

*Full Length Research Paper*

# The e-business strategies fit on different supply chain integration structures

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**This study explores the different e-business strategies fit on different supply chain integration structures. We generalize three research frameworks through three e-business strategies including e-commerce, e-operations, e-marketing; and three integration structures including complete integration, supplier integration, and customer integration. Through testing for research frameworks, we can understand the application of which e-business strategies can effectively improve practice of which integration structure to achieve. This study will use structural equation modeling to test the research hypotheses. According to test results, we found that e-operations strategy has positive effect to improve partner's integration under complete integration operational environment; positive effect of e-commerce and e-operations are on the supplier integration operational environment; finally, positive effect of e-commerce and e-marketing are on the customer integration operational environment.**

**Key words:** Supply chain, integration, e-business strategy, e-commerce, e-operations, e-marketing.

## INTRODUCTION

Supply chain management (SCM) can improve a firm's competitiveness and performance (Guillen et al., 2007; Rosenzweig et al., 2003; Samiee and Walters, 2006; Stevens, 1989; Wisner, 2003). Especially with the current trend towards globalization, manufacturers must adopt effective tools or strategies to connect suppliers and customers of other countries. Through successful supply chain practices, manufacturers can effectively connect suppliers and customers of other countries and achieve the ability to be globally competitive.

However, powerful competitive ability depends on the effective integration of supply chain partner-firms; when partner-firms lack integration, partner-firms of the supply chain will find that conflict exists between these firms. This conflict will lead these firms to find it difficult to cooperate with other firms for practice-related supply chain activity, which will result in weak supply chain. integration must be a priority if manufacturers wish to Therefore, most practitioners indicate that supply chain possess effective competitive ability through the supply chain. Successful integration can reduce conflict between

partner-firms at various stages that will lead to competitiveness.

In order to improve integration, manufacturers and researchers try to explore which tool or strategy can most effectively improve integration. In recent years, electronic business (e-business) has shown that it can more effectively improve supply chain integration than other tool or strategy. E-business is widely adopted when manufacturers try to improve supply chain integration.

The term "e-business" refers to the application of Information Technology (IT). By using IT to build an environment of information flow and integration, supply chain firms at various stages can mutually integrate and communicate; this leads to the best supply chain business practice process and ensures that integration will result. Research from Cagliano et al. (2005), Phan (2003), and Stevens (1989) showed that the greatest collaboration, optimization of processes, and optimal supply chain practices can be achieved when manufacturers adopt e-business to improve supply chain integration.

However, Cagliano et al. (2003, 2005) also found that partners can integrate and collaborate more effectively to practice every internal operation if they can select a fit e-business strategy according to different internal operations characteristic. Related literature, such as that published by Phan (2003), indicated that e-business

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application dimensions can be classified into three dimensions, including: the buying and selling of goods and services, the inter-organizational systems flow of goods and collaboration production, and the providing of customer service.

Therefore, most researchers, such as Cagliano et al. (2005), De Boer et al. (2002), Kehoe and Boughton (2001), Naim (2006), Boyer (2001), and Cotter (2002) indicated that e-business strategy can be further identified as three strategies, including e-commerce, e-operations, and e-marketing.

When manufacturers adopt e-commerce in a supply chain operational environment, e-commerce can build a Business-to-Business (B2B) and Business-to-Customer (B2C) model to improve partner's integration and collaboration on transaction activity practice (Brynjolfsson and Smith, 2000; Ghiassi and Spera, 2003; Naim, 2006; Strader et al., 1999). Otherwise, when manufacturers adopt e-operations, e-operations can streamline partner's integration and collaboration on the supply chain production activity practice (Boyer, 2001).

Additionally, when manufacturers adopt e-marketing, manufacturers can provide complete product and service information and establish a more convenient online trading platform for connecting and integrating downstream customers (Baloglu and Pekcan, 2006; Cotter, 2002). Based on afore mentioned, it seems that all e-business strategy should be implemented to guide partner's integration and collaboration on every internal operation practice.

However, considering changes in the competitive environment and firms' internal resources and ability, manufacturers usually adjust and decide upon a different supply chain integration structure (Frohlich and Westbrook, 2001) showed. Different integration structure will focus on different activity to practice for achieving different competitive abilities. Therefore, when manufacturers develop different integration structures for competitiveness, Frohlich and Westbrook (2001) and Cagliano et al. (2005) used to advise manufacturers to choice an adaptive electronic strategy for more effective guide partner to integrate for practice related activities; however, most practitioners find it difficult to characterize which e-business strategies should be implemented to which integration structure. Existing studies still lack empirical results for the practical adoption of e-business strategies on different supply chain integration structures.

Based on earlier discussion, this study presents a practical adoption of e-business strategies on different supply chain integration structures.

## LITERATURES REVIEW

### The importance of partner's integration

Partner's integration is the key to the development of a

supply chain's competitive ability. Successful partner's integration can improve competitive advantage and create more competitive ability to achieve high competitive performance in areas such as cost, quality, flexibility, and delivery for manufacturers (Tan et al., 1998).

Related research such as that of Cheng and Wu (2005), Khouja (2003), and Munson et al. (2003) explored the integration relationship of supply chain members, and all indicated that successful integration produces a direct influence on costs, delivery, and flexibility in a complex environment. Bramel et al. (2000) explored the integration of distribution networks between supply chain members and indicated that delivery and flexibility can be satisfied through integration.

