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The positive effects of relationship learning and absorptive capacity on innovation performance and competitive advantage in industrial markets

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ABSTRACT

This study utilized structural equations modeling (SEM) to explore the positive effects of relationship learning and absorptive capacity on competitive advantages of companies through their innovation performances in Taiwanese manufacturing industry. The results of this study showed that relationship learning and absorptive capacity positively influence upon innovation performances of companies, and further have positive effects on competitive advantages of companies. In addition, this study divided the sample into three groups by the levels of relationship learning and absorptive capacity and found that there was a significant difference of innovation performance among these three groups: 'Highly Capable Companies', 'Medially Capable Companies', and 'Lowly Capable Companies'. It is important for 'Lowly Capable Companies' to increase both of their relationship learning and absorptive capacity to enhance their innovation performances.

1. Introduction

If companies want to obtain sustainable competitive advantages, they can implement strategies that exploit their internal strengths and external opportunities and avoid their external threats and internal weaknesses (Barney, 1991; Porter, 1985). In the era of knowledge economy nowadays, innovation becomes a key source of competitive advantages (Daghfous, 2004; Prajogo & Ahmed, 2006). Successful innovation is affected by several environmental and contextual factors (Roberts & Amit, 2003; Roberts, 2003). For example, to improve innovation performance, companies are motivated to engage in learning activities in order to enhance their innovation capabilities under the context of technological changes and increasing global competition. Companies can learn from one another to increase their knowledge stock by the relationship learning. In the Chinese context, "guanxi" is as well as relationship, found to be important for business trust in the Chinese social connections (Farh, Tsui, Xin, & Cheng, 1998). Guanxi means the connection and networking between one and the others, such as the connections between companies and their suppliers, clients, and customers, etc. Relationship learning means that the management can develop and promote the learning capabilities of targeted customer–supplier relationships. Within the customer–supplier relationship, relationship learning cannot be mandated by either organization, but depends on both parties' willingness to cooperate in learning activities (Selnes & Sallis, 2003). Management can promote relationship learning by cultivating a collaborative culture and formulating specific objectives for joint learning activities (Selnes & Sallis, 2003). However, there was no research exploring the relationship between relationship learning and innovation performance. Therefore, this study wants to fill this research gap.

Besides the external relationship learning, companies need to have the internal capability—absorptive capacity to enhance their innovation performance. Absorptive capacity is defined as the ability to enable firms to effectively acquire and utilize external knowledge as well as internal one which affects their innovations (Daghfous, 2004; Fichman, 2004). Companies can not only rely solely on their external networking, but also have to develop their absorptive capabilities to obtain knowledge actively (Matthyssens, Pauwels, & Vandenbempt, 2005). They need to have approaches and mechanisms to learn, to disseminate, and to exploit knowledge which can lead to the new organizational innovations (Daghfous, 2004). Absorptive capacities of firms can influence the effectiveness of innovation activities (Cockburn & Henderson, 1998).

There was no prior study exploring the influences of the external factor and the internal factor upon innovation performance. This research selected the external factor, relationship learning, and the internal factor, absorptive capability, and explored their influences on the competitive advantage through the full mediator, innovation performance, in the Taiwanese manufacturing industry. Hence, the two antecedents of the research framework in this study are relationship learning and absorptive capacity, and the consequent is competitive advantage, while the full mediator is innovation

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performance. This study addressed three research issues. First, is relationship learning positively associated with innovation performance? Second, is absorptive capacity positively associated with innovation performance? Third, is innovation performance the mediator between the two antecedents, relationship learning and absorptive capacity, and the consequent, competitive advantage?

The structure of this study was as follows. A literature review was discussed in Section 2, and three hypotheses were also proposed in this section. In Section 3, this study described the methodology, the sample and data collection, and the measurements of constructs. Next, the descriptive statistics, reliability of the measurement, correlations between constructs, and the results of LISREL were shown in Section 4. In the end, this study mentioned the conclusions and implications in Section 5.

