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Full Length Research Paper

The effects of inter-firm power and supply partner assessment on supply chain integration

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With rapid changes in technology and globalization of markets, it has become very difficult for firms to "go it alone". World-class companies, therefore, seek to enhance competitive performance by effectively linking them with the external operations of supply chain members. Several factors are critical to effective integration. Supplier's power is one of the major factors influencing supply chain integration. Supplier's characteristics determined its power. Inter-firm power affects buyers and suppliers' decision and subsequently, the performance of the buyer. The relationships among supplier's assessment, power, cooperative attitude and supply chain integration are hypothesized and investigated based on empirical data collected from companies in semiconductor component manufacturing supply chain. The results demonstrate that both power structure and suppliers' characteristics influence supply chain integration. Managerial insights are provided accordingly for companies to achieve better supply chain integration in nowadays highly competitive environments.

Key words: Supply chain integration, power, supplier assessment, cooperation.

INTRODUCTION

With rapid changes in technology and globalization of markets, it has become very difficult for firms to "go it alone" (Koufteros et al., 2007). Large, global corporations like Lucent, Wal-Mart, Procter and Gamble and Sun Microsystems have demonstrated that value can be created through supply chain integration (Lee, 2000). Supply chain integration becomes a critical successful factor for firms to enter partnership relationship with their supply chain partners (Ellram and Hendrick, 1995; Lee, 2000; Wang and Kess, 2006).

Prior researches suggested that greater degree of supply chain integration is strongly associated with higher level of performance (van de Vaart and van Donk, 2007). However, most previous studies have focused on using information technology to achieve integration. There is little evidence of empirical work from a behavioral perspective to investigate the impacts of buyer-supplier relationships on supply chain integration (Dapiran and Hogarth-Scott, 2003).

Firms always depend, to varying extents, on their trading partners; therefore, power is considered to be an important concept for understanding buyer-supplier relationship (Caniëls and Gelderman, 2007; Koufteros et al., 2007). Power affects the willingness of any two parties to invest in cooperative activities and expectation of conducting these activities. One party might desire a particular type of interaction doesn't mean that this desire will be shared by the other party. Also, the stronger party will take advantage of opportunism and has less motivation in business exchange to keep scare recourses away from the other party (Emerson, 1962; Cox et al., 2003; Hingley, 2005,). Therefore, power determines parties' motivation to cooperation, the most critical element for integration (Maloni and Benton, 2000). A firm's cooperative attitude determines its efforts engaging in buyer-supplier integrating actives.

Besides power, supply partner assessment is also an important factor for successful supply chain integration (Tracey and Tan, 2001; Lin et al., 2005). Selecting

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good-performing suppliers on competence-based selection criteria and on partner-based selection criteria is positively associated with improved integration effectiveness as well (Petersen et al., 2005; Ellram and Hendrick, 1995). Competent suppliers contribute their advanced technology and manufacturing expertise for supply chain integration. And the suppliers attempting to establishing partnership with buyers are likely to have higher incentive for cooperation and supply chain integration.

Power comes from two sources, context-based and resource-based (Yan and Gray, 1994). Context-based bargaining power of one party comes from the availability of alternatives to itself. The possession or control of critical resources also constitutes power in inter-organizational relations (Pfeffer, 1992) and these resources contribute to the supply partner's performance on competence-based selection criteria. Therefore, supplier performance not only contributes to integration effectiveness but also to supplier's power. To our best knowledge, there is no study to explore the relationship among supplier's performance, supplier's power and supply chain integration.

The focus of this study lies in the determinants of supply chain integration, rather than the consequences of supply integration in prior literatures. Through the exhaustive literature survey, power on buyer-supplier dyad, supplier characteristics and supplier's cooperative attitude are identified as the major factors influencing supply chain integration. Because of little empirical evidences supporting their interrelationships, the relationships of antecedences of supply chain integration need further validation. There are four research objectives as described below.

1) To examine the main effect of supplier's power on supplier's cooperative attitude.
2) To investigate the main effect of supplier's cooperative attitude on supply chain integration.
3) To analyze the main effect of supplier's competence-based assessment on buyer's dependence.
4) To investigate the moderation effects of buyer's power and supplier's relationship-based assessment between power's power and supplier's cooperative attitude.

LITERATURE AND HYPOTHESES

Determinants of supply chain integration

Supply chain management seeks to enhance competitive performance by closely integrating the internal functions within a company and effectively linking them with the external operations of suppliers, customers, and other channel members (Kim, 2006). Integration therefore plays a key role in achieving efficient and effective supply chain management (Olhager and Selldin, 2004; Yeung et al., 2009).