Starbird (2003) also argued that integration can affect the performance of cost, quality, and delivery. Hult and Swan (2003) and Petersen et al. (2003) explored the integration between supply chain members for new product development and indicated that integration can improve the market requirements of cost and quality in new product development. If in each stage, firms fail to integrate, uncertain situations of supply chain improvement and practice, such as the "bullwhip effect" (Lee, 1997), will exist and lead to a poor supply chain operations environment. These problems will lead to low competitive performance, which may be manifested in high manufacturing costs, high inventory costs, long replenishment lead-time, high transportation costs, high labor costs for shipping and receiving, low level of product availability, and low profitability (Chopra and Meindl, 2003).

Based on the aforementioned, the importance of partner's integration is clear. In fact, no matter what the view of industry dynamics (Forrest, 1961) or value chain (Porter, 1985), they all support the importance of partner's integration. For this reason, partner's integration has become a hot research issue in the past decade (Narasimhan and Kim, 2002; Rosenzweig et al., 2003; Romano, 2003; Childerhouse and Towill, 2003).

### Different integration structures and activity focus

Integration structure means an operational environment that is established by partner's coordination. As the empirical test results of Frohlich and Westbrook (2001), Rosenzweig et al. (2003), and Vickery et al. (2003) indicated, supply chain integration structures include supplier integration structure and customer integration structure except for complete integration structure. Firms usually develop with partners, a suitable integration structure according to situation of competitive environment.

Different integration structures involve partners from different stages, and have different integration activity focuses. A complete integration structure involves completely extending and connecting to upstream suppliers,

manufacturers, and downstream customers, forming a closed integration structure. Firms wish to achieve high competitive performance through a complete integration structure; they must therefore effectively improve the production process and eliminate non-value-adding production activities between manufacturers and suppliers (Frohlich and Westbrook, 2001). In addition, the establishing of customer relationships and sales and service of the product should be improved. Related literature showed that when firms successfully improve complete integration and drive all the internal activity towards effective improvement, high competitive performance will be achieved. Writers such as Narasimhan and Kim (2002) and Rosenzweig et al. (2003) indicated that a complete integration can lead to better product quality, delivery reliability, process flexibility, and cost leadership when complete integration is improved.

Supplier integration involves the integration process of manufacturers to suppliers. Successful supplier integration must focus on improvement in internal production and raw material or semi-product purchasing activities. Swink et al. (2007) indicated that supplier integration is done in manufacturing plants in order to better meet product and production requirements through developing and more effectively exploiting both the supplier's and plant's capabilities and cost structures. Monczka et al. (2000), Spina et al. (2002), and Wognum et al. (2002) also indicated that integration focuses on supplier integration in production and purchasing operations improvement. As mentioned earlier, related literature indicated that when manufacturers successfully improve supplier integration, high competitive performance will be achieved. Das et al. (2006), Petersen et al. (2005), Flynn and Flynn (1999), Grant (1996), and Vickery et al. (2003) indicated that manufacturers can reduce new product design and production costs, increasing product quality, delivery speed, and manufacturing flexibility through supplier integration.

Customer integration structure means that operational environment involves the process of manufacturers to customers. If manufacturers develop and adopt customer integration and wish for customer integration to be a successful practice, they must focus on customer sales and service activities improvement with downstream partners. Swink et al. (2007) indicated that customer integration is done in manufacturing plants in order to gain and incorporate a better understanding of customers' preferences, and to build relationships with customers. As mentioned earlier, we knew that the customer integration's focus was to establish customer relationships and to integrate product sales and service. Related literature indicate that when manufacturers successfully establish superior customer relationships and improve product selling and service process integration, high practice and competitive performance will be achieved. Authors such as Gillbert and Ballou (1999), Grant (1996), and Lummus and Vokurka (1999) indicated that

manufacturers can reduce service costs, increasing service quality, shortening of delivery time, and flexibility of service through customer integration.

## HYPOTHESES AND RESEARCH FRAMEWORK

The term "e-business" refers to adopting Information Technology (IT) such as the internet or the World Wide Web (WWW) to establish an electronic operational environment for effectively improving partner's communication and business operations practice. Through IT, firms can communicate, integrate, and share immediately, related internal/external information with related departments, partnership firms, and customers. Especially in the supply chain operational environment, implementation of e-business has powerful effect on guide of partner's integration, therefore, more firms always implement e-business to guide partner integration for effective collaboration practice and every internal operations or activities.

Furthermore, e-business can be classified as several strategies and Cagliano et al. (2005) also indicated that implementation of different strategies can guide partner integration on different operations collaboration practice. According to literatures of Cagliano et al. (2005), De Boer et al. (2002), Kehoe and Boughton (2001), Naim (2006), Boyer (2001), and Cotter (2002), e-business strategy can be further identified as three strategies, including e-commerce, e-operations, and e-marketing. In the e-commerce, e-commerce can develop transaction models such as B2B or B2C, and these models can assist a firm to effectively practice raw/semi material purchasing or product transactions activities between firms and either customers or other firms (Gunasekaran et al., 2004; Brynjolfsson and Smith, 2000; Ghiassi and Spera, 2003; Naim, 2006; Strader et al., 1999). Therefore, when e-commerce is adopted, it can guide integration and collaboration of partners for collaboration practice transaction activities.

In the e-operations, although some researchers argued that e-operations is involved in e-commerce, writers such as Cagliano et al. (2005) and Phan (2003) indicated that e-operations should be independently explored. E-operations emphasize an improvement in the product production operation by use of an electronic operational environment (Lowson and Burgess, 2003; Chaffey, 2002). As Boyer (2001) indicated, when firms adopt e-operations to guide partners to integrate and collaborate to practice related production activities, performance of related production activities such as product inventory, facilities cost, purchasing and order sourcing, and job specialization/scheduling for customization production can be effectively enhanced.