2. Literature review and hypothesis development

2.1. The positive effect of relationship learning on innovation performance

Relationship means "guanxi" in Chinese. Guanxi in traditional Chinese society is based on formal and informal connections that promote shared social experience among individuals and organizations. It is important for companies to build up the connections, networking and relationship with key customers and suppliers (Farh et al., 1998). The origin of guanxi is from the word "lun" which is used in the Confusian ideology to advocate the concept of guanxi (Tsui & Farh, 1997). Therefore, the relation-centered culture is one of the characteristics of the traditional Chinese society. Many studies about Chinese social relations have noted that in comparison with Westerners, Chinese have much stronger tendency to divide people into different groups which are treated in different ways. The tendency to treat people differentially on the basis of the relationship with them is why guanxi is such important in the Chinese and Taiwanese societies (Farh et al., 1998). In summary, guanxi, the relationship between one and the others plays a key role which can help companies to build up trust with their customers and suppliers in the Chinese and Taiwanese societies. Thus, in contrast to previous research about relationship learning that was conducted in the Western society, this study focuses on the relationship learning in the manufacturing industry in the Eastern society, Taiwan.

According to the resource dependence theory, an organization builds its collaborative relationships and organizes its resources in response to environmental uncertainty (De Ven, 1976; Pfeffer & Salancik, 1978). Companies are motivated to engage in relationship learning in order to obtain more control or to buffer the consequences from the environmental uncertainty (Selnes & Sallis, 2003). Companies can improve their relationship learning to facilitate the information exchange with their suppliers and customers, to develop knowledge-learning from external actors, and to update their R&D capabilities. Relationship learning means that the management can share information and develop relationship-specific memories of targeted customer–supplier relationships (Li, 2006). Within the customer–supplier relationship, relationship learning cannot be mandated by either organization, but rather learning depends on both parties' willingness to cooperate in joint learning activities (Selnes & Sallis, 2003). Relevant partners of firms' relationship learning are included customers, suppliers, competitors, consultants, government agencies, universities, research institutions, market research organizations, advertising agencies and sales/distribution agents (Appleyard, 1996). Several managerial approaches can enhance relationship learning, such as cultivating a collaborative culture, formulating specific objectives for joint learning activities, and developing relational trust (Selnes & Sallis, 2003).

Through relationship learning, the relevant partners of the relationship learning can identify ways to improve the quality, reliability, and speed of information and knowledge sharing. For manufacturers, possessing more knowledge and information about their customers enables them to provide and to develop more valuable products for their customers; likewise, possessing more knowledge and information about their suppliers enables them to choose proper components and qualified suppliers to satisfy their needs and wants (von Hippel, 1994). Within rapidly changing markets, there are significant incentives for companies to develop their networking to enhance their capabilities about relationship learning. Relational capital is defined as the relationships between a firm and its upstream suppliers, downstream clients, strategic partners or other external stakeholders. Chen, Lin, & Chang (2006) posited that relational capital is positively associated with new product development performance. In addition, information sharing between the two parties in a relationship is a necessary condition of relationship learning (Huber, 1991). To develop innovations, companies can learn from their partners, customers and suppliers through their relationship learning. Previous studies have observed that there is a positive relationship between organizational learning and innovation performance (Baker & Sinkula, 2007; García-Morales, Ruiz-Moreno, & Llorens-Montes, 2007).

Selnes and Sallis (2003) developed a theory of how management can develop and promoted the learning capabilities of targeted customer–supplier relationships. Relationship learning means that a supplier and a customer can improve their joint learning activities by facilitating information exchange, developing common learning arenas, and updating their behavior accordingly (Selnes & Sallis, 2003). The relational view of competitive advantage, however, identifies relationship learning as an important approach for enhancing competitiveness and creating profits in relationships (Li, 2006). Management can promote relationship learning by cultivating a collaborative culture, formulating specific objectives for joint learning activities, and developing relational trust (Selnes & Sallis, 2003). As relational trust develops, the effective learning is increased (Selnes & Sallis, 2003). Selnes and Sallis (2003) found that the learning capability of a relationship has a strong, positive effect on performance. There is no study exploring the positive relationship between relationship learning and innovation performance, so this study wants to fill this research gap. Based on the mention above, relationship learning enables companies to obtain crucial information and knowledge from their networking members for developing innovation (Selnes & Sallis, 2003). Because relationship learning can influence learning capabilities positively, this study asserts that relationship learning has a positive effect on the innovation performance. Hence, this study implies the following hypothesis:

Hypothesis 1. Relationship learning of firms is positively associated with their innovation performance.

