INNOVATION ORIENTATION、SUPPLY CHAIN INTEGRATION AND SUSTAINABLE COMPETITIVE ADVANTAGE: EVIDENCE FROM MANUFACTURERS IN TAIWAN

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Abstract

Responding to the trend of industrial globalization and the progress in information technology in recent years, numerous countries have attempted to enhance corporate productivity and industrial competitiveness through innovative research and development to achieve a sustainable competitive advantage (SCA). This study investigated innovation orientation、 supply chain integration (SCI; customer, supplier, and internal integration) and SCA.A total of 423 valid completed questionnaires were collected from representatives of Taiwanese companies. To test our hypothesis, we used structural equation modeling. According to the results, innovation orientation and SCI exerted a positive impact on SCA. Moreover, SCI (supply integration, internal integration) exerted mediating effects on the relationship between innovation orientation and SCA. Our results provide empirical evidence that innovation orientation and SCI affect SCA. This study contributes to the understanding of the value of supply chain management mechanisms from a resource-based view. The findings demonstrate that innovation orientation and SCI contribute positively to the SCA of firms.

Keywords: Supply chain management, innovation orientation, supply chain integration, sustainable competitive advantage, SEM

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INNOVATION ORIENTATION、SUPPLY CHAIN INTEGRATION AND SUSTAINABLE COMPETITIVE ADVANTAGE: EVIDENCE FROM MANUFACTURERS IN TAIWAN

創新導向、供應鏈整合及持續競爭優勢：台灣製造業為例

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摘要

全球產業的趨勢和資訊科技的快速發展，許多國家試圖透過創新的研究和開發來提高企業的生產力和競爭力，以實現持續競爭優勢。本研究探討創新導向(IO)，供應鏈整合（SCI）和持續競爭優勢（SCA）。針對台灣製造公司收集了 423 份有效的問卷。為了驗證本研究的假設，使用結構方程模型分析數據。結果顯示，創新導向和供應鏈整合對持續競爭優勢產生正向影響。此外，供應商整合，內部整合對創新導向與持續競爭優勢之間具有中介效果。本研究結果提供實證創新導向和供應鏈整合影響持續競爭優勢。這項研究有助於從資源基礎理論了解供應鏈管理機制的價值並提出創新導向和供應鏈整合對持續競爭優勢的貢獻。

關鍵詞: 供應鏈管理，創新導向，供應鏈的整合，可持續的競爭優勢，SEM

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1.Introduction

Despite progress in technological and economic development, steadily rising production costs have not enabled businesses to achieve high output. This is likely due to a failure to use limited resources for appropriate innovative goals and strategies. Businesses, which have been limited by scale and resource inadequacy, have encountered difficulties in performing innovative research and promoting development. However, by integrating internal and external resources through supply chain integration (SCI): businesses can overcome limitations in innovative research and development (R&D).

The importance of maintaining a competitive advantage has been emphasized in numerous previous studies. For example, Hofer and Schendel (1978) considered a competitive advantage as an element of decision making characterized by an organization's field of activity and resources, which determines the unique competitive position of competitors. Porter (1985) observed that a competitive advantage is derived from the value creation of a business through cost reduction and differentiation. In addition, he suggested that regardless of the adopted strategy, outstanding industrial performance can be achieved only when a business exerts more effort than its competitors in achieving sustainability. Only when businesses have a competitive advantage can they defy the actions of competitors and destruction caused by industrial changes. Because no competitive barrier is unsurmountable, businesses must continue to invest in and improve their competitive position. Innovation is the most common key factor for enhancing competitiveness (Ettlie, 2000).

In response to considerable changes in the global business environment, companies must actively engage in innovation and launch new products quickly in line with market and consumer needs. Moreover, businesses have adopted strategies to enhance sustainable management. Previous studies on supply chain management have presented empirical evidence regarding the impact of supply chain management on business performance and maintaining a competitive advantage (Min & Mentzer 2004; Min et al., 2007; Muller & Seuring,2007；Sezen, 2008; Vickery et al., 2003; Zailani & Rajagopal, 2005).

In related studies, SCI has been regarded as a method for improving performance

and enabling businesses to create value through supply chain management (Frohlich & Westbrook, 2001; Corsten & Felde, 2005; Fabbe-Costes & Jahre, 2007; Krause et al., 2007；Paiva et al.,2013；Xu et al.,2014). Scholars have argued that whereas market orientation is an essential condition, it is not sufficient for achieving a sustainable competitive advantage (SCA) (Baker & Sinkula, 2002). Market orientation describes the direction of an enterprise toward creating superior customer value (Naver & Slater, 1990). Liu et al. (2011) surveyed 246 firms in the manufacturing and services industry in China; their results indicated that market orientation (i.e., customer and competitor orientation) moderated the relationship between SCI and firm performance.

However, few studies have addressed the impact of innovation orientation on SCI. Therefore, this study adopted a perspective of innovation orientation to investigate suitable areas of innovation. In addition, through SCI, internal and external resources can be integrated to facilitate firm development and promote the innovation that is required to withstand substantial industrial competition and achieve an SCA that meets a firm’s expectations.

