subject to common method bias.

Table 2 provides an overview of the characteristics of the sample in terms of company age, number of employee, and company capital. The largest group of firms established between 31 and 40 years (33.2%), then 27.2% between 21 and 30 years, the smallest group for firms between 11 and 20 years (5.1%). The most of firms have employees ranging from 101 to 500 (33.6%); 18.3% of the firms worked in a firm that employees over 2,000. 35.7% of firm's capital excesses 2,000 million NTD. Table 3 provides a summary of the characteristics of the respondents. Basically, service innovation is likely to be developed by marketing, planning, and business department, managers were chosen from these fields. Among the 235 respondents, 30.21% were responsible for business department and 25.53% in other categories. The highest position of respondents is CEO, with 15.31%, 79(33.61%) respondents were departmental manager, 28.08% of the respondents considered their job relative to service innovation (e.g., R&D engineer and general manager, etc.). The most of respondents claimed that they had worked in the company in the period of 7-10 years, and the least of respondents (8.51%) worked less than 3 years.

Table 2. Characteristics of sample

Characteristics	Number of response	Percentage
Company age		
0-10 years	35	14.8%
11-20 years	12	5.1%
21-30 years	64	27.2%
31-40 years	78	33.2%
> 41 years	46	19.5%
Number of employees		
1-100	32	13.7
101-500	79	33.6%
501-1,000	54	23%
1,000-2,000	27	7.1%
> 2,000	43	18.3%
Company capital (million NTD)		
≦100	41	17.4%
101-500	23	9.8%
501-1,000	13	5.5%
1,000-2,000	74	31.5%
>2,000	84	35.7%

Table 3. Distribution of respondents

Characteristics	Number of respondents	Percentage
Department		
CEO office	22	9.36%
Planning	13	5.53%
Marketing	69	29.36%
Business	71	30.21%
Others (e.g., staff of CEO office)	60	25.53%
Respondent title		
CEO	36	15.31%
Manager	79	33.61%
Vice manager	54	22.97%
Others (e.g., engineer)	66	28.08%
Tenures with company		
<3 years	20	8.51%
4-6 years	36	15.31%
7-10 years	74	31.48%
11-20 years	56	23.82%
>21 years	49	20.85%

3.2. Measurement

The theoretical constructs in the study were measured using multi-item scales. The measurement instruments were taken from the literature when available. However, since we did not find a precise or definitive set of items, we made some minor modifications to suit our particular case in some instances.

3.2.1. Dependent variables

Prior research has used many indicators of innovation measuring innovation performance by combining several dimensions related to the levels of innovation activities such as R&D inputs, patent counts, patent citations, or counts of new product announcements (Li & Tang,

2010; Liu & Buck, 2007; Zeng, Xie, & Tam, 2010). Recently some scholars question the advantage of using these indicators to measure innovation performance (e.g., Hagedoorn & Cloodt, 2003). Thus, this study used self-reported data as a valid indicator. Subjective innovation performance measures were used because subjective measures have been shown to be correlated to objective measure of innovation performance (Dess & Robinson, 1984; Slater & Narver, 1994); moreover, subjective measures have been used in prior MO-performance studies (Cheng & Krumwiede, 2012; Jaworski & Kohli, 1993).

In order to encompass the measurement of innovation performance, as it indicates the achievement from technology to service. The six items of innovation performances therefore overarches the measurement of innovation performance of service product and process. We used five items to assess the innovation performance. These items tap into the multiple facets of innovation performance incorporated in our definition, including service, product, and process. Respondents expressed their level of agreements of 7-point scale (from 1=disagree strongly to 7=agree strongly). This self-reported data is also widely adopted by prior research (Keeble, 1997; Xavier Molina-Morales, Teresa Martínez-Fernández, & Torlò, 2011).

3.2.2. Independent variables

Service innovation is operationalized as the firm introduces the new services into the market or significantly improved existing services. Previous studies by Cheng and Krumwiede (2012), Chen et al. (2011), Avlonitis, Papastathopoulou, and Gounaris (2001) provided guidance in developing items. We use six items to measure the construct of service innovation.

There is some debate as to whether MO is best measured from the viewpoint of the firm itself or from that of the customer. Most of studies are based on the former. Thus, we opted to follow the majority and consequently decided to measure MO from the point of view of firm. Based on the MKTOR scales (Narver & Slater, 1990), we decided to use a modified 9 items version of MO scale. In particular, we used a list of items for each of the three dimensions of MO: competitor orientation, customer orientation, and inter-functional orientation. All items are listed by Appendix.

3.3. Measure validation

Measure validation began with exploratory factor analysis (EFA) and reliability analyses to purify the scales and ensure consistency of the items. The analysis revealed that one item for innovation performance and three items for MO were not consistent with the scales. After deletion of these items, we considered a confirmatory factor analysis (CFA) to assess construct reliability and unidimensionality. The results of CFA for measure validation the model fit for the CFA was reasonable (Hair, 2006), with a chi-square of 334.29(df=149), and a RMSEA of 0.065 and CFI of 0.918, Standardized item loadings for all constructs were statistically significant ($p<0.01$).