2.2. The positive effect of absorptive capacity on innovation performance

Absorptive capacity is defined as a set of organizational routines by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capacity (Zahra & George, 2002). Acquisition of knowledge is the ability to recognize, value, and acquire external knowledge that is critical to a firm's operations (Lane & Lubatkin, 1998; Zahra & George, 2002). Assimilation of knowledge means a firm's routines and processes that allow it to understand, analyze, and interpret knowledge from outside sources. Transformation of knowledge means the firm's ability to develop routines that facilitate combining existing knowledge with newly acquired and assimilated knowledge (Zahra & George, 2002). Exploitation of knowledge is a firm's ability to apply new external knowledge commercially to achieve organizational objectives (Lane & Lubatkin, 1998).

Acquisition, assimilation, transformation, and exploitation of knowledge are important for organizational innovation. Absorptive

capacity appears to be one of the most important determinants of the firm's ability to acquire, assimilate, and profitably utilize new knowledge to increase its innovation performance. Firms need to raise their absorptive capacities to acquire, assimilate, transform, and exploit knowledge which can lead to the organizational innovations (Daghfous, 2004). Therefore, absorptive capacities of companies can affect the effectiveness of innovation activities (Cockburn & Henderson, 1998). In addition, absorptive capacity enables firms to effectively acquire and utilize external knowledge as well as internal one which affects their abilities of innovation (Daghfous, 2004).

Absorptive capacity is the ability to acquire, to assimilate, to transform, and to exploit knowledge which may determine its levels of organizational innovation and competence (Cohen & Levinthal, 1990; Daghfous, 2004; Fichman, 2004; Vinding, 2006). Cohen and Levinthal (1990) and Daghfous (2004) pointed out that the absorptive capacity of a firm is beneficial to organizational learning and R&D activities. Schilling (1998) asserted that through absorptive capacity, firms expand their knowledge and skill base, improve their ability to assimilate, to utilize future information, and eventually to enhance their performances of technological developments. Therefore, when firms have greater absorptive capacity, it would increase their performances of innovation. In addition, Cohen and Levinthal (1990) argued that absorptive capacity of a firm is critical to its innovative capabilities. Moreover, Cohen and Levinthal (1990) argued that the development of absorptive capacity is path-dependent, and asserted how lack of investment in absorptive capacity would impede the future development of technical capabilities. Because a firm's absorptive capacity can determine its organizational adaptability (Cohen & Levinthal, 1990; Daghfous, 2004), this study argues that absorptive capacity can influence its innovation performance positively. Therefore, this study proposed the following hypothesis:

Hypothesis 2. Absorptive capacities of firms are positively associated with their innovation performance.

2.3. The positive effect of innovation performance on competitive advantage

According to the resource-based view, companies within an industry may be heterogeneous with the respect to the strategic resources they control. There are four indicators to measure the potential of firm resources to generate sustainable competitive advantages—value, rareness, imitability, and substitutability. If a company obtains valuable and rare resources, it can exploit those resources in implementing value-creating strategies that cannot be duplicated by other companies to obtain sustainable competitive advantages. These resources may not be perfectly mobile across companies, and thus heterogeneity can be long lasting (Barney, 1991). Resources of companies include physical assets, capacities, organizational culture, patents, trademarks, information, and knowledge, etc (Daft, 1983). If value, rareness, imitability, and substitutability are the characteristics of resources of companies, they are helpful to innovation and companies can exploit them to gain competitive advantages (Learned, 1969; Porter, 1981). Innovation is a key source of competitive advantage in the era of knowledge economy (Daghfous, 2004; Prajogo & Ahmed, 2006). Innovation can create "isolation mechanisms" which protect profit margins and allow benefits to be gained for companies (Lavie, 2006). Innovation enables companies to create and deploy their capabilities that support the long-run business performance (Teece, 2007). Successful innovation can make external imitation more difficult and allow firms to sustain their advantages better (García-Morales et al., 2007). Therefore, innovation performance of firms would affect their competitive advantages, and this study implies the following hypothesis:

Hypothesis 3. Innovation performance of firms is positively associated with their competitive advantages.