2.Theoretical Background

In the past, researchers have typically conducted empirical studies to examine the relationship between supply chain integration and firm performance from an RBV (Kim, 2009; Liu et al., 2011; Hong et al., 2010；Xu et al.,2014). Few researchers have determined the influence of innovation orientation and supply chain integration. There are few researches to examine innovation orientation and supply chain integration, sustained competitive advantage through RBV and DC theory, and firms through supply chain integration to affect the acquisition of resources, mining resources and application resources, sustainable competitive advantage of an enterprise to create firm performance

This research combines an RBV with the theory of DC, which indicates that a past mode of operation cannot guarantee a competitive advantage. Innovation orientation is at the core of business management, and supply chain integration is treated as a dynamic capability (Vickery et al., 2013). Supply chain integration includes internal and external integration and the integration of suppliers and customers, which can facilitate the acquisition of knowledge from internal or external resources (Eisenhardt & Martin,

2000) aid managers in formulating policies to extend, revise, or reallocate existing resources, and enable a firm to adapt to environmental change (Pavlou & Sawy, 2011).

Maintaining a competitive advantage in this rapidly changing and fiercely competitive environment is difficult for any business. Two main approaches to maintaining a competitive edge exist: the inside-out approach and the outside-in approach. In the inside-out approach, when facing a rapidly changing external environment, it is prudent to view the ongoing construction of the internal environment, application, and cumulative operating conditions. This method adheres to a resource-based view (RBV): regarding firms as resources that are valuable, scarce, and difficult to imitate or replace(Barney,1991,1995). Thus, in principle, each firm has different core resources and capabilities that it can use to find success. However, obtaining these resources in a short period is challenging. Therefore, a leading advantage may be maintained for a long time and yield a sustained competitive strength, which can be reflected in the cost and quality of a company's products or services.

In other words, holding a sustained competitive advantage means that other firms cannot rapidly obtain to create value strategy simultaneously and cannot obtain the same profit through imitation. Thus, the inside-out approach suggests that enterprises first identify their strengths and then determine the direction of business profit.

The outside-in approach is applicable when a business confronts the specialty of resources and the capability differences caused by the industrial environment. In this context, a firm must make new policies and change its existing management policies to respond to the changing environment and adjust its management of an organization or business (Coyne, Hall, Rindova, & Fombrun, 1997). The view of dynamic capability (DC): as proposed by Teece, Pisano, and Shuen (1997): suggests that implied outside-in strategic thinking can, through integration, build and reconfigure internal and external resources, and thus develop the ability to cope with rapid changes in the environment. Sustained competitive advantages are derived from unique firm processes and the coordination and integration of specific property positions, which include difficultly changed knowledge properties, firm activities required complementary assets, goodwill, and related properties.

The path of firm development from existing property position, organization, and management process to new property position, organization, and management process

connects the internal and external environments. Therefore, rather than being a firm resource, dynamic capability motivates adjustments to firm properties and abilities. Leonard-Barton (1992) suggested that DC reflects an ability that an organization uses to achieve innovation and maintain a competitive strength on a fixed path and market position.From the resource-based view, or dynamic capability perspective, existing literature has not explored the associations among innovation orientation, supply chain integration (SCI): and sustainable competitive advantage (SCA): nor integrated and verified the three associations.

This study explored the associations among innovation orientation, SCI, and SCA in the Taiwanese technology industry. Accordingly, the research purposes of this study are as follows:

1. To investigate the relationship between innovation orientation and SCA.
2. To investigate whether there is a significant relationship between innovation orientation and SCI.
3. To investigate whether there is a significant relationship between SCI and SCA.

3.Literature Review and Hypotheses development

3.1Innovation orientation and sustainable competitive advantage

Innovation is a mechanism used by organizations to generate new products, processes, and systems to adapt to the changing needs of the market, technology, and competitive modes. It represents the quality, efficiency, speed, flexibility, and capacity of a company’s competitive advantage and determines the future success of a company (Kiernan,1996; Dougherty & Hardy, 1996;). Porter (1990) showed that companies that create a competitive advantage in the value chain of activities can deliver superior value to customers by using new means; therefore, innovation and competitive advantage are closely related. Innovation has been regarded as a powerful source of a competitive advantage (Lengnick-Hall, 1992; Sastry, 1999). According to Siguaw et al. (2006): being innovation oriented entails having knowledge of market dynamics and a cognitive architecture, providing a model of knowledge required for development

processes, and building the dynamic capabilities of an enterprise.

Jones et al. (2000) suggested that a competitive advantage characterizes a company that operates beyond the ability of its competitors in the same industry. An SCA describes a company's strategy for creating value while being unaffected by current or potential competitors, and other companies cannot copy this strategy (Barney, 1991).In a highly competitive environment, creating and sustaining a competitive advantage is difficult for companies; an SCA can be conceptualized as a privileged market position that enables companies providing superior customer value and achieving high market shares; the leading cause may be the enjoyment of low cost and superior financial performance (Day & Wensley, 1988；Hunt & Morgan, 1995；Bastic & Leskovar-Spacapan, 2007).