Unfortunately, supplier's cooperation attitude will be pruned if the suppler has relatively stronger power in buyer-supplier relationship (Duffy and Fearne, 2004). The stronger side is likely to hold such cooperative actions as information sharing or conflict resolution to maintain the resources of power, under the assumption of serf-interest. Once the supplier has less sentiment on cooperative actions, the quality of cooperation and coordination will be hurt.

Also, to enhance the quality of cooperation and coordination with suppliers, buyers should select competent suppliers that are able to provide timely, accurate and complete information of advanced technology or logistical data (Li et al., 2006). Buyers need to select the suppliers that are trusted and expect to establish long-term relationship with buyers as well. These suppliers, even with relatively stronger power, will repress their self-interest behavior for maintaining the health relationship with buyers. Suppliers' characteristics therefore influence the effectiveness of integration.

Many firms believe that selecting right supplier is critical to the supply chain integration (Wu et al., 2004; Petersen et al., 2005; Koufteros et al., 2007). Interviews on practitioners in this study and insights from the literature suggest that two forms of assessments to select right supplier are deemed necessary antecedents to successful supplier integration (Ellram and Hendrick, 1995; Gulati et al., 2005).

The first one is the assessment of the suppliers with capabilities well-matched to buying company's needs, such as advanced manufacturing technology, innovation capability, good performance on production quality, dependable delivery, etc (Petersen, et al., 2005). These capabilities are associated with resources and skills that a buying firm requires for its competitive success (Dong and Glaister, 2006). The typical assessment items comprise technological capability, production technology, technological support, conformance quality, consistent delivery, prompt response and so on (Choi and Hartley, 1996; Saxton, 1997; Ittner et al, 1999; Tracey and Tan 2001).

The first kind of assessment is defined as competence-based assessment in this research. The second assessment of suppliers is to identify whether suppliers share the same goals with the buying firms and whether trust exists between the two partners (Dong and Glaister, 2006). The common assessment items include goal congruence, suppier's reputation for integrity, pre- vious cooperation experience (Ellram and Hendrick, 1995; Choi and Hartley, 1996; McCutcheon and Stuart 2000; Dong and Glaister, 2006; Wang and Kess, 2006). The goal of this kind of assessment is to identify whether supply partner attempt to establish long-term partnership with the buying company or not. The second assessment is called relationship-based assessment herein.

Cooperative attitude, inter-power structure and supplier characteristics shape and influence supply chain integration. integration. The associations between these factors and supply integration should be studied and analyzed. Because

of the lack of research investigating these associations, this study aims to explore the associations and bases on the buying firms' perspective to help them successfully integrate suppliers to reduce time-to-market and respond to fast-changing market demand more efficiently.

Supplier's power and competence-based assessment

H_1: The supplier's competence is positively related to the supplier's power

Supplier's power comes from context-based and resource-based sources (Yan and Gray, 1994). Since con-text is determined by the industry structure and can not be changed by any single firm, resource-based sources are focused in this study. Valuable resources are usually scarce, imperfectly imitable, and lacking in direct sub-stitutes. These resources not only allow a firm to establish a sustainable competitive advantage but also help firms to attract and retain customers. When companies own valuable resources, they will become more competent in the market. Their customers hardly leave them because of needs for their products or services (Rese, 2006; Choi and Hartley, 1996). This complies with recourse dependence theory.

Proprietary technology, knowledge, and patents are typical resources owned by a supplier in a supply chain (Mitra and Singhal, 2008). When a supplier owns more advanced technological expertise, professional know-ledge, innovativeness, and dependable delivery capability, it buyers would depend on the supplier more and the suppliers would have relatively stronger power as well (Cäniels and Gelderman, 2007). Building upon this discussion, the hypothesis is established.

Supplier's power and cooperative attitude

H_2: The supplier's power is negatively associated with the supplier's cooperative attitude to supply chain integration

Cooperation is "similar or complementary coordinated activities performed by firms in a business relationship to produce superior mutual outcomes or singular outcomes with expected reciprocity over time" (Anderson et al., 1994). Several studies suggested that power negates co-operation and is a negative influence and not helpful in the building of relationship quality (Doney and Cannon, 1997; Hingley, 2005). The primary reason why is that power creates an opportunity for the more powerful company to behave opportunistically in terms of distorting information or reneging on commitment (Jap and Anderson, 2003). Suppliers with stronger power, therefore, have lower cooperative motivations. As a buyer becomes more dependent, it is harder to get its vendors' cooperation. Hypothesis 2 is thus derived.

