

## KNOWLEDGE ASSETS, SUPPLIER & CUSTOMER COORDINATION