Olavarrieta and Ellinger (1997) defined SCA as a competitive advantage that can be maintained over a certain period of time and cannot be easily copied or eliminated; it plays a prime role in enabling companies to maintain superior performance. Bastic and Leskovar-Spacapan (2007) an SCA enables a firm to achieve a performance.

This study suggests that innovation orientation is highly related to the mind-set of members of an organization, as well as the efficiency of operational activities. Furthermore, an environment that requires innovation also encourages members of an organization to engage unorthodox activities that might create distinctive competitive advantages. To promote intrinsic motivation, companies must create a nurturing and supportive environment and a favorable corporate culture to encourage innovation. This would inspire members of an organization to work relentlessly toward achieving an SCA.We proposed the following hypothesis:

H1: Innovation orientation exerts a positive influence on SCA.

3.2Innovation orientation and supply chain integration

In a complex and dynamic environment, resources will not necessarily constitute a competitive advantage; however, enterprises can benefit from examining the competitive value of the resources. Innovation orientation refers to a company's strategic development and launch of innovative new products before competitors enter the market (Kerin, Varadarajan, & Peterson, 1992). Innovation orientation is a basic

strategy for gaining entry into a market (Ali et al., 1995).

Companies facing competition must continue to innovate and constantly develop new products or services. Hurley and Hult (1998) defined innovation orientation as openness to accept new concepts within a corporate culture. Innovation-oriented enterprises take the initiative to explore new opportunities rather than rely solely on existing advantages. They pay attention to change, encourage risk taking and creativity, and reduce innovation risk perception. In addition, innovation-oriented enterprises strive to cultivate an atmosphere of innovation, stimulate creative ideas and solutions, promote learning, and enhance business agility in a competitive environment. Therefore, innovation-oriented enterprises further development and offer new products for partners to maximize value. These companies routinely seek various channels to obtain innovative intellectual capital (Autry & Griffis 2008).Innovation orientation enables enterprise access to capacities, processes, resources, and technologies that promote active knowledge acquisition and knowledge sharing in order to achieve effective SCI, whereby a variety of information is distributed in a timely manner to benefit supply chain partners (Siguaw, Simpson, & Enz 2006; Henneberg et. al., 2010; Rampersad et. al., 2010). Flynn et al. (2010) suggested that SCI can be divided into three types: internal, supplier, and customer integration; this distinction reflects the diversity of supply chains. Internal integration involves eliminating barriers and promoting common features among the key functions of instant message sharing (Wong et al., 2007).Suppliers can provide new technology and reduce the risk of potential environmental changes in manufacturing (Ragatz et al., 2002).

Consequently, suppliers and manufacturers can cooperate to design and develop new product ideas and innovative materials (Lau et al., 2010). Customer integration includes services, logistics, and information flow and reflux from customers to vendors (Frohlich & Westbrook, 2001; Narasimhan and Carter, 1998). Customer integration involves maintaining core competitiveness in cooperation with key customers and vendors to facilitate integration with pivotal suppliers who play a role in determining coordination capacity (Narasimhan & Kim, 2002; Swink et al., 2007; Vijayasarathy, 2010；Flynn et al., 2010). Companies can integrate information collected from customers and combine it with existing IT products and services to innovate (Boon-itt & Wong, 2011；Edvardsson et al., 2012).

Therefore, innovation orientation refers to a mode of thinking different from the existing mode; involves new ideas for transformation or creation; is conducive to developing additional innovative activities; facilitates maintaining the enterprise environment, corporate image, and rules and regulations; and can be achieved by reusing existing resources and technology. Innovation orientation endows enterprises with inimitable, irreplaceable, and unique characteristics that are beneficial in SCI.

Therefore, we proposed the following hypotheses.

H2: Innovation orientation exerts a positive influence on SCI.

H2a: Innovation orientation exerts a positive influence on customer integration.

H2b: Innovation orientation exerts a positive influence on supplier integration.

H2c: Innovation orientation exerts a positive influence on internal integration.

3.3Supply chain integration and sustainable competitive advantage

Bowersox and Closs (1996) suggested that in the current competitive environment, companies must expand the integration of customer and supplier activities, and that supply chain integration must include the integration of upstream and downstream suppliers or customers integrate (Frohlich & Westbrook, 2001; Vickery et al., 2003；Richey Jr et al.,2009).Wagner (2003) defined supplier integration on the internal resources of the company as the buyer with a particular major supplier through the company network resources and business processes, combined with the ability to achieve a competitive advantage. Shawnee et al. (2003) emphasized that integrating the entire functionality and a systematic supply chain through cross-functional integration of various resources is crucial for reasonably and quickly gathering relevant information, collaboratively contributing to policies regarding operational resources, creating value, and improving the performance of the supply chain. SCI leads to the attainment of an SCA by promoting access to complementary resources and capabilities in the supply network between transfer and use. Knowledge on sensitive data and information generated through cooperative problem solving, which is secure and confidentially conducted, cannot be easily be imitated, thereby preventing competitors from gaining a competitive advantage.