Supplier's cooperative attitude and supply chain integration

H_3: The supplier's cooperative attitude is positively related to the effectiveness of supply chain integration

Integration between organizational units can arise when there are appropriate incentives (Gulati, et al., 2005; Kretschmer and Puranam, 2007). Behaviors are driven by motivated incentives. In the researches of buyer-supplier, cooperation is frequently highlighted as a key mediating variable for supply chain integration (Duffy and Fearne, 2004; Gounaris, 2005). Supply chain integration is realized when supplier has positive attitude of cooperation and coordination, because suppliers with higher cooperative motives are more willing to share information or to be open to communication. Hypothesis 3 is thus derived.

Moderating effect of buyer's power

H_4: The buyer's power has moderation effect on the interrelationship between the supplier's power and the supplier's cooperative attitude

As mentioned before, power comes from dependence. When a buyer enhance its own valuable and scare resource and differentiate itself from other competitors, the dependence of its suppliers will increase. Researchers found that buyers' market knowledge or their improved product salability and demand now and in the future will make supplier depend on the buyer (Hitt et al., 2000; Wu et al., 2004). For example, a manager in a large, global IC design company said that one of major vendors, with a large scale, treats the buying company very well even when it was still in small size. The vendor expects the products provided from the buying firm will become main stream products in the future and the needs of the product will swift. Therefore, the vendor, even as a much more powerful party, it will offer cooperation and coordination activities requested by the buying firm in order to establish long-term relationship with the buying firm.

When the buyer and supplier have greater mutual dependence, they will need greater level of coordination, joint problem solving and mutual adjustment (Pearce, 1997). Although the supplier has relatively stronger power, it will restrict the usage of power and investment in cooperation to exchange information or resource with the buyer. Therefore, supplier's dependence (buyer's power) positively moderates the relationship between buyer's dependence and supplier's participation incentive (Gulati et al., 2005; Wu et al., 2004; Caniëls and Gelderman, 2007). Hypothesis 4 is thus derived.

Moderating effect of relationship-based assessment

H_5: Selecting suppliers with aspect to relationship-based assessment has moderation effect on the interrelationship between the supplier's power and the supplier's cooperative attitude

Cooperation can arise through processes of identification, which infuse members of a supply chain with a willingness to cooperate and exert effort for the goals of the aggre-gated supply chain (Gulati et al., 2005). Goal congruence, trust (Cavusgil et al., 2004) and duration and quality of relationship (Deeds and Hill, 1999) are, therefore, supported to curtail opportunism. Relationship-based assessment on supplier is a typical tool to screen benevolent supplier from supplier base.

Goal congruence is important for continuing relationship and a supplier with the attitude for long-term relationship will restrict its opportunistic behavior (Ellram and Hendrick, 1995; Choi and Hartley, 1996). Trust is defined as a type of expectation that alleviates the fear that one's exchange partner will act opportunistically (McCutcheon and Stuart, 2000). If there is trust between a buyer and supplier, it means that the supplier will not act opportunistically by placing its own short-term gains over the other firm's welfare (Wu et al, 2004). Prior experiences provide buyers opportunities to understand suppliers' management attitudes and outlook for the future (Ellram and Hendrick, 1995; Hitt et al., 2000). These experiences help a buyer to evaluate such relationship qualities as consistent, honest, fair, responsible, helpful and benevolent to identify whether a supplier is qualified to be a good partner for cooperation. Therefore, choosing a supplier providing satisfied prior experiences is an effective way to ensure supplier's cooperative attitude. Hypothesis 5 is thus derived.

Supplier assessment and supply chain integration

H_6: Selecting the "right" suppliers with aspect to competence-based criteria is positively associated with supply chain integration effectiveness.

H_7: Selecting the "right" suppliers with aspect to relationship-based criteria is positively associated with supply chain integration effectiveness.

There are several criteria should be considered to select a supply partner (Monczka et al., 1998; Spina et al., 2002; Stump et al., 2002). Regardless of the specific criteria of interest, the fundamental objective of supplier chain partnership is to achieve alignment between the buying company's needs and the supplier's capabilities, both from a technical standpoint of and a behavioral standpoint (Dong and Glaister, 2006; Wang and Kess, 2006). It is, therefore, conceptualized competence-based assessment as the degree to which the supplier's capability complimented the buyer's needs. Most companies expect that a supplier who is involved in the supply chain relationship has technology and manufacturing expertise so that buying companies can get information about latest technology development and product design suggestions.

In addition, it is also conceptualized relationship-based assessment as (a) the degree to which the supplier's business value/goal complimenting the buyer's value/goal, (b) the degree of integrity and trustfulness of supplier and (c) the degree of satisfied prior trading or cooperation experience. A supplier with high performance on relationship-based assessment is likely to provide timely and reliable information which contribute to effective integration. Both assessments can improve the quality of information sharing to realize the alignment of actions and interests and both assessments help achieve effective supply chain integration (Laaksonen et al., 2009; Yeung et al., 2009).