The term e-marketing refers to the use of IT to guide and assist partners' practice of marketing activities (Krishnamurthy, 2006). It also involves building an online

presence where the company is showcased and detailed information is provided. As the views of Krishnamurthy (2006), Baloglu and Pekcan (2006), and Cotter (2002) indicated, e-marketing focuses on three actions improvement: Internet advertising, website marketing, and service model designing. Cotter (2002) indicated that customers can obtain related product information from Internet advertising and websites, and firms can also integrate and improve customer relationships and provide immediate related service to customers through website service. Therefore, when firms adopt e-marketing, firms can effectively integrate customer or downstream firm and effective activities of product sales and service process.

According to earlier discussion, we can try to align different e-business strategies and different supply chain structure further, and build hypotheses. The focus of complete integration involves all internally related activities, including the transaction, production, and the service. If firms wish to successfully achieve high competitive performance through complete integration, firms should implement all the e-business strategies to guide partner's integration and collaboration practice in all internal activities. These results lead to a further hypothesis that we wish to examine in this paper:

H<sub>1a</sub>: When firms adopt e-commerce, which can guide partner's integration and collaborate practice on related internal operations in complete integration supply chain structure.

H<sub>2a</sub>: When firms adopt e-operations, which can guide partner's integration and collaborate practice on related internal operations in complete integration supply chain structure.

H<sub>3a</sub>: When firms adopt e-marketing, this can guide partner's integration and collaborate practice on related internal operations in complete integration supply chain structure.

H<sub>4a</sub>: When related internal operations under complete integration supply chain structure have effectively practice, high product quality, high delivery reliability, high process flexibility, and cost leadership will be achieved.

H<sub>1b</sub>: When firms adopt e-commerce, this can guide partner's integration and collaborate practice on related internal operations in supplier integration structure.

H<sub>2b</sub>: When firms adopt e-operations, this can guide partner's integration and collaborate practice on related internal operations in supplier integration structure.

H<sub>3b</sub>: When related internal operations under supplier integration structure have effectively practice, firm can reduce new product design and production costs, increase product quality, delivery speed, and manufacturing flexibility.

H<sub>1c</sub>: When firms adopt e-commerce, this can guide partner's integration and collaborate practice on related internal operations in customer integration structure.

H<sub>2c</sub>: When firms adopt e-marketing, this can guide

partner's integration and collaborate practice on related internal operations in customer integration structure.

H<sub>3c</sub>: When related internal operations under supplier integration structure have effectively practice, firms can reduce service costs, shorten delivery time, increase service quality, and increase flexibility service.

As the aforementioned literature and hypotheses, this study will test three models: 1) alignment of e-commerce, e-operations, e-marketing, complete integration structure, and performances; 2) alignment of e-commerce, e-operations, supplier integration structure, and performances; 3) alignment of e-commerce, e-marketing, customer integration structure, and performances. Test models are shown in Figure 1.

## RESEARCH DESIGN

### Data collection and sample profile

This study cites a questionnaire of the International Manufacturing Strategy Survey (IMSS- $\chi$ ) and refers related literatures to develop an own questionnaire for collecting Asia corporation data. The IMSS is a cooperative research network of Manufacturing Strategy (MS) research, and aims at investigating the global manufacturing industry in manufacturing strategy and supply chain strategy.

As our test model, we will develop three part question, including supply chain integration activity, e-business strategy, and performance. In the supply chain integration activity, eight kinds of integration activities from IMSS was cited, including: (1) share inventory-level knowledge; (2) share production planning decisions and demand forecast knowledge; (3) order tracking/tracing; (4) agreements on delivery frequency; (5) dedicated capacity; (6) require supplier(s) and customer(s) to manage or hold inventories of materials at their site (for example, vendor-managed inventory, consignment stock); (7) collaborative planning, forecasting and replenishment; (8) physical integration of the supplier into the plant. The questions were measured on a five-point Likert scale.

In the e-business strategy, we also cite eight kinds of e-business items from IMSS to investigate in regard to the adoption level of e-business strategy, including: (1) scouting/pre-qualification; (2) auctions; (3) RFx (request for quotation, proposal, information); (4) data analysis (audit and reporting); (5) access to catalogs; (6) order management and tracking; (7) content and knowledge management; and (8) collaboration support services. The questions were measured on a five-point Likert scale. These e-business strategies can be classified as three e-business strategies, including e-commerce, e-operations, and e-marketing. E-commerce involves auctions, RFx (request for quotation, proposal, and information), and order management and tracking. E-operations involve data analysis (audit and reporting), content, and knowledge management and collaboration support services. E-marketing involves scouting/pre-qualification and access to catalogs.

In the performance, according to mentioned literatures, we found performance can be developed into four performance items, including; cost, quality, delivery, and flexibility. Cost performance includes: Cost leadership, new product design and production costs, and service costs. Quality performance includes; high product quality, service quality. Delivery performance includes; delivery reliability, speed, and time. Flexibility performance includes; process flexibility, manufacturing flexibility, and flexibility service.