Hoyt and Huq (2000) reported that obtaining a sustainable competitive advantage requires an efficient information flow, trust, and a willingness to cooperate among supply chain members. Jin and Edmunds (2015) indicated that in a collaborative integrated supply chain, manufacturers having the opportunity to seek a sustainable competitive advantage is critical. Supply chain partners can obtain tangible and intangible knowledge resources through supply chain integration and use this to consolidate partnerships and information sharing among members, and thus obtain a sustainable competitive advantage.Prahalad and Ramaswamy (2000) suggested that customers are a new source of competitive advantage and that the link between customers and suppliers is a crucial source of information and knowledge (Carr & Pearson, 2002; Chang et al., 2006.). Wisner et al. (2008) analyzed the integration needs of customers to understand the products, processes, and customer operations of vendors. Certain activities of suppliers enable customers to improve their competitive position. Therefore, to improve sales, customers should be integrated in relevant information between customers and suppliers. Previous studies have extensively studied supplier and customer integration and typically defined them as two basic types of external integration (Wong & Boon-itt, 2008). The integration of external supply chains is a key strategy for achieving a competitive advantage in an uncertain environment (Quesada et al., 2008).

Thus, the integration of customers and suppliers can enable companies to achieve improved sales rates, higher profits, and a greater market share. Distinguishing the company from customers and suppliers in the supply chain network can lead to a competitive advantage (Morash and Clinton, 1998；Narasimhan and Kim, 2002；Cagliano et al., 2006；Swink et al., 2007；Flynn et al.2010；Zhang & Huo, 2013；Paiva et al.,2013).

Therefore, we proposed the following hypothesis.

H3: SCI positively affects SCA.

H3a: Customer integration positively affects SCA.

H3b: Supplier integration positively affects SCA.

H3c: Internal integration positively affects SCA

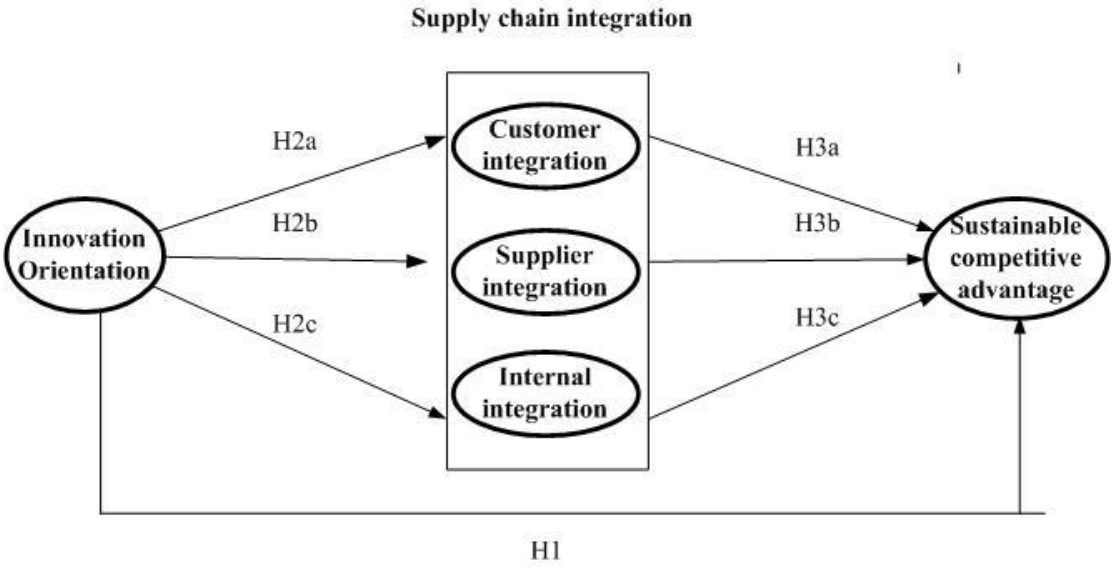

Fig.1

4.Research method

4.1Measurements

Previous studies have used only a single customer to explore the unique contributions of SCI implementation (Closs & Savitskie, 2003; Fynes et al., 2005; Sahin & Robinson, 2005) and supplier consolidation (Humphreys et al., 2004; Corsten & Felde, 2005; Scannell et al., 2000; Das et al., 2006). Flynn et al. (2010) argued that SCI is a multidimensional concept that should be measured according to three dimensions: customer, supplier, and internal integration. Therefore, measurements developed by Flynn et al. (2010) were adopted in this study.

Measures of innovation orientation were borrowed from Hurley and Hult (1998): Zhou et al. (2005): and Chen et al. (2009). In addition, Siguaw et al. (2006) suggested the inclusion of changes in the organizational structure and management processes to obtain the degree of innovation of ideas and an innovation-oriented corporate strategy.