This study hypothesizes that a rigorous and proper supplier assessment, which yields a supplier with characteristics that are good match with the buying company's needs, will lead to improved supply chain integration. For the purpose of discussion, the "well-matched" suppliers are called the "right" supplier. In light of the preceding reasoning, hypotheses 6 and 7 were proposed.

An overview of the proposed hypotheses and their interrelationship are provided in Figure 1.

METHODOLOGY

Survey instrument development

Developing effective measurement scales for various dimensions can be challenging. To address these issues, both past works and pilot field testing were employed to development the scales used in the study. Whenever possible, existing scales were used to measure the construct of interest. Additionally, field interviews were conducted to evaluate different measure scales. Scale items were developed based on interviews and past literature and all measures in this study relied on multi-item scales. The variable compositions, measurements and references are shown in Table 1.

Once developed, the survey instrument was reviewed by four (two managers in IC design house and two experts in IDM) practitioners who had experience in supplier interactions and management in difference companies in the semiconductor industry. The questionnaire was then pre-tested using 10 respondents in different companies. Feedback on the clarity and meaning led to minor changes to the phrasing and order of some the questionnaire's item. Based on the previous steps, a three-page, 38-items survey questions were sent out.

Sample and data collection

Data were collected via a questionnaire sent or emailed to com-panies in the semiconductor industry in Taiwan. The semiconductor industries consist of IC design companies (also known as design houses or fabless), IC manufacturers (also known as foundries), IC packaging companies, IC testing companies, IDM (integrated device manufacturer), EDA tool provider (providing electronic design automation tools for IC design house), design service provider

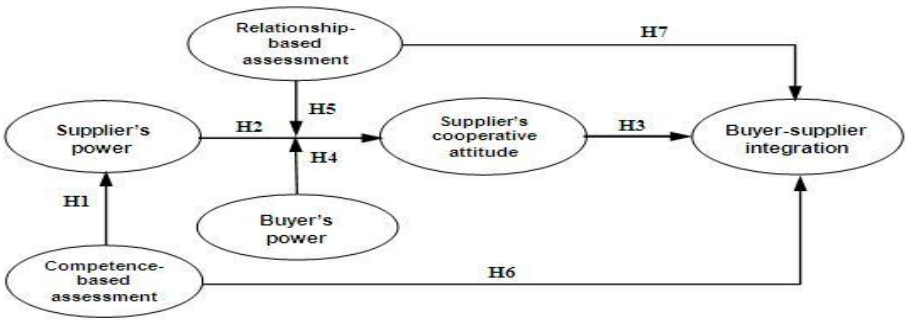

Figure 1. Proposed conceptual model

Table 1. Questionnaire design of constructs.

Construct	Questionnaire compositions and measurements	Sources of literature references
Buyer's power	4 variables Seven-point Likert scales	Adapted from Caniëls and Gelderman (2007)
Supplier's power	4 variables Seven-point Likert scales	Adapted from Caniëls and Gelderman (2007)
Cooperative attitude	5 variables Seven-point Likert scales	Developed based on Ellran and Hendrick (1995) and Li et al. (2006)
Supply chain integration	7 variables Seven-point Likert scales	Adapted from Li et al. (2006) and Leonidous et al. (2007)
Relationship-based assessment	5 variables Seven-point Likert scales	Developed based on Dong and Glaister (2006)
Competence-based assessment	6 variables Seven-point Likert scales	Adapted from Choi and Harley (1996).
Demographic variable	7 variables	Demographic data of respondent companies, their suppliers and respondents are included.

(provide design houses with IC design service), and so on. IC design house and IDM are the most upstream companies, so they are commonly buying companies. IC manufacturers, IC packaging companies and IC testing companies will be the buyers and sup-pliers for each other. EDA tool providers, design service providers and other companies, such as mask providers and lead-frame providers, always play the roles of vendors. Because the semi-conductor industry is a knowledge-intensive industry, such suppliers as IC manufacturers and IC packaging and testing companies might be relatively powerful because of the possession of scare resources, such as IP, technology capability and capacity. IC manufacturers and IC packaging and testing companies are also powerful because of their larger scales than the scales of fablesses. Buyers depend on suppliers; however, these suppliers also need of the market infor-mation raised from shorter product lifecycle. The effects of power structure and supplier characteristics might be more obvious in this industry. The semiconductor industry is also chosen for its leading role in the economic development (Gerwin, 2006).

The key-informant data collect method was used whereby the social scientist obtained information about the group under study through a member who occupied such as a role as to be well-informed (Lee, 2001; Li et al., 2007; Zhao et al., 2007). The target informants were the managers or staff having experiences in supply chain management or supplier interaction. These target populations were mostly in the department of purchasing, R&D, production planning and control, and supply chain management according to the practices in the semiconductor industry. The target populations were then asked to select a relationship in which the buying company had most contact frequencies with its suppliers.