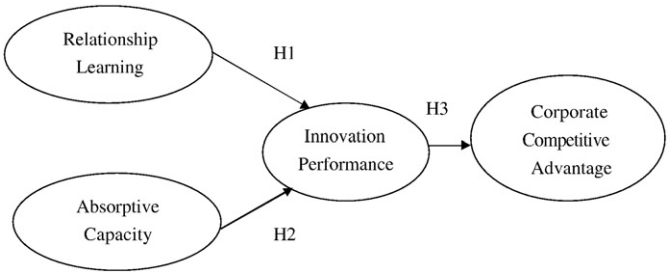

Fig. 1. Research framework.

2.4. The research framework of this study

This study proposed three hypotheses, and showed the research framework in Fig. 1. There was no previous research exploring the effects of the external factor and the internal factor on innovation performance. This study selected the external factor, relationship learning, and the internal factor, absorptive capability, and discussed their effects on the competitive advantage through the full mediator, innovation performance, in the Taiwanese manufacturing industry. Therefore, the two antecedents of the research framework in this study are relationship learning and absorptive capacity, and the consequent is competitive advantage, while the full mediator is innovation performance.

3. Methodology and measurement

3.1. Data collection and the sample

The unit of analysis in this study was the business level. This research employed an empirical study by use of the questionnaire survey method. The research object was the companies in the manufacturing industry in Taiwan. Prior to mailing to the respondents, six experts and scholars were asked to modify the questionnaire in the first pretest. Subsequently, the questionnaires were randomly mailed to ten CEOs or the managers of manufacturing, marketing, purchasing, HR or R&D departments in different Taiwanese manufacturing companies and they were asked to fill in the questionnaire and to identify the ambiguities in terms, meanings and issues in the second pretest. After the second pretest, the sample was randomly selected from "2006 Business Directory of Taiwan", and it covered the consumer electronics and electronic component industry, the optoelectronic and communication industry, the biotechnology and medical industry, the food industry, and the textile industry, etc. These industries face the highly uncertainty and competitive environment where the need for relationship learning, absorptive capacity, innovation performance and competitive advantage is intensive for manufacturing companies.

The respondents of the questionnaires were the CEOs or the managers of manufacturing, marketing, purchasing, HR or R&D departments in Taiwanese manufacturing companies. To heighten the valid survey response rate, this research called to each company that was sampled, explained the objectives of the study and the questionnaire contents, and confirmed the names and job titles of the respondents prior to questionnaire mailing. The respondents were asked to return the completed questionnaires within two weeks through mailing. High content validity is a necessary requisition for the questionnaire in this study. This sampling method, which separated informants for the measure of relationship learning, absorptive capacity, innovation performance and competitive advantage, is essential for this study because the casual attribution by a single informant for perceptually related constructs is considered a major source of common method variance (CMV) (Ayers, Dahlstrom, & Skinner, 1997; Olson, Walker, & Ruekert, 1995). To avoid common

Table 1
Means, standard deviations and correlations of the constructs

Constructs	Mean	Standard deviation	1	2	3	4
1. Relationship learning	3.88	0.67	1.000			
2. Absorptive capacity	3.70	0.81	0.568**	1.000		
3. Innovation performance	3.71	0.67	0.517**	0.596**	1.000	
4. Competitive advantage	3.59	0.73	0.267**	0.513**	0.463**	1.000

*$p<0.05$.
**$p<0.01$.

method variance (CMV), the respondents of different constructs in the questionnaire were different. The respondents of "relationship learning" are managers of marketing or purchasing departments of the manufacturing companies; those of "absorptive capacity" are HR or R&D managers; those of "innovation performance" are R&D managers; those of "competitive advantage" are CEOs in the Taiwanese manufacturing industry. The measurement of the questionnaire items in this study was by use of the "five-point Likert scale from 1 to 5" rating from strongly disagreement to strongly agreement. This study sent 500 questionnaires to the CEOs or the managers of manufacturing, marketing, purchasing, HR or R&D departments in Taiwanese manufacturing companies. There were 106 valid and 18 invalid questionnaires, and the effective response rate was 21.2%.