According to the operational definitions provided by Bastic and Leskovar-Spacapan (2007) and Jaakkola et al. (2010) an SCA enables a firm to achieve a performance superior to that of the competition (Rosenzweig et al., 2003; Roth et al., 1992; Miller & Roth, 1994; Kristal et al., 2010). In this study, therefore, the

measurement of SCA is compiled from the scales developed by Bastic and Leskovar-Spacapan (2007).All measures were translated into Chinese and subsequently back-translated to ensure conceptual equivalence (Hoskisson et al., 2000). All scales were measured using a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree). The measurement items are reported in Appendix A.

Data collection

Before the survey was mailed to participating companies, it was pretested by supply and materials management professionals to ensure content validity. The respondents were employees in sales, production, or R&D departments who were responsible for and adequately acquainted with the supply chain operations of their companies.

To obtain a representative sample, 1000 firms were randomly chosen from the lists of companies provided by major industrial parks in this city. The questionnaires were sent to the respondents via email or conventional mail with a postage-paid return envelope. After two weeks, follow-up telephone calls were made to remind the participants to answer the questionnaires. A total of 547 questionnaires were returned (effective response rate of 54.7%); however, 124 of them were not useable because they were incomplete. The final usable sample comprised 423 questionnaires. The profiles of the usable respondent companies and their industry characteristics are shown in Table 1. Descriptive statistics (means and standard deviations) as well as the correlation matrix of all variables are presented in Table 2. In addition, the Cronbach's alpha values for the constructs are provided in Table 2. All values were adequate, and one value was over 0.70 (Nunnally, 1978).

4.2Common method bias

When data for the independent and dependent variables are collected from single informants, common method bias may lead to inflated estimates of the relationships between the variables (Podsakoff & Organ, 1986). Therefore, Harman's one-factor test was used post hoc to examine the extent of potential bias. Substantial common method variance is signaled by the emergence of either a single factor or one "general" factor

that explains a majority of the total variance (Podsakoff & Organ, 1986). The results of a factor analysis revealed nine factors, which combined to account for 63.836% of the total variance. The first factor accounted for 31.434% of the total variance; however, it did not account for a majority of the variance. On the basis of these results, problems associated with common method bias were not considered significant.

Table 1 Industry

Industry (n=423)	**Percentage**	**Cooperation time**	**Percentage**
Electronics Industry	25.8	1-3Year	26.7
IT Industry	14.2	4-6Year	45.4
Communication Related	5.7	More than 6 Years	27.9
Semiconductor-related	17.7	**Department**	
Optical Industry	.5	Production department	4.5
IC design	4.3	Manufacturing department	18.4
Computer Related	24.6	Purchasing department	24.6
Distribute	6.6	Marketing department	13.7
Other	0.7	Administration	2.1
		R & D department	33.6
		Other	3.1

Table 2 correlation matrix and summary statistics

Variable		Mean	S.D	α					
SCI	Customer integration	5.46	0.636	0.821	1				
	Supply integration	5.50	0.677	0.894	.663**	1			
	Internal integration	5.36	0.641	0.813	.601**	.746**	1		
IO		5.57	0.652	0.794	.474**	.575**	.734**	1	
SCA		5.41	0.702	0.805	.437**	.488**	.576**	.538**	1

4.3Analysis

This study focused on innovation orientation, SCI and combinative competitive capabilities in Taiwan's electronics and technology industry. Furthermore, we investigated related procurement, marketing, logistics, and staffing. We used managers, staff, and R&D engineers to understand the practical situation. This questionnaire was designed to measure various dimensions of 45 items in five parts; mining closed questionnaire, subjects were made by the subjective perception of the respondents. We used SPSS 19 and LISREL 8.8 as analytical tools. The measurements and subsequent analysis enabled us to test our hypotheses and achieve our research purpose.

Measurement model

LISREL, the covariance matrix being the input, with maximum likelihood method was applied in this study to test the measurement model. The initial model fit indices indicated that the fit was far from acceptable; therefore, further model modification was implemented on the basis of the modification index (MI). The MI represents both the measurement error correlations and item correlations (multicollinearity) (Joreskog & Sorbom, 1989).As suggested by Tucker and Lewis(1973):Byrne (1994) and Hu and Bentler (1998): all fit indices were used to assess goodness of fit of the model: the goodness-of-fit index (GFI; values > 0.90 indicated a good fit): the comparative fit index (CFI; values > 0.90 indicated a good fit): NNFI and NFI; values > 0.90 indicated a good fit) and the root-mean-square error of approximation (RMSEA)values equal to or less than .05 are considered a “good adaptation” (close fit): whereas values between .05 and .08 are considered a “fair adaptation” (reasonable fit) and values between .08 and .10 are considered a mediocre fit (Browne and Cudeck, 1993; McDonald and Ho, 2002). The GFI values were 0.9 suggesting a good fit between the implied covariance in the model and the observed covariance in the data. The overall fit of the measurement model was good ($\chi 2$ = 380.50; d.f. = 109; GFI =.90; CFI = 0.96；NFI=0.94；NNFI = 0.95; root mean square residual (RMSEA) = 0.077).