The total number of test samples were 500 and 153 respondents

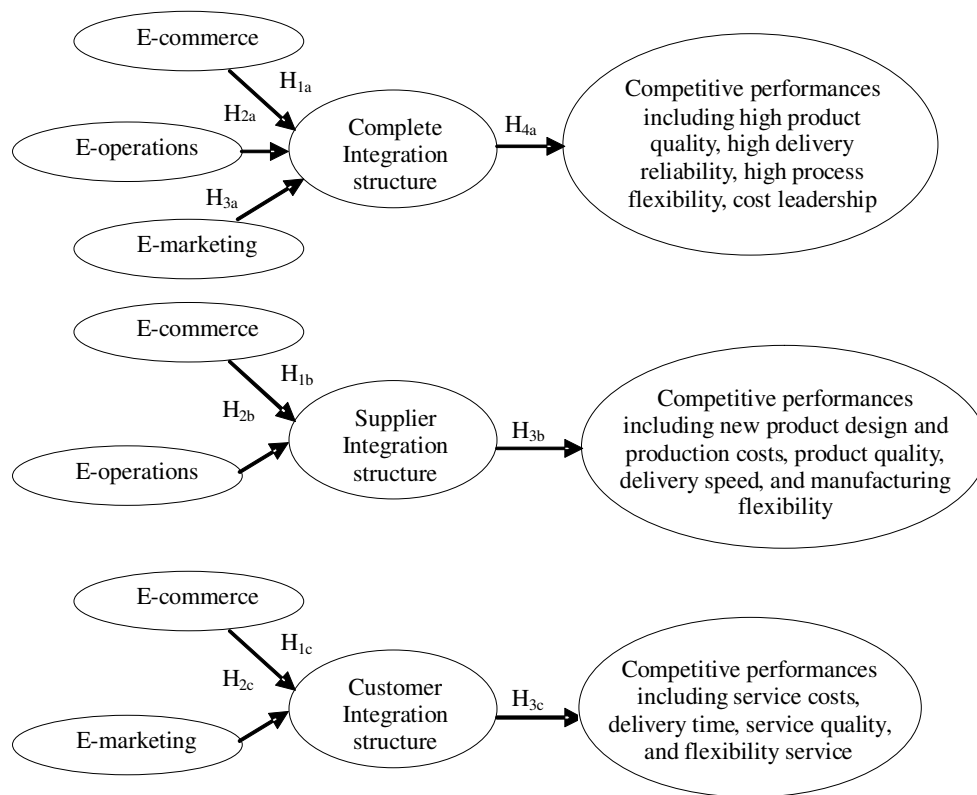


Figure 1. Research framework.

Table 1. Sample by region.

Region	Test sample	
	Count	Percentage
China	56	36.60
Taiwan	45	29.40
Southeast Asia	38	24.84
Japan	7	4.58
Korea	7	4.58
Total	153	100

were retrieved. The respondent rate for the total sample was approximately 31%, and the total test samples are summarized by region in Table 1. In the profile of 153 test samples, approximately 39.87% of the respondents were manufacturers of fabricated metal products; 16.34% of the respondents were manufacturers of machinery and equipment; 3.27% of the respondents were manufacturers of office, accounting, and computing machinery; 15.03% of the respondents were manufacturers of electrical machinery and apparatuses; 8.50% of the respondents were manufacturers of radio, television, and communication equipment and apparatuses; 2.61% of the respondents were manufacturers of medical, precision, and optical instruments, watches, and clocks; 7.84% of the respondents were manufacturers of motor vehicles, trailers, and semi-trailers; 6.54% of the respondents were manufacturers of other transport equipment. In the sample size, average employment was 32,628; 56% belong to non-transnational corporations, 23% belong to non-corporations but possess the ability to develop

more than one manufacturing site in their own country, and 21% belong to transnational corporations.

#### Identification for three integration structures and sample clusters

In this study, we try to explore the practical adoption of e-business strategies on three supply chain integration structures; therefore, we first identify three integration structures. In the identification of integration structures, this study will cite the extensive integration arc view of Frohlich and Westbrook (2001). Frohlich and Westbrook identified a judgment model as shown in Figure 2. Figure 2 can discriminate three quartiles in the suppliers and customer arc: upper, middle, and lower. A practice situation of supplier and customer integration activity will be placed into the upper, middle, or lower quartiles. According to the identification of

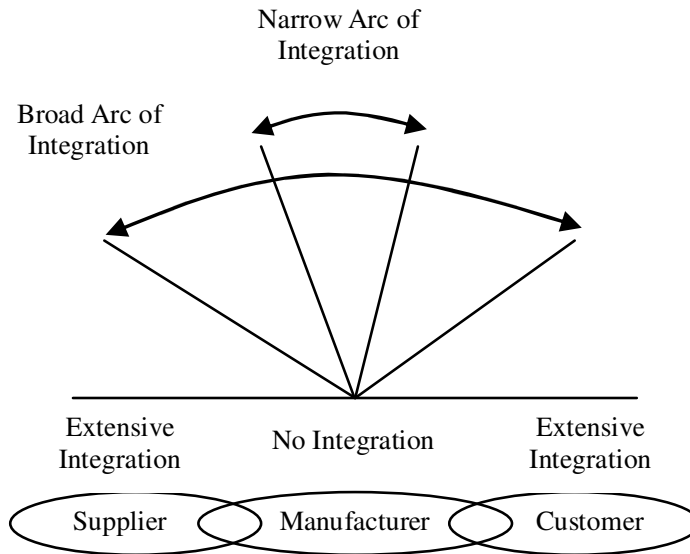


Figure 2. Judgment model of integration structure.