Companies in semiconductor industries were contacted for key informants and questionnaires were sent to the key informants, with a cover letter highlighting the study's objectives. Respondents were encouraged to participate by entitlement to a summary report and a small incentive gift. Respondents were asked to provide information about a relationship between buyer and one of its suppliers. An informant was selected from a company.

However, because of a big difference in companies' scales, more informants were contacted for their agreement for filling

questionnaires out. From these companies, 196 informants agreed to receive the questionnaires and questionnaires were received after several follow-up calls. The usable data used in this study were completed by 124 informants. The response rate was 63.26% based on the number of questionnaires distributed.

Analytical method

Partial least squares (PLS) were employed in this study. It a form of causal modeling that, like LISREL, works by simultaneously assessing the reliability and validity of the measures of theoretical constructs and estimating the relationships among these constructs (Fornell, 1982). It is a confirmatory second-generation multivariate analysis technique. PLS differs in its approach from other structural equation modeling techniques such as LISREL in that it tests the strength of individual component relationships rather than the overall fit of a proposed model to observed covariances amongst all of the variables. PLS is better suited for when the focus is on theory development, whereas LISREL is preferred for confirmatory testing of the fit of a theoretical model to observed data, thus requiring stronger theory that PLS (Chwelos et al., 2001). The variance-based approach, PLS, shifts the orientation from casual model/ theory testing to component-based predictive modeling (Chin and Newsted, 1999).

PLS method was chosen as the most appropriate modeling technique to use in testing the proposed model for the several reasons. First, this study is the first study exploring the interre-lationship among inter-firm power, supplier assessment, cooperative attitude and supply chain integration. It is not based on “strong theory”. Second, some observations of measures did not followed normal distribution. This restricts the use of covariance model. Also, because the minimal recommendations range from 200 - 800 if employing LISREL (Chin and Newsted, 1999), PLS is more proper to test the proposed model only with 124 valid samples. This study employed SmartPLS 2.0 (beta) software application.

RESULTS

The descriptive statistics, respondents’ profiles, are analyzed first. Then, a strict process was employed to test construct reliability. The partial least squares model, con-structed by following the proposed research framework The reason why that there are eight constructs is that added are two constructs, presenting the moderation effects of buyer’s power and relationship-based assessment in the PLS model.

Respondent profiles

The responding companies came from different kinds of companies, as illustrated in Table 2. Among these samples companies, 36.29% of them are IC design companies (fabless) and 32.26% of them belong to IC manufacturers (foundries). They are typical buyers in the semiconductor industry. That the number of employees in sample companies varied largely is consistent with the nature of the semiconductor industry. Companies focus on a small, niche market will survive; therefore companies differ in scales. Some companies such as most foundries have larger scale than those of other companies in other positions of the semiconductor supply chain because of their chase for scope of economics.

Among the respondents, 58% of them are division or department managers and 68% of respondents came from the production control and planning, supply chain management and R&D departments in which staff have frequent interactions with their suppliers. 80% of respondents have been in their position for more than 3 years. Thus, the respondents were familiar with their com-panies’ activities, and the data colleted from them should be reliable. 58% of the suppliers were IC manufactures and IC packing and testing companies. They are the major vendors for IC design companies (fabless) and IC manufacturers.

Convergent and discriminant validity

Reliability is the prerequisite of the scales; however, validity is the necessary and sufficient condition for a proper scale. Therefore, convergent and discriminant validity are then tested.

In PLS, the convergent validity of latent variables can be addressed in terms of consistency or reliability of the set of reflective indicators. All construct in the proposed model are reflective construct and measured by multi-item measures. If the items appear to make sense as means of tapping into a specific construct and these items form reliable scales, the measures are assumed to have convergent validity.

In PLS, alternative ways of judging multiple-item consistency, rather than Cronbach’s alpha, are used. The methods look at (1) the reliability of the individual items that make up the measures (2) the composite reliability of the items as a group (comparable to Cronbach’s alpha) and (3) the average variance extracted form the constructed by each of the items.

Table 3 shows the summary of convergent validity checks. Individual item reliability is assessed using the item’s loading on the construct. A loading of 0.7 indicates that about one-half of the item’s variance (the squared loading) can be attributed to the construct; thus, 0.7 is the suggested minimum level for items loadings. When the loading of any items is lower 0.7, the item will be dropped. Composite reliability assesses the inter-item consistency, which should have a minimum value of 0.7. Table 4 shows the operational measurement scales and corresponding mean and standard deviation. All of the scales demonstrated acceptable performance on this basis. The third standard for reliability is that the average variance extracted (AVE) from the construct by the items should exceed 0.5 so that the items share at least half of their variance with the construct. All scales performed acceptably on this standard. Therefore, the measures in this study demonstrated adequate support for convergent validity.