Structural model: Analysis of the hypothesized paths

We evaluated the overall model fit. The analysis of the full structural model (i.e., measurement and path model combined) involved several goodness-of-fit indices, as shown in Table 3. The values of both the absolute fit indices (GFI = 0.90) and the comparative fit indices ($\chi 2$ = 288.48; d.f. = 47；CFI = 0.93, NFI=0.91,NNFI = 0.90 and RMSEA =0.11) were higher than the suggested values. Although RMSEA indicators was not very good, most indicators were compliant. The hypothesized relationships among the various constructs with standardized regression weights (r) and P values in the full structural model are shown in Fig. 2.

In this study, the theoretical models of the maximum likelihood estimation method were estimated path coefficients, according to which each hypothesis was tested. Ding, Velicer, and Harlow (1995) suggested that the most suitable number of samples is 100 to 150 when the maximum likelihood estimation method is used to estimate a structural model; the number of samples in this study exceeded the required number.We evaluated the individual paths of the model. The results are summarized in Table 3 and Table 4.

For H1, the standardized estimate was 0.21(t = 2.25, P < 0.01). H2 proposed a positive relationship between innovation orientation and SCI. H2a was supported, as evidenced by a standardized estimate of 0.39 (t = 6.61, P < 0.01). H2b and H2c were supported, as evidenced by standardized estimates of 0.56 (t = 6.89, P < 0.01) and 0.43 (t = 7.20, P < 0.01): respectively. However, H3a(customer integration) was not supported, as evidenced by a standardized estimate of 0.00 (t = 0.07). H3b was supported, as evidenced by a standardized estimate of 0.29 (t = 3.19 P < 0.01): and H3c was supported, as evidenced by a standardized estimate of 0.29 (t = 3.90 P < 0.01). The hypotheses H3b (supply integration) and H3c (internal integration) suggested a direct relationship between SCI and Sustainable competitive advantage, and the results show that this relationship was significant.

Table 3 Path model results

Path	Standardized coefficient	t-value	significantly	Result
H1 Innovation orientation→ Sustainable competitive advantage	0.21	2.25	***	Supported
H2 Innovation orientation→ Supply chain integration				
IO→ CI　(H2a)	0.39	6.61	***	Supported
IO→ SI　(H2b)	0.56	6.89	***	Supported
IO → II　(H2c)	0.43	7.20	***	Supported
H3 Supply chain integration →Sustainable competitive advantage				
CI (H3a) →SCA	0.00	0.07		NON-Supported
SI (H3b) →SCA	0.29	3.19	***	Supported
II (H3c) →SCA	0.29	3.90	***	Supported
Note 1: ｜T｜≧1.96,n p 0.05 level				

Table 4 The direct effect and indirect effect

	Effect	Customer Integration		Supply Integration		Internal Integration		Sustainable competitive advantage	
		Effect	T value	Effect	T value	Effect	T value	Effect	T value
Innovation orientation	Direct Effect	0.39	6.61	0.56	6.89	0.43	7.20	0.21	2.25
	Indirect Effect	-	-	-	-	-	-	0.29	3.95
	Total Effect	0.39	6.61	0.56	6.89	0.43	7.20	0.50	6.20
Sustainable competitive advantage	Direct Effect	0.00	0.07	0.29	3.19	0.29	3.90	-	-
	Indirect Effect	-	-	-	-	-	-	-	-
	Total Effect	0.00	0.07	0.29	3.19	0.29	3.90	-	-

According to the total and indirect effects shown in Table 4, 1) SCI (supply integration, internal integration) mediated the relationship between innovation orientation and SCA; So this study the effect of the establishment.