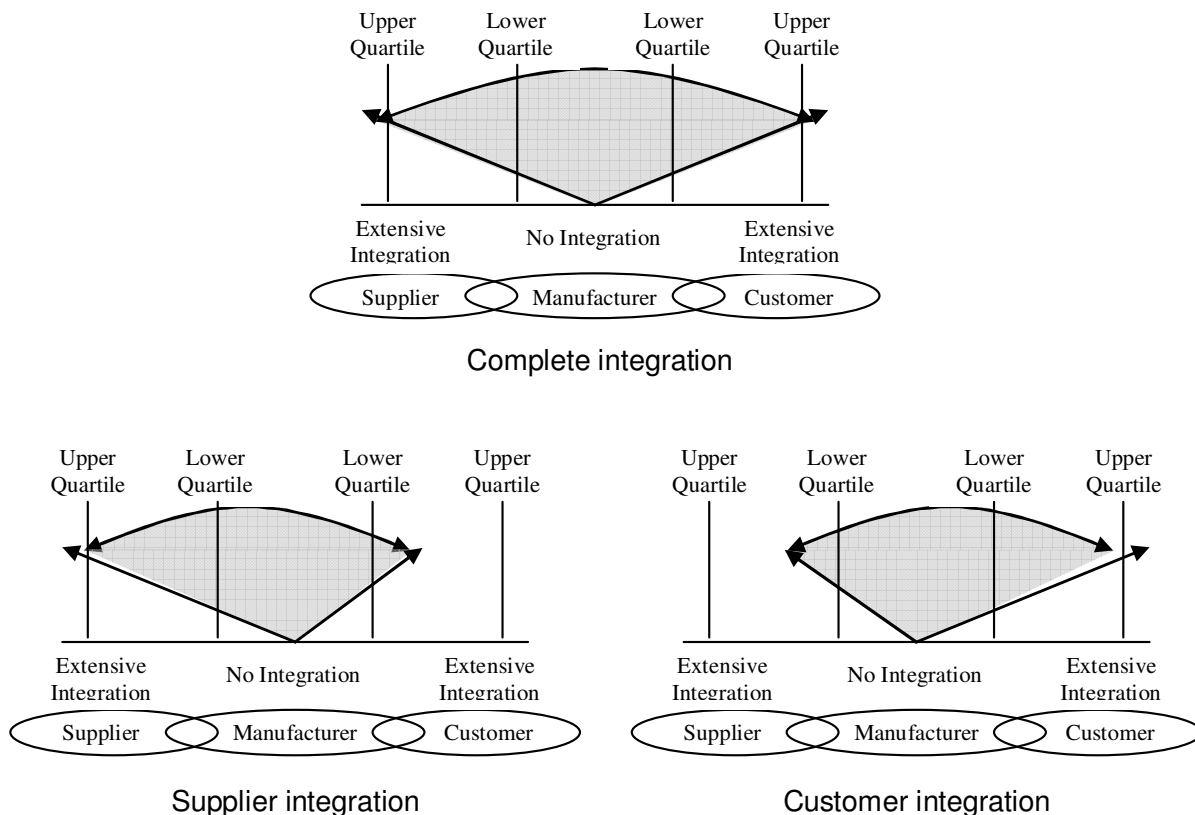


Figure 3. Three integration structures.

Frohlich and Westbrook, high levels of integration in the upper quartiles for both customers and suppliers were labeled “complete integration.” Then, instances of extensive integration with suppliers, but having customer integration below the upper quartile,

were categorized as “supplier integration.” Finally, instances of extensive integration with customers, but remaining below the upper quartile for suppliers, were categorized as “customer integration.” The definition of integration is shown in Figure 3. As in

**Table 2.** Results of discriminant analysis.

	Cases	Complete integration	Supplier integration	Customer integration
Complete integration	46	46 (100%)	0	0
Supplier integration	40	8 (20%)	32 (80%)	0
Customer integration	67	6 (9%)	0	61 (91%)

90.8% of original grouped cases correctly classified.

the aforementioned definition, test samples will be further clustered to three integration structures. In the practice situation of integration activity in suppliers and customers, we use an activity factor score to judge. In a practice situation of integration activity in suppliers and customers, we found that 46 samples would be classified in complete integration, 40 samples would be classified in supplier integration, and 67 samples would be classified in customer integration.

However, supplier and customer integration activities can be combined to develop each integration structure that must be tested. In this study, the ANOVA was conducted to compare each integration activity between supplier and customer. The test results indicated that difference does not exist between supplier and customer activities. Therefore, we can ensure that the supplier and customer integration activities can be combined to develop each supply chain integration structure.

To ensure the results of the sample classification in three integration structures, we adopted discriminant analysis in order to judge correctly classified results. As seen in Table 2, the results of the discriminant analysis indicated that the classified result of complete integration is 100%, supplier integration is 80%, and customer integration is 91%. The discriminant analysis confirmed that 90.8% of the samples were classified correctly. Based on this result, we can modify classified result and further use these samples to test in further discussion.

### Research methodology

This study conducted Structural Equation Modeling (SEM)-based methodology with EQS to test research hypotheses. In addition to SEM, we used Confirmatory Factor Analysis (CFA) to validate measures of constructs for e-business strategy and performance. CFA is a more powerful method for assessing variables' construct than traditional assessing methods in factor analysis and alpha in item to total correlation. Through CFA, e-business strategy and performance variables' construct will be ensured, and an unreliable variable can be effectively eliminated. After CFA, the SEM result will be more accurate.

## RESULTS AND DISCUSSION

### Results

Here, we test three research models which are presented in Figure 3. The construct of the model is shown in Table 3. First, we test CFA of every integration structure to each construct in different test models. The CFA results are given in Table 4. As shown in the results of Table 4, we can ensure the construct in different test models. Otherwise, we can understand that the constructs of the three models are satisfactorily fit to each measurement model. All coefficients are significant at the 0.01

level.