Discriminant validity is used to analyze the potential problem of having measures for one construct overlap the

Table 2. Basic information of informants and surveyed buyer companies.

Items	Scale	Numbers	Cumulative %
Industry of focal companies	IC design house	45	36.29
	IC manufacturing	40	32.26
	Packaging/ Testing	29	23.39
	Integrated device manufacturer (IDM)	8	6.45
	Others	2	1.61
Employees	Lower than 100	8	6.45
	100-200	32	25.81
	201-500	26	20.97
	501-800	18	14.52
	801-1000	8	6.45
	1001-2000	15	12.10
	More than 2000	17	13.71
Annual sales	Lower than 1 billion NT	18	14.52
	1-5 billion NT	15	12.10
	5-10 billion NT	25	20.16
	10-30 billion NT	14	11.29
	30-100 billion NT	20	16.13
	Higher than 100 billion	32	25.81
Department of informants	Purchasing	30	24.19
	Supply chain management	29	23.39
	Production control/ planning	38	30.65
	R&D	19	15.32
	Others	8	6.45
Position of informants	Division manager	21	16.94
	Department manager	51	41.13
	Engineer or planner	42	33.87
	Others	10	8.06
Years in the current position	Less than 1 years	8	6.45
	1-3 years	17	13.71
	3-5 years	46	37.10
	5-8 years	32	25.81
	More than 10 years	21	16.94
Industry of suppliers	IC manufacturing	35	28.23
	Packaging/ Testing	30	24.19
	Designer service provider	7	5.65
	Mask provider	5	4.03
	Equipment provider	8	6.45
	Chemical provider	7	5.65
	Materials (probing care, lead frame, …)	21	16.94
	Others	11	8.87
n=124			

conceptual territory of another construct (Johnston et al., 2004). One criterion for assessing discriminate validity is the correlation of a construct with it indicators (that is the square root of AVE) should exceed the correlation between the construct and any other constructs. Correlations between constructs are illustrated in Table 5. In Table 5, the square roots of AVE of every construct are considerably higher than any bi-variate correlation

Table 3. Convergent validity checks of constructs.

Latent variables	Loadings	Squared loading	Composite reliability	AVE
Supplier's power				
BD1	0.862	0.928	0.892	0.734
BD2	0.791	0.889		
BD3	0.871	0.933		
BD4	0.853	0.924		
Buyer's power				
BP1	0.884	0.940	0.927	0.806
BP2	0.853	0.924		
BP3	0.727	0.853		
BP4	0.984	0.992		
Cooperative attitude				
CA1	0.901	0.949	0.916	0.748
CA2	0.922	0.96		
CA3	0.741	0.861		
CA4	0.943	0.971		
CA5	0.958	0.979		
Competence-based assessment				
CBA2	0.964	0.982	0.847	0.702
CBA3	0.835	0.914		
CBA4	0.729	0.854		
CBA6	0.899	0.95		
CBA7	0.954	0.976		
Relationship-based assessment				
RSA1	0.897	0.947	0.856	0.712
RSA2	0.732	0.856		
RSA3	0.852	0.961		
RSA4	0.975	0.987		
RSA5	0.727	0.853		
SC integration				
SCI1	0.884	0.94	0.901	0.743
SCI2	0.902	0.95		
SCI3	0.943	0.971		
SCI5	0.747	0.864		
SCI7	0.985	0.993		

Convergent validity: Composite reliability >0.7; AVE >0.5; Indicator loadings >0.7

between constructs. Thus, there is strong discriminate validity, that is, each construct is more highly correlated with its measures that with any other constructs are.

Hypotheses testing and results

Path coefficients of the structural model are illustrated in Figure 2. All paths were significant at the level of P-value < 0.05 except the coefficient presenting the moderation effect of relationship-based selection. Given the loadings, hypothesis 1 is supported (β = 0.604, t-value = 8.743). Buyer's characteristics about competence are strong predictors for buyer's dependence on a supplier. Competence-based assessment on suppliers explained a considerable amount of variance in the level of supplier's power, with R^2 value of 0.428.

Given the loading between supplier's power and supplier's cooperative attitude of (β = -0.256, t-value = 2.674), it can be said that it is a negatively strong predictor of whether the supply chain relationship would likely have cooperative behaviors. Hypothesis 2 is supported. How-ever, Buyer's power can moderates the negative impacts of supplier's power on its cooperative attitude because the moderation effect of buyer's power is significant (β = 0.228, t-value = 2.02). Hypothesis 4 is supported as well.