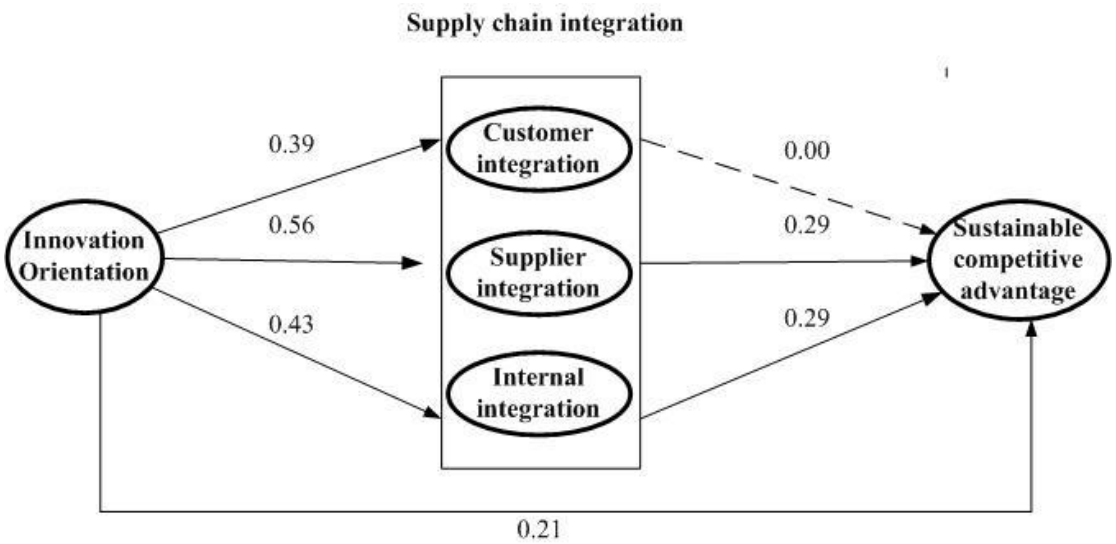

Fig.2

5.Discussion

This study proposed five main hypotheses and thoroughly researched Taiwan's electronic technology industry regarding supply chains; we applied SEM analysis to empirical data and determined that innovation orientation, SCI (customer integration ,supply integration , and internal integration) have an impact on SCA. The statistical analysis demonstrated that the empirical data and theoretical models were moderately consistent. This study provides crucial implications for management.

Previously, the electronics and technology industry of Taiwan was characterized as efficiency oriented, seeking to increase productivity and reduce costs to compete with international standards. However, in response to lower production costs in mainland China and other countries, Taiwan must transition toward innovation. The results of this study demonstrate that innovation orientation exerts a positive impact on SCI. Innovation orientation exerts a significant impact on supplier integration. Consequently,

innovation-oriented vendors have a significant impact on integration. These findings are consistent with those of Kamath and Liker (1990): who argued that suppliers are willing to participate in innovation-orientated product development (Campbell,1998; LaBahn & Krapfel, 2000) and cooperate with innovation-oriented enterprises. to maintain relations will affect the findings supplier involvement in new product development is consistent

The results of this study suggest that SCI in Taiwan's technology industry should involve highly innovation-oriented companies. The supply chains of innovation-oriented companies are highly integrated. International companies have focused on maximizing efficiency and productivity. However, regarding technology, the level of innovation is still insufficient. Therefore, in response to strong market competition, integration with supply chain partners can facilitate achieving product differentiation and, thus, new products can be produced more quickly to meet market needs and enhance the competitiveness of enterprises.

Innovation orientation exerts a significant influence on customer integration. This finding is consistent with that of Siguaw et al. (2006): who proposed that innovation-oriented enterprises focus on creating and implementing new ideas, innovative products, and services that are likely to succeed in the marketplace and to improve customer satisfaction, loyalty, and impressions. This enables these enterprises to focus on long-term customer relationships as well as pay attention to customer needs, customer values, and their corporate image. Therefore, the ability to predict consumer demand and improve the ability to respond more quickly than competitors can yield substantial benefits.

Innovation orientation exerts a significant influence on internal integration, which is a strategy-oriented process and, thus, affects organizational innovation (Hurley & Hult, 1998；Zhou, Gao, Yang, & Zhou, 2005). A company that exhibits an innovation-oriented culture is likely to encourage creativity and promote innovative practices (Siguaw et al., 2006).

Second, we determined that SCI has a positive impact on SCA. It has been argued that, in the electronics and technology industry, a higher degree of SCI is related to a more obvious SCA and higher firm performance. However, customer integration exerts no significant influence on SCA. To maintain an SCA and engender loyalty in customers, enterprises must promote their customer-centric innovation and deliver

consistent value to their customers. Therefore, we recommend that enterprises initiate rapid changes to address global technological innovation; in addition, we advocate improving customer service and making improvements in goods and services to meet future consumer demand. Without innovative business practices and adapting to change, enterprises are likely to be uncompetitive and their development is likely to be unsustainable.

Third, innovation orientation exerts a significant impact on SCA. Hurley and Hult (1998) defined innovation-oriented openness as the ability to accept new things and as a type of corporate culture. Innovation-oriented enterprises actively explore new opportunities without impeding existing strengths. They pay attention to change, encourage risk taking as well as creativity, and value the courage to embrace the unknown.

Fourth, in recent years, industry practitioners and academics have begun to pay attention to the importance of SCI. SCI has been recognized to be crucial for supply chain partners in providing customers with high value and enhancing firm performance through sustainable operations.

Global competition has become increasingly intense, and product life cycles have become shorter. In addition, the speed of technological innovation has increased. The success of an enterprise depends on SCI because it facilitates effective management, the development of new products, and the phasing out of old products. SCI enables quickly determining market information to understand consumer preferences, improve business models, and promote efficiency upgrades.

6.Managerial implications

This study suggests that innovation orientation affects SCI and SCA. Today, it is increasingly difficult for enterprises to create SCAs and dominate new markets; therefore, innovation-oriented enterprises employ beneficial SCI practices in combination with internal and external resources to obtain and reconfigure innovative resources and capabilities in order to continually create superior value. Strengthening SCAs can enable enterprises to remain unrivaled.