The construct reliabilities ranged between 0.860 and 0.867. And the average variance extracted (AVE) for the measures ranged from 47% to 51.7%, meeting standards accepted in the literature (Nunnally, 1994). Discriminant validity was evaluated through CFA of construct pairs. This study computed the AVE and compared it with the variance that each factor shared with the other factors in the model. Table 4 shows the results that all the diagonal elements represent the square root of the AVE are greater than the highest shared variance (the off-diagonal correlations). The method has been widely used by prior studies (e.g., Kandemir, Yaprak, & Cavusgil, 2006).

Table 4. Descriptive statistics and correlations

	Mean	S.D.	1	2	3
1 . Market orientation	4.495	1.177	0.71		
2. Service innovation	4.892	0.971	0.518**	0.78	
3. Innovation Performance	4.084	1.203	0.463**	0.366**.	0.75

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

4. Results

We estimated the structural model by AMOS 17.0 using the maximum likelihood estimation method. Table 5 identifies the overall and increment fit statistics of the theoretical structural model. The overall fit statistics of Model 3 indicate an adequate model fit (χ^2 =220.502, df=160; GFI=0.915; RMSEA=0.040). However, the measures of incremental fit, which compare the specific model to a null, are excellent (IFI=0.975; NFI=0.913). H1 predict positive relationships between MO and innovation performance. The path coefficient is found to be significant and positive (β=0.717, t=7.252, p<0.001). Thus, H1 is supported. This finding is consistent with previous studies (e.g., Atuahene-Gima, 1996; Vázquez, Santos, & Álvarez, 2001). Atuahene-Gima (1996) proposed an empirical study of 158 manufacturing and 117 service firms in Australia to examine the influence of MO on innovation performance. The results indicated that MO makes a significant contribution to innovation performance. Vázquez et al. (2001) have verified empirically that MO high-tech firms obtain significantly better results in innovation performance.

The results support H2, as the service innovation positively influences the innovation performance (β=0.616, t=6.145, p<0.001). This findings is congruence with studies that have posited that service innovation is the facilitation and generation of outcomes that benefit innovation performance regardless of financial rewards or market positions (e.g., Alam, 2006; Benner & Tushman, 2003; Song et al., 2009). Table 5 presents the results and displays coefficient estimates and t-statistics. The study examines mediation in the following way. Firstly, service innovation-innovation performance (β=0.737, t=6.712, p<0.001) link is significant, thus, H3 is supported. Secondly, MO-innovation performance was added with SI-IP simultaneously included and found to be insignificant (β=0.126, t=0.921, p>0.05), suggesting the mediating role of service innovation between MO and innovation performance. To test MO's direct effect on innovation performance, we removed service innovation and conducted a model 1 analysis. Results of this analysis showed that the MO-innovation performance link is significant when service innovation is excluded from the model 1, supported the hypothesis that MO could influence innovation performance, but its effect is mediated by service innovation. This result provides evidence for the hypothesized mediating role of service innovation between MO and innovation performance.

Table 5. Testing mediator effects using structural equation model

Testing steps in mediation model	Model 1		Model 2		Model 3	
	Coefficients	t values	Coefficients	t values	Coefficients	t values
Testing Step 1						
Outcome: Innovation performance						
Predictor: MO (H1)	0. 717***	7.252				
Testing Step 2						
Outcome: Service innovation						
Predictor: MO (H2)			0.616***	6.145		
Testing Step 3						
Outcome: Innovation performance						
Mediator: service innovation (H3)					0.737**	6.712
Predictor: MO					0.126	0.921
Overall fit						
χ^2	134.758		108.757		220.502	
df	72		71		160	
RMSEA	0.061		0.048		0.040	
GFI	0.923		0.94		0.915	
NFI	0.962		0.96		0.913	
IFI	0.922		0.93		0.975	

* $p < .05$; ** $p < .01$; *** $p < .001$

5. Discussion

Our interest in investigating the role of MO in innovation performance was triggered by service innovation in the high-tech settings. This study extend prior studies (e.g., Deshpandé et al., 1993; Lukas & Ferrell, 2000; Zhou et al., 2005) that report MO as a direct antecedent to performance but fail to providing compelling argument as to why it has such impact. An interesting finding is that MO has a strong direct effect on innovation performance, but its effect is insignificant when mediated by service innovation.

Many of our findings offer guidance to technological management practitioners, by elaborating our conceptual model, we offer a rich set of results. The role of MO in affecting organization performance is well discussed in the organization literature (Baker & Sinkula, 1999; Hult & Ketchen, 2001; Kirca, Jayachandran, & Bearden, 2005). What is less understood is how MO affects innovation performance rather than market, financial, organizational performance, etc. Our findings suggest that a major concern is the development of MO, but also the innovation performance under evaluation. It is quite plausible in theory that true effects of MO can be more closely ascertained in relation to innovation performance, the reason being that these are more likely to result from a greater understanding of customers' needs, competitors' strategies and the market sensing.