After the CFA test, we further tested the structural model. In the fit indices of Model 1, test result indicated that e-commerce and e-marketing were non-significant and only e-operations was significant. Therefore, we consider dropping the variables of e-commerce and e-marketing. After these have been dropped, we found that the fit indices have been reformed. Test results indicated that RMR = 0.046, CFI = 0.965, and GFI = 0.871. Although GFI is still not higher than 0.90, the GFI has trended to 0.90. These results confirm the evidence of convergent validity in Model 1.

In the fit indices of Model 2, we found that the RMR is lower than 0.05 (0.023) and the CFI is higher than 0.90 (0.965); the GFI however, is lower than 0.90 (0.819), but trends to 0.90. As fit indices, we can confirm the evidence of convergent validity in Model 2. In the fit indices of Model 3, we found that the RMR is equal to 0.05, while the CFI and GFI are higher than 0.90 (0.967, and 0.907 respectively). As fit indices, we can confirm the evidence of convergent validity in Model 3. The final results of the structural model in three Models have been shown in Figure 4.

The hypotheses will be reflected in the test results of the three models. The test results indicated that the  $H_1$  is unsupported, while  $H_2$  and  $H_3$  are supported. The results of the hypotheses have been shown in Table 5.

## DISCUSSION

Regarding the test results, we found that only e-operations has a direct influence on complete integration. Although e-commerce and e-marketing do not have a direct influence on complete integration, manufacturers can still improve complete integration to achieve the greatest practice results and performance through e-operations. In supplier integration, we found that e-commerce and e-operations have a direct influence on supplier integration and improve supplier integration to align with the greatest practice results and performance. Additionally, we found that e-commerce and e-marketing have a direct influence on customer integration and help customer integration to align with the greatest practice results and performance.

As far as we know, this study is the first to explore the alignment of different e-business strategies and different supply chain integration structures. As per our

**Table 3.** Construct of model.

<b>E-commerce</b>
V11: Actions
V12: RFx (request for quotation, proposal, information)
V13: Order management and tracking
<b>E-operaiton</b>
V21: Data analysis (audit and reporting)
V22: Content and knowledge management
V23: Collaboration support services
<b>E-marketing</b>
V31: Scouting/pre-qualification
V32: Access to catalogues
<b>Performance</b>
V41: Cost
V42: Quality
V43: Delivery
V44: Flexibility

**Table 4.** CFA results of e-business strategy in different integration.

Variable	Integration structures		
	Complete integration	Supplier integration	Customer integration
$\chi^2$ (df)	22.11 (df=17)	9.31 (df=8)	3.80 (df=4)
RMR	0.045	0.006	0.027
GFI	0.900	0.930	0.978
CFI	0.980	0.996	1.000
RMSEA	0.082	0.065	0.000

Hypotheses test results, we can understand when firms adopt different integration structures for competitiveness and which e-business strategy can be effective in improving which integration.

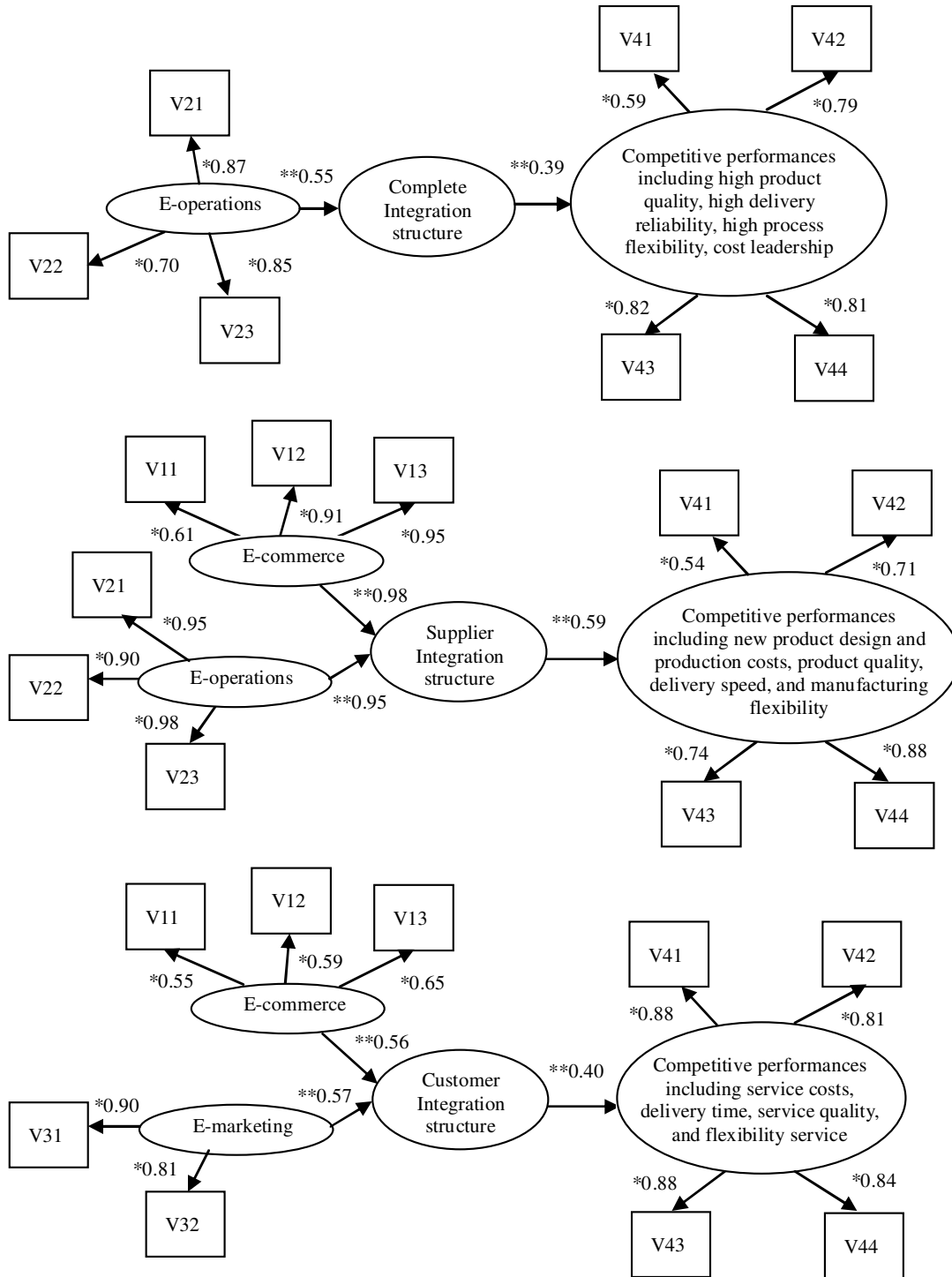
After the test, hypotheses test results provide some interesting conclusions, and these conclusions should be discussed. First, complete integration structures involve all the production and selling service process between manufacturers and suppliers, as well as manufacturers and customers. To our knowledge, complete integration should be improved through all of the e-business strategies if firms adopt and hope the complete integration can practice effectively. However, test results indicated that only e-operations possess a direct influence to improve partner's integration for effective practice of every internal operation under complete integration.