The results showed that the innovation orientation competition model has become

mainstream. Innovation-oriented corporate culture has facilitated upstream and downstream SCI for acquiring complementary resources and enhancing SCA. Hurley and Hult (1998) stated that innovation orientation involves openness to new ideas and to sustainable development. The construction of an innovative organizational culture is crucial to maintaining sustainable growth.

Innovation orientation is beneficial to internal integration in corporate culture because it promotes cross-functional cooperation and diversity among employees, who cooperate with each other and reinforce professional competence, cooperating to implement innovative ideas. Companies should encourage employees to innovate; every member should regularly put forth innovative ideas that are not limited to company products, but apply to improvement of all company affairs. Innovation orientation for supply integration has a positive impact on enterprises because it is associated with various areas of the supply chain, encouraging brainstorming and interactive dialogue among supply partners and facilitating the creation of new products and the maintenance of an SCA. The results illustrated that innovation orientation has a significant positive impact on SCI, with internal integration (II) and supplier integration (SI) also significantly influencing SCA. Only customer integration was found to have no significant impact on SCA

Research has shown that the Taiwanese high-tech industry would benefit from attention to innovations in product development and provision of various solutions for enhancing market competitiveness. II (process transformation and cross-functional information sharing) and SI (acquisition of new technologies and the latest knowledge regarding resources from upstream suppliers) are crucial to the supply chain partner relationship because it depends on the creation of value, not merely the reduction of manufacturing costs or promotion of low-cost activities. Furthermore, II and SI strengthen the basis of value creation among suppliers by enabling the construction of an efficient supply chain with professional manufacturing links, rather than upstream and downstream compression costs, thus enabling a company to maintain a competitive advantage.

7.Limitations

This study investigated only the electronics and technology industry. The

characteristics of each industry differ. Therefore, we recommend that future research address other industries. According to the mentioned scholars, an innovation-oriented high-tech industry does not develop naturally, but also in other tissues also occur. In addition, the study of the electronic and technology industry background screening only between SCI and SCA. Further studies can include more relevant theoretical construct or different research methods.

In Taiwan, the electronics and technology industry is under competitive pressure; companies continually attempt to develop various markets and explore new areas; for example, they move to other regions in the search for lower costs of production. The investigation in this study concerned only Taiwan. Therefore, an interregional analysis would be appropriate for follow-up studies.

【Insert Appendix A about here】

Appendix A

Supply chain integration
Customer integration (Flynn et al.2010) The level of linkage with our major customer through information networks. The level of computerization for our major customer's ordering. The level of sharing of market information from our major customer. The level of communication with our major customer. The establishment of quick ordering systems with our major customer. Follow-up with our major customer for feedback. The frequency of period contacts with our major customer. Our major customer shares Point of Sales (POS) information with us. Our major customer shares demand forecast with us. We share our available inventory with our major customer. We share our production plan with our major customer
Supplier integration (Flynn et al.2010) The level of information exchange with our major supplier through information networks.

The establishment of quick ordering systems with our major supplier. The level of strategic partnership with our major supplier. Stable procurement through network with our major supplier. The participation level of our major supplier in the process of procurement and production. The participation level of our major supplier in the design stage. Our major supplier shares their production schedule with us. Our major supplier shares their production capacity with us. Our major supplier shares available inventory with us. We share our production plans with our major supplier. We share our demand forecasts with our major supplier. We share our inventory levels with our major supplier. We help our major supplier to improve its process to better meet our needs
Internal integration (Flynn et al.2010) Data integration among internal functions. Enterprise application integration among internal functions. Integrative inventory management. Real-time searching of the level of inventory. Real-time searching of logistics-related operating data. The utilization of periodic interdepartmental meetings among internal functions. The use of cross functional teams in process improvement. The use of cross functional teams in new product development. Real-time integration and connection among all internal functions from raw material management through production, shipping, and sales
Innovation Orientation (IO)
Innovation Orientation (IO) - Hurley and Hult (1998)；Zhou et al. (2005)；Chen et al.(2009)；Siguaw et al. (2006)。 IO1. Our company pays close attention to innovation. IO2. Our company emphasizes the need for innovation for development. IO3. Our company promotes the need for development and utilization of new resources. IO4. The extent to which a firm embraces, accepts, and measures innovation.

IO5. Management actively seeks innovative ideas. IO6. People are encouraged for new ideas that don't work
Sustainable competitive advantage Leskovar-Spacapan and Bastic (2007)
1.How easy is it for your competitors to match your firm's product innovations? 2.How easy is it for your competitors to match your firm's process innovations? 3.How easy is it for your competitors to match your firm's organizational system innovations? 4.How easy is it for your competitors to match your firm's capability to learn and innovate from market changes innovations? 5.How easy is it for your competitors to match your top management's capability to support and promote the development of the staff? 6. How easy is it for your competitors to match your firm's marketing capabilities?

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