We suggest high-tech firms should strive to improve their MO so as to increases their technological-based product quality, in turn, which related to superior innovation performance. The finding that service innovation strongly influences innovation performance in high-tech industry. Traditionally, the scenarios of innovation performance in high-tech firms include those of R&D inputs (Wang, 2011), new product development (Rothaermel & Deeds, 2004), technological innovation capabilities (Yam, Lo, Tang, & Lau, 2011), and technology acquisition

(Tsai & Wang, 2008). We recognize that the idea of recommending high-tech firms to actively invest these resources of innovation performance sounds ill-advised because the overlap between each of these resources is that great (Hagedoorn & Cloodt, 2003), leaving very little space for breakthrough the innovation performance. However, it should be noted our finding suggest that service innovation exert a significant impact on product or/and process innovation performance in these high-tech firms. This finding provide us with a better understanding of the sources of innovation performance in the high-tech firms and highlight the need to analyze the service innovation and innovation performance together.

Previous MO research suggested that the MO are implemented and determined their performance (Agarwal, Erramilli, & Dev, 2003; Gotteland & Boulé, 2006; Rodríguez-Pinto, Carbonell, & Rodríguez-Escudero, 2011). In contrast, our study indicated that the effects of MO are not straightforward and it is not sufficient to examine the presence or absence of innovation performance. Specifically, our analytical service innovation also helps us to refine the argument that the link MO-innovation performance is likely to be mediated by service innovation. Managers must recognize that a failure to include service innovation will present an incomplete picture of the determinants of innovation performance. Relation capital theory (Kale, Singh, & Perlmutter, 2000) provides a possible explanation for the finding. High-tech firm investment in customer relationship network allows for successful access to, and usage of, new information that exist in the social network, which informs managers of customer future desires; thus, high-tech firms can recognize the need to develop service innovation to satisfy customer want in a timely manner (Alam & Perry, 2002). Recall to the main question addressed in this study "Does service innovation matter in high-tech industry?" Our study provides clear evidence to rationalize and design a service innovation system that promotes MO. Further, after MO being successfully implemented, managers need to focus on incorporate MO into service innovation; thereby driving innovation performance.

6. Limitation and future research

Our study presents a first step toward uncovering service innovation in high-tech industry and study limitations suggest the need for additional research. First, since the sample for this research is drawn from the database of top Taiwanese 1,000 manufacturing firms, the applicability of these findings to other countries in developed countries (e.g., United States) should be considered with caution. Future researches in a wider variety of countries within high-tech firms are necessary to generalize the findings further. Secondly, this study is based on the management-reported assessments of MO, however, the evaluation of the high-tech firm's MO in prone to be evaluated by customers. Future research is needed to assess MO using customer-oriented assessment may be a better indicator.

Thirdly, while our study focuses on MO as they relate to innovation performance, additional managerial characteristics may contributes to innovation performance. Future research may therefore include other antecedent of innovation performance such as organization learning (Alegre & Chiva, 2008), alliance partner (Wang, 2011), intellectual capital (Hsu & Wang, 2012). Fourth, although our study provides new insights how service innovation in related to enhance innovation performance, it does not address how they are triggered to change levels of innovation performance. Hence, future research explicitly conducts qualitative research (e.g., in-depth case study) to better understand how the service innovation strategies changed overtime.

Limitation aside, our study represents a significant step in service innovation. In response to call for research or service innovation within high-tech industry, our study not only examines how respective MO and service innovation contribute to innovation performance, but also reveals service innovation mediates the effectiveness of MO in innovation performance.

Appendix

Service innovation [α= 0.86; CR= 0.85; AVE=0.62]

1. Our company totally developed new services.
2. Our company improved new services.
3. Our company repositioning of existing services.
4. Our company extended existing service line.
5. Our company offered new features that competitors do not offer in the market.
6. Our company tried to change the customers' behavior by offering new service.

Innovation performance [α= 0.89; CR= 0.82; AVE=0.57]

1. Our company significantly improves existing services of their basic characteristic and promote to the market.
2. Our company introduces new service into market.
3. Our company develops new product attributes. (deleted)
4. Our company develops new components.
5. Our company improves the level of automations.
6. Our company uses new energy sources.

Market orientation [α= 0.80; CR= 0.78; AVE=0.51]

1. Our salespeople regularly share information within our business concerning competitor's strategy.
2. We target customers in which we can develop a competitive advantage. (deleted)
3. Senior managerial staff discusses the strengths and weaknesses of our competitors with the other managers in the company.
4. When somebody in the company has important information about competitors, they quickly alert staff in other departments.
5. We periodically revise our products to ensure they match up what our customers want.
6. We supply our customers with complete information so they can get the best from our products.
7. The information on the satisfaction felt by customers is systematically distributed to all the activities in the company.
8. We meet periodically with our customers in order to find out what products they will need in the future. (deleted)
9. Any information that covers from the market is distributed throughout all departments and levels of the company.
10. Staff from the different activities in our company meets periodically for the joint planning of response to the change that take place in the business environment.
11. We share resources with other departments in the company.
12. All of managers in the company understand how the company can contribute to creating customer value. (deleted)

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