Table 4. Operational measurement scales and corresponding mean and standard deviation.

Item name	Scale item	Mean	S.D.
Buyer's power			
BP1	Your company is an important customer for the supplier, considering the volume of trade.	3.79	1.29
BP2	The supplier needs the technological expertise of your company.	3.21	1.47
BP3	The products of the supplier can be sold to other customers. (R)	4.42	1.71
BP4	The supplier will incur high switching cost when the supplier replaces your company with other buyers.	3.25	1.03
Supplier's power			
BD1	The reliability of delivery of the product from the supplier is important for an uninterrupted flow of manufacturing.	4.10	1.28
BD2	Your company needs the technological expertise of the supplier.	4.43	1.36
BD3	The product from the supplier can not be bought from other suppliers.	4.92	1.54
BD4	Your company will incur high switching cost when your company replaces the supplier. (R)	4.15	1.58
Supply Chain Integration			
SCI1	Your company is pleased with our relationship with the supplier.	5.05	1.68
SCI2	Your company wishes more of our suppliers were like this one.	4.79	1.72
SCI3	Your company would like our relationship with the supplier to continue in the future	4.86	1.61
SCI5	Your company is pleased to deal with this supplier.	5.10	1.30
SCI7	Your company is pleased with the support and services provided by the supplier.	5.83	1.21
Supplier's cooperative attitude			
CA1	The supplier is highly willing to help us in difficult situations.	5.27	1.39
CA2	The supplier is willing to share information informally with us without specific agreements.	5.01	1.35
CA3	The supplier shares expertise and technical information with us.	4.34	1.30
CA4	The supplier establishes frequent contact with us.	5.36	1.41
CA5	The supplier has frequent face-to-face communication with us.	5.06	1.47
Relationship-based assessment			
RSA1	The supplier shares the same goal with your company.	4.99	1.37
RSA2	Your company is satisfied with previous cooperation experience with the supplier.	5.08	1.40
RSA3	Your supplier considers how its actions will affect us.	4.85	1.54
RSA4	The supplier is truthful and honest.	4.99	1.32
RSA5	The supplier has high integrity.	4.12	1.30
Competence-based assessment			
CBA2	The supplier has capability for production design.	5.21	1.11
CBA3	The supplier has technology capability	5.45	1.10
CBA4	The supplier has capability for high product quality.	5.42	1.10
CBA6	The supplier has high performance on on-time delivery.	5.12	0.96
CBA7	The supplier provides prompt response.	4.90	1.25

R: reverse item.

With respect to the moderation effect of relationship-based assessment, the path loading was not significant (β = 0.101, t-value = 1.329). That means the effects of supplier's power on cooperative attitude will not be moderated by suppliers' such characteristics as trust-worthiness, integrity or sharing congruent goals with the buyer companies. Hypothesis 5 is not supported. The effects of supplier's power and the moderation effects of buyer's power and relationship-based assessment explained the 50.3% (R^2 =0.503) variance of cooperative attitude. Buyer's dependence and power provide strong predictive effects.

Hypothesis 3 is supported because of the t-value of 3.29 and the loading is equally to 0.338. Higher coope-rative attitude results in higher supply chain integration. Also, both dimensions of supplier assessments loaded significantly on supply chain integration. This provides empirical evidences that supplier's characteristics in terms of competence-based and relationship-based were significantly related to the whole supply chain integration. Hypotheses 6 (β = 0.235, t-value = 2.486) and 7 (β = 0.201, t-value = 2.486) are then supported.

Table 5. Correlation matrix for discriminate validity check for latent variables.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Supplier's power (BD) (1)	1.000							
Cooperative attitude (2)	-0.436	1.000						
Supply chain integration (3)	0.281	0.421	1.000					
Buyer's power (BP) (4)	0.169	0.247	0.359	1.000				
Competence-based assessment (5)	0.319	0.284	0.411	0.161	1.000			
Relationship-based assessment (6)	0.256	0.230	0.429	0.180	0.342	1.000		
BD*BP (7)	0.312	0.352	0.216	0.350	0.283	0.108	1.000	
BD*RBA (8)	0.345	0.244	0.189	0.129	0.319	0.229	0.186	1.000
The square root of AVE	0.857	0.864	0.862	0.898	0.837	0.843	1.000	1.000