3.2. Definitions and measurements of the constructs

The questionnaire comprised five parts. The first part of the questionnaire consisted of the descriptive data of companies (including the number of employees, year founded, and industry sector, etc.); the second part was the measurement of relationship learning; the third part was the measurement of absorptive capacity; the fourth part was the innovation performance; and the fifth part was the competitive advantage. The definitions and measurements of the constructs were further defined as follows.

- *Relationship learning*: Relationship learning means that companies can improve learning activities by facilitating information exchange, developing common learning arenas, and updating their behavior accordingly from their suppliers, customers, partners, and stakeholders, etc (Selnes & Sallis, 2003).The measurement of relationship learning includes five items: (1) whether the company exchanges information related to changes in the technology of products with its relevant partners; (2) whether the company exchanges information related to changes in market structure, such as mergers, acquisitions, or partnering with its relevant partners; (3) whether the company is frequently influenced by its relevant partners to adjust its common understanding of trends in technology related to its business; (4) whether the company is common to establish joint teams to analyze and discuss strategic issues with its relevant partners; (5) whether the company and its relevant partners frequently meet face-to-face in order to refresh the personal network (Selnes & Sallis, 2003).
- *Absorptive capacity*. Absorptive capacity is what enables the companies to effectively acquire and utilize external as well as internal knowledge which affects the company's ability to innovate and to adopt to its changing environment (Daghfous, 2004). This study defines absorptive capacity as the ability to acquire, to assimilate, to transform, and to exploit knowledge which may determine its levels of organizational innovation and competence (Cohen & Levinthal, 1990; Daghfous, 2004). The items of the questionnaire about the measurement of "absorptive capacities" in this study include: (1) whether the company has the ability to apply new external knowledge commercially and invent new product; (2) whether the company of the corporation has the ability to understand ,analyze and interpret information from external knowledge; (3) whether the company has the ability to combine existing knowledge with the newly acquired and assimilated knowledge (Cohen & Levinthal, 1990; Daghfous, 2004).
- *Innovation performance*. To capture the varied aspects of innovation performance, this study built the construct for measuring product, process and overall assessment of organizational innovation on the basis of several criteria that were conceptualized and used in pervious empirical studies of innovation (Cordero, 1990; Utterback & Abernathy, 1975). The measurement of innovation performance included five items: (1) whether the company can improve its product quality by innovation; (2) whether the company can accelerate the commercialization pace of the new products by innovation; (3) whether the company make considerable profit from its new products; (4) whether the company can develop new technology to improve operation process; (5) whether the company purchase new instruments or equipments to accelerate productivity (Cordero, 1990; Govindarajan & Kopalle, 2006; Utterback & Abernathy, 1975).
- *Corporate competitive advantage*. Previous studies defined corporate competitive advantage as a company occupies some position where the competitors cannot copy its successful strategy and the company can gain the sustainable benefits from this successful strategy (Barney, 1991; Coyne, 1986; Porter, 1985). The measurement of corporate competitive advantage contained four items: (1) whether the company has the competitive advantage of low cost compared to other competitors; (2) whether the company has better managerial capability than other competitors; (3) whether the company's profitability is better; (4) whether the company is the first mover in some important fields and occupies the important position.

4. Empirical results

4.1. Model and analysis

This study utilized LISREL 8.72 to verify the research framework and hypotheses. The two antecedents of the research framework in this study are relationship learning and absorptive capacity, and the consequent is competitive advantage, while the full mediator is innovation performance. Through flexible interplay between theory

Table 2
The loadings (λ) of the items and the Cronbach's α coefficients and AVEs of the constructs

Construct	Items	λ	Cronbach's α	AVE	The square root of AVE
1. Relationship learning			0.846	0.525	0.772
	RL1	0.71			
	RL2	0.83**			
	RL3	0.70**			
	RL4	0.71**			
	RL5	0.66**			
2. Absorptive capacity			0.798	0.621	0.788
	AC1	0.49			
	AC2	0.86**			
	AC3	0.94**			
3. Innovation performance			0.828	0.521	0.722
	IP1	0.79			
	IP2	0.81**			
	IP3	0.61**			
	IP4	0.69**			
	IP5	0.68**			
4. Competitive advantage			0.814	0.523	0.734
	CA1	0.77			
	CA2	0.71**			
	CA3	0.71**			
	CA4	0.77**			

AVE is average variance extracted.
*$p<0.05$.
**$p<0.01$.