In light of all this, why is it that only e-operations possess a direct influence? The main reason lies in a

firm's ability to establish a stable supply chain operational environment. As in the view of Lee et al. (1997), if firms want to establish a successfully complete integration structure, firms must possess the ability to establish a better coordination environment. In an environment of better coordination, firms can eliminate many surplus transaction activities between suppliers and manufacturers, or manufacturers and customers, which can lead to a stable supply chain partner-relationship between manufacturers and suppliers, or manufacturers and customers (Frohlich and Westbrook, 2001).

When a stable partner-relationship is formed, firms just need to adopt an adaptive strategy or tool to improve internal operations integration between supply chain members. Moreover, it is unnecessary for manufacturers to adopt another strategy or tool for improvement or maintaining in the transaction relationship or process, or





**Figure 4.** Structural models. \*\* Significant at  $p < 0.01$ ; a: complete integration- $\rightarrow$  RMR = 0.046,  $\chi^2 = 25.967$  (df = 19), CFI = 0.965, GFI = 0.871, RMSEA = 0.090; b: supplier integration- $\rightarrow$  RMR = 0.023,  $\chi^2 = 49.083$  (df = 33), CFI = 0.965, GFI = 0.819, RMSEA = 0.092; c: customer integration- $\rightarrow$  RMR = 0.050,  $\chi^2 = 37.879$  (df = 27), CFI = 0.967, GFI = 0.907, RMSEA = 0.078.

improvement in downstream customer integration. As Boyer (2001) noted, when a stable partner-relationship exists in a supply chain operational environment, the firms just need e-operations to streamline internal

operations.

However, in the real world, only major transnational corporations possess related resources and an ability to develop a better coordination environment. Because the

**Table 5.** Test results of hypotheses.

Hypotheses	Conclusion
H <sub>1a</sub> : When firms adopt e-commerce, which can guide partner's integration and collaborate practice on related internal operations in complete integration supply chain structure.	Un-supported
H <sub>2a</sub> : When firms adopt e-operations, which can guide partner's integration and collaborate practice on related internal operations in complete integration supply chain structure.	Supported
H <sub>3a</sub> : When firms adopt e-marketing, this can guide partner's integration and collaborate practice on related internal operations in complete integration supply chain structure.	Un-supported
H <sub>4a</sub> : When related internal operations under complete integration supply chain structure have effectively practice, high product quality, high delivery reliability, high process flexibility, and cost leadership will be achieved.	Supported
H <sub>1b</sub> : When firms adopt e-commerce, this can guide partner's integration and collaborate practice on related internal operations in supplier integration structure.	Supported
H <sub>2b</sub> : When firms adopt e-operations, this can guide partner's integration and collaborate practice on related internal operations in supplier integration structure.	Supported
H <sub>3b</sub> : When related internal operations under supplier integration structure have effectively practice, firm can reduce new product design and production costs, increase product quality, delivery speed, and manufacturing flexibility.	Supported
H <sub>1c</sub> : When firms adopt e-commerce, this can guide partner's integration and collaborate practice on related internal operations in customer integration structure.	Supported
H <sub>2c</sub> : When firms adopt e-marketing, this can guide partner's integration and collaborate practice on related internal operations in customer integration structure.	Supported
H <sub>3c</sub> : When related internal operations under supplier integration structure have effectively practice, firms can reduce service costs, shorten delivery time, increase service quality, and increase flexibility service.	Supported

majority of transnational corporations possess large resources and capital, they can continue to develop their own upstream sub-corporations and downstream retailers through large capital applied to direct or indirect investment. Through investment to establish a stable supply chain operational environment, it is unnecessary for firms to adopt a related strategy or tool to improve or maintain a transaction relationship between supply chain members. Additionally, due to a stable supply chain operational environment, they possess the ability to respond immediately to customers of different markets. Therefore, firms can agglomerate and attract loyal customers and reduce the adoption level of related strategies or tools to improve marketing.