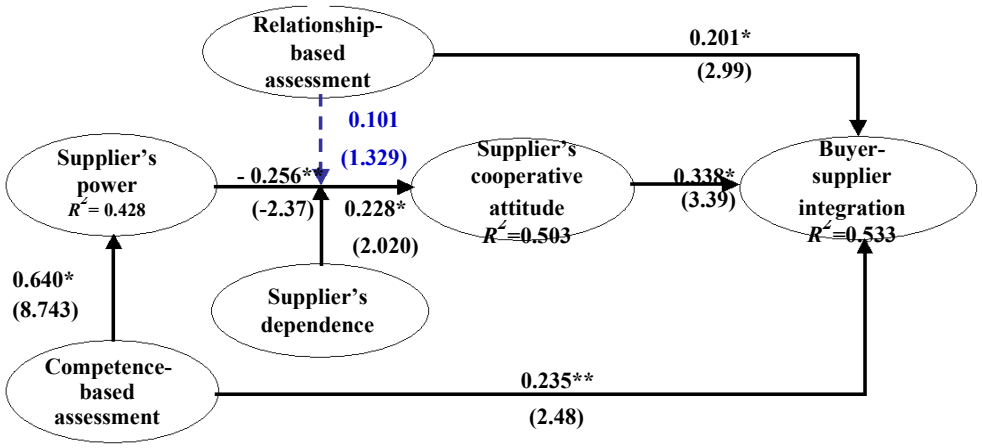

Figure 2. Empirical model with path loadings (Path coefficients and t-values in parenthesis are coming from PLS algorithm and Bootstrapping within SmartPLS software tool) - significant paths are presented as solid lines (t-value>1.96 means significant impacts at 0.05 level).

Cooperative attitude and suppliers' assessments contributed an R^2 of 0.502 in supply chain integration. Overall, the proposed conceptual model gained considerable support form the data.

DISCUSSION AND CONCLUSION

This study focuses on exploring the determinants of supply chain integration. This research is the first study that deals with the power, cooperation attitude and cooperation results in semiconductor industry. It provides empirical evidence of the cooperation behavior implicates of supply chain. According to the critical role of power, cooperative attitude and supplier assessment in supply chain integration, the relationships among the power structure, cooperative attitude, supplier assessment and supply chain integration are investigated based on empirical study with data collected from companies in the semiconductor industry.

From the empirical evidences, power structure between a buyer and supplier and supplier selection do have impacts on the supply chain integration through supplier's cooperative attitude. Buyer's dependence on a supplier, supplier's power, has direct negative effects on supplier's cooperative attitude. The results do indicate that consistent with TCA theory. Supplier's power makes suppliers to take advantage of opportunism and curtail their motives to cooperation (Morgan et al., 2007; Maloni and Benton, 2001). Although buyer's dependence on a supplier decrease supplier's cooperative attitude, the effect of buyer's dependence on a supplier can be moderated by supplier's dependence on the buyer. When a buyer and its supplier depends on each other the buyer, supplier's cooperative attitude will be raised. Higher level of interdependence between buyer and supplier stimulate supplier's positive cooperative attitude to retain its buyer. Several studies suggest the similar results (Duffy and Fearne, 2004; Hingley, 2005; Caniëls and Gelderman, 2007).

With respect to the moderation effects of relationship-based assessment, it is not significant. One possible

reason may be that these characteristics, such as sharing congruent goals and trustworthiness, are the basic conditions to win an order in semiconductor industry. In this highly competitive industry, suppliers will not survive or sustain for a long time if they have bad reputation for integrity and trustfulness and incompatible goals with its customers.

Supplier's cooperative attitude positively influences buyer-supplier integration. The more willingness to cooperate a supplier has, the higher quality of integration can be achieved. It is consistent with empirical results in Duffy and Fearne (2004). Supplier's cooperative attitude mediates the impact of supplier's power in supply chain integration.

Both relationship-based assessment and competence-based assessment lead to supplier's higher cooperative behavior, the buyer-supplier integration. Buying companies should select partner carefully. Selecting right suppliers is a premise for successful integration. Suppliers with good performance on competence contribute their expertise of most updated information and trend of advanced technology. The benevolent and trustful suppliers are like to share timely information to improve buyer-supplier integration (Saxon, 1997). Therefore, a buyer's prudent supplier selection is critical for supplier's cooperative behavior (Ellarm and Hendrick, 1995; Gounaris, 2005).

Power exists within any relationship between a buyer and a supplier. Buyers should learn to live with power. Supplier's power does diminish a supplier's cooperative behavior. However, a buyer can stimulate supplier's motivation by improve its competence to increase supplier's dependence on it to restrict supplier's opportunistic behaviors. By enhancing supplier's cooperative attitude and prudently selecting competent and benevolent suppliers, the effectiveness of buyer-supplier integration will, therefore, be increased from the evidence we observed in semiconductor industry.

The sample frame of this study draws data from only one side of the dyad. Data should be collected from both sides of the buyer-supplier dyad to gain a more accurate understanding of inter-firm power and cooperation attitude and supply chain integration effectiveness. It is useful to collect data from both buyer's and supplier's perspective to validate related constructs in future researches.

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