Table 3
Structural model results

Hypothesis	Proposed effect	Path coefficient	*t*-value	Results
H1	+	0.26	1.94*	H1 is supported
H2	+	0.54	3.29**	H2 is supported
H3	+	0.60	5.03**	H3 is supported

*$p<0.05$.
**$p<0.01$.

and data, the structural equation model approach bridges theoretical and empirical knowledge for a better understanding of the real world. In the structural equation model of this study, we examined the two level of analysis—the measurement model and the structure model.

4.2. The results of the measurement model

Table 1 shows the means, standard deviations and the correlation matrix of this study. In Table 1, there were significantly positive correlations among relationship learning, absorptive capacity, innovation performance and competitive advantage. In addition, there are several measurements to confirm the level of the reliability and validity of the constructs. One measure of the reliability is to examine the loadings of each of the constructs' individual items. With respect to the quality of the measurement model for the sample, the loadings (λ) of items of the constructs listed in Table 2 are significant. Cronbach's α is the other measure of the reliability. Table 2 listed Cronbach's α for the constructs, and showed that Cronbach's α of relationship learning was 0.846; that of absorptive capacity was 0.798; that of innovation performance was 0.828; and that of competitive advantage was 0.814. Because the Cronbach's α coefficients of all constructs were more than 0.7, the measurement of this study was acceptable in reliability (Hair, Anderson, Tatham, & Black, 1998). On the other hand, it is also important to verify whether the validity of the measurement in this study was acceptable. This study applied Fornell and Larcker's (1981) measure of average variance extracted (AVE) to access the discriminate validity of the measurement. The AVE measures the amount of variance captured by the construct though its items relative to the amount of variance due to the measurement error. To satisfy the requirement of the discriminate validity, the square root of a construct's AVE must be greater than the correlations between the construct and other constructs in the model. For example, the square roots of the AVEs for the two constructs, relationship learning and absorptive capacity, are 0.772 and 0.788 in Table 2 which are more than the correlation, 0.568, between them in Table 1. This demonstrates there is adequate discriminate validity between the two constructs. The square roots of all constructs' AVEs in Table 2 of this study were also greater than the correlations among all constructs in Table 1. Therefore, the discriminate validity of the measurement in this study was acceptable. Besides, if the AVE of a construct is greater than 0.5, it means that there is convergent validity for the construct. As shown in Table 2, the AVEs of the relationship learning, absorptive capacity, innovation performance and competitive advantage were 0.525, 0.621, 0.521, and 0.523 respectively, which were greater than 0.5, it indicated that there was convergent validity in this study. In sum, it demonstrated that there were adequate reliability and validity in this study.

4.3. The results of the structural model

This section presented the main result of this research. The VIF values of the model were below 10, so there was no "multicolinearity" in this model (Hair et al., 1998). Structural equations modeling was performed to estimate the effect using LISREL with the correlation matrix and covariance matrix as input. The type of analysis has the advantage of correcting for unreliability of measures and also gives information on the paths between multiple constructs after controlling for potentially confusing variables. The results of the structural model are presented in Table 3. All of the three paths estimated are significant. The overall fit measures, the signs and significant levels of