In the profile of test samples of complete integration, we found that approximately 70% of samples are from transnational corporations, although 30% of the other samples are not from transnational corporations. However, these 30% sample firms still possess the ability to develop more than one manufacturing site in their own country. Based on the profile of test samples of complete integration, we can show that when firms possess large resources to develop a complete integration structure of supply chain, firms can develop a better coordination environment and stable partner-relationship.

Therefore, when firms possess the ability to develop a complete integration structure for competitiveness and hope to improve integration by using e-business strategy, firms just need e-operations to improve partner's internal operations integration for ensuring effective practice and achieving high competitive performance. In addition, as shown earlier, we can discuss the results of H<sub>2a</sub> to H<sub>2c</sub>, and H<sub>3a</sub> to H<sub>3c</sub>. Firms may consider competitive resources and ability and development environments to change and adopt other supply chain integration structures for competitiveness.

The test results of Frohlich and Westbrook (2001) indicate that over 90% of firms adopt other integration structures for competitiveness. When firms are limited in internal/external resources and development environments to change and adopt other supply chain integration structures, firms may be unable to establish a stable partner-relationship in a supply chain operational environment. Also, transaction uncertainty will exist in an unstable partner-relationship.

For improvement in supplier and customer integration, except for adopting an adaptive strategy to improve the integration activity focus in supplier and customer integration, firms also have to adopt a related strategy to improve and maintain transactional relationships between manufacturers and suppliers or manufacturers

and customers to avoid transaction uncertainty.

In the sample cluster of supplier integration, we found that over 80% of samples are involved in non-transnational corporations, and they lack the ability to develop more manufacturing sites in their own country or another country. Therefore, when firms try to adopt an e-business strategy to improve supplier integration, as the  $H_{2a}$  to  $H_{2c}$ , test result depicts, in addition to adopting e-operations to improve the production operations process between manufacturers and suppliers, firms also adopt e-commerce to improve transaction relationships between manufacturers and suppliers.

In the sample cluster of customer integration, we also found that over 80% of the samples are involved in non-transnational corporations, and they lack the ability to develop more manufacturing sites in their own country or another country. Therefore, when firms try to adopt an e-business strategy to improve customer integration, as the Hypothesis 3 test result shows, in addition to adopting e-marketing to improve product selling and the service process between manufacturers and customers, firms also adopt e-commerce to improve the transaction relationship between manufacturers and customers.

## CONCLUSION AND FUTURE RESEARCH DIRECTIONS

This study tries to explore the practical adoption of different e-business strategies on different supply chain integration structures. As is characteristic of three e-business strategies, three different integration structures, and performance, we conceptualize three models, including: alignment of e-commerce, e-operations, e-marketing, complete integration structure, and performance; alignment of e-commerce, e-operations, supplier integration structure, and performance; and alignment of e-commerce, e-marketing, customer integration structure, and performance.

As per the test results, the findings indicate that only e-operations possess a direct influence to improve complete integration. This result indicates that the firms of majority development complete integration possess the ability to develop a better coordination environment and stable partner-relationship. In a stable partner-relationship, firms do not need to adopt other strategies or tools to maintain or improve transaction relationship to suppliers and customers. Rather, they just need to adopt a related strategy to improve internal operations integration.

Otherwise, considering changes in competitive environments and firms' internal resources and ability, firms will adjust and decide upon different supply chain integration structure. These firms lack the ability to develop a stable partner-relationship. Therefore, when firms try to adopt an e-business strategy to improve supplier or customer integration structure, in addition to firms needing to follow different integration activity requirements to

adopt an adaptive e-business strategy to improve different integration structure, firms also have to adopt e-commerce to improve a transaction relationship between manufacturers and suppliers, or manufacturers and customers. As test results indicate, supplier integration should be improved through adoption of e-operations and e-commerce, and customer integration should be improved through adoption of e-marketing and e-commerce.

The discussed findings present some important implications for research and managerial practice. In terms of research, we knew that the different supply chain integration structures have existed in the real world, and considering changes in the competitive environment and firms' internal resources and ability, firms will adjust and decide upon an adaptive supply chain integration structure for competitiveness. When researchers try to explore the alignment relationship supply chain integration and e-business, perhaps researchers should judge what kind of limited and development environment leads firms to select a different integration structure and follow the aforementioned judgment results to further explore how e-business improves.

This study also has several important implications for managers. Managers can refer to our findings and deductions in order to check their integration structure and further select an adaptive e-business strategy to improve supply chain integration. We believe that managers can effectively use an e-business strategy to improve supply chain integration and further increase competitive ability in the global competitive environment when managers consider our findings and deductions.

In future research, as our results indicate, some issues should be further explored.

Firstly, this study only explores three supply chain integration structures; however, the results of Frohlich and Westbrook (2001) indicated that five integration structures exist in the real world. Therefore, future research may be able to explore the alignment relationship of more integration structures and e-business strategies.

Secondly, perhaps more e-business strategies are waiting to be explored. Researchers may look into utilizing more e-business strategies and work to discover how best to apply them in different integration structures.

Thirdly, this study indicated that a complete integration structure should be based on a better coordination environment—but how to improve a better coordination environment? Which resources and conditions are necessary when manufacturers try to improve a better coordination environment?

Fourthly, if firms possess large resources to develop a stable partner-relationship but firms only develop a supplier or customer integration structure for competitiveness, what application of e-business strategy will be changed?

Finally, this study only investigated Asian manufacturing firms; perhaps researchers can investigate further global manufacturing firms in future research.

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