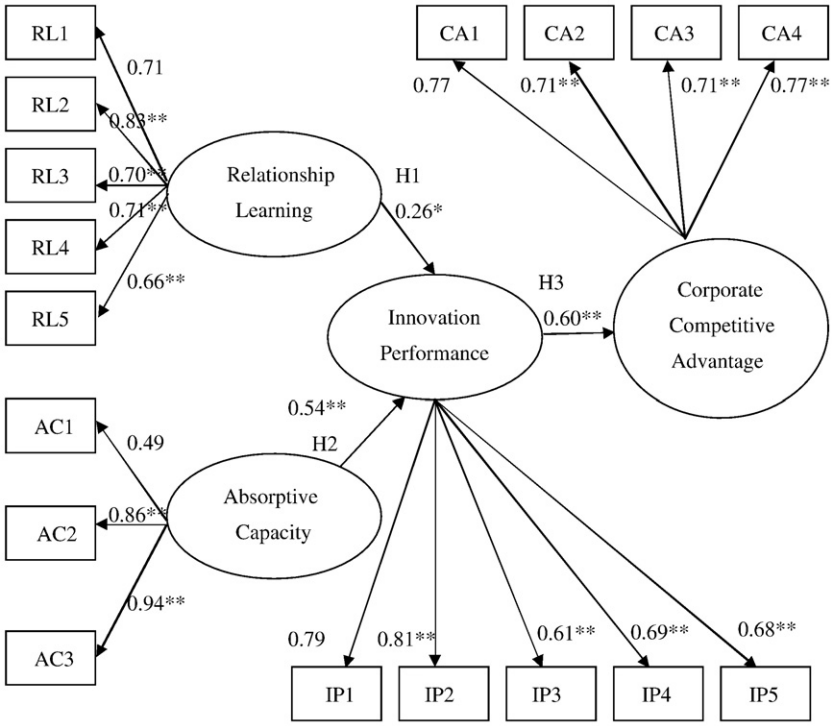

Fig. 2. Path coefficients.

Absorptive Capacity	Relationship Learning: High	Relationship Learning: Low
High	Highly Capable Companies	Medially Capable Companies
Low	Medially Capable Companies	Lowly Capable Companies

Fig. 3. The classification of the companies.

the paths coefficients all indicate the fit of the model is well (Chi-square = 143.78, RMSEA = 0.049, GFI = 0.86, CFI = 0.98). Adding more paths in this research framework would not significantly improve the fit. The residuals of the covariance were also small and centered around 0. Moreover, subsequent discussion will focus on the individual paths.

The results of the full model in this study are shown in Fig. 2. Relationship learning has a positive effect on innovation performance, and thus the result supports Hypothesis 1. In the Chinese context, guanxi based on several direct particularistic ties was important for suppliers, customers and other stakeholders. Companies acquired technology and knowledge through communication and information exchange via their networking partners. The result resonated with Selnes and Sallis's (2003) argument that relationship learning can gain mutual understanding with the customers and the suppliers of organizations for improving innovation performance. With respect to Hypothesis 2, the positive effect of absorptive capacity on innovation performance is highly significant. These results support the argument of Daghfous (2004) that absorptive capacity enables firms to effectively acquire and to utilize external and internal knowledge which affects innovation performance positively. If companies obtain knowledge or technology without the absorptive capacity, it can not perform well in innovation. In additional, the effect of innovation performance on competitive advantage is also highly significant, and thereby the result supports Hypothesis 3. The result is the same as previous study that asserted innovation can help companies to develop their competitive advantage (Learned, 1969; Porter, 1981).

4.4. Further exploration of the data

As shown in Fig. 3, this study classified the manufacturing companies in Taiwan into three groups by the levels of relationship learning and absorptive capacity. This study defined the relationship learning is high when it is higher than the mean value of the entire sample's relationship learning. On the contrary, it is defined as low when its relationship learning is lower than the mean value of the entire sample's relationship learning. Similarly, this study also defined absorptive capacity is high or low in the same way. The first group is named "Highly Capable Companies" and both of its relationship learning and absorptive capacity are high; the second group is named "Medially Capable Companies" and either its relationship learning or absorptive capacity is high; the third group is named "Lowly Capable Companies" and both of its relationship learning and absorptive capacity are low. The total sample size in the study was 106 including 36 highly capable companies, 31 medially capable companies, and 39 lowly capable companies. The study applied *t* test to explore whether innovation performance among three groups of firms were significant different. Table 4 showed that innovation performances of highly capable companies were significantly higher than those of medially and lowly capable companies in the Taiwanese manufacturing industry, and innovation performances of medially capable companies were significantly higher than those of lowly capable companies. This study found out that relationship learning and absorptive capacity are positively associated with innovation performance. Therefore, it is imperative for lowly capable companies to increase both of their relationship learning and absorptive capacity to enhance their innovation performance. In addition, there are two types of medially capable companies: the first type has high relationship learning and low absorptive capacity, and the second one has low relationship learning and high absorptive capacity. Therefore, if medially capable companies want to strengthen their innovation performance, the first type of medially capable companies should increase their absorptive capacity and the second one of medially capable companies should increase their relationship learning.

Table 4
Difference analysis of the innovation performance among three groups of firms

		Mean	A–B	A–C	B–C
Innovation Performance	Highly Capable Companies (A)	4.18			
	Medially Capable Companies (B)	3.76	0.42** (3.47)	0.94** (7.23)	0.52** (3.90)
	Lowly Capable Companies (C)	3.24			

*$p<0.05$.
**$p<0.01$.

5. Conclusions and implications

The empirical results of this study showed that relationship learning and absorptive capacity had positive effects on innovation performance, and innovation performance had a positive effect on competitive advantage. Therefore, H1, H2 and H3 were supported in this study. Hence, this research indicated that the more the investments in relationship learning and absorptive capacity, the better is the innovation performance. Besides, the more investments in innovation performance, the better is the competitive advantage. Therefore, in the era of knowledge economy, investments in the external determinant—relationship learning, and the internal determinant—absorptive capacity, is more important for companies to enhance their innovation performances and competitive advantages. Therefore, in the era of knowledge economy, companies should consider both of external and internal determinants simultaneously.

Previous research focused on the either internal or external effect on innovation performance or competitive advantage, but there was no research taking into the effects of both. Companies can not only rely on external information by relationship learning, but also develop capabilities to actively absorb relevant knowledge. This study summarized the literature on the relationship learning and absorptive capacity into a new managerial framework from the view of knowledge management. The results showed the internal and external effect of innovation—relationship learning and absorptive capacity fit the model exactly from the result of SEM. Therefore, this study indicated that relationship learning and absorptive capacity are two positive determinants for innovation performance and competitive advantage, and innovation performance mediates the relationship between relationship learning and competitive advantage, and that between absorptive capacity and competitive advantage.

Besides, previous samples in the stream of research were drawn form Western companies, we do not know whether such cultural effect generalize to Chinese social–cultural settings. Therefore, we

conducted the study to explore the idea of relationship learning in a different cultural context, Taiwan, where guanxi is thought to be the social relations which are the principles of interaction and social treatment between individuals who are connected by different guanxi bases. In a relation-centered world, trust is particularly important under such circumstances. This study found that the relationship learning is positively related to innovation performance in the Taiwanese manufacturing industry.

Abundant research opportunities exist in the areas of relationship learning, absorptive capacity, innovation performance and competitive advantage. Next, this research raised five topics for future studies. First, this study focused on the manufacturing industry in Taiwan, so further studies can focus on other industries or countries and compare with this study. Second, this study verified hypotheses by use of questionnaire survey, only providing cross-sectional data, so that this study can't observe the dynamic change of innovation performance and competitive advantage in the process of the development of the manufacturing industry in Taiwan through longitudinal data. Therefore, future studies can set forth toward the longitudinal study to find out the differences of innovation performance and competitive advantage in the different stages of the development of the manufacturing industry in Taiwan. Third, this study discussed relationship learning from the perspective of the company itself, so the further studies can focus on the interaction between the company and its customers or suppliers. A fourth area of attention is the additional variables that might be added to the model, such as organizational antecedents (e.g., the capability of knowledge socialization, combination, articulation or internalization), and other mediators might be included (e.g., the performance of new product development, product differentiation). Future decisions about the inclusion of more variables must be taken into consideration the trade-offs between the need for a parsimonious model and the desire for comprehensive one. A fifth research topic is to develop a multilevel model of innovation performance. Future studies can investigate the effect of individual-level and organizational-level factors on observed behavior such as learning and absorptive capacity and the subsequent development of innovation performance. Finally, this study hopes that the research results are beneficial to managers, researchers, or governments, and contribute to relevant studies and future researches as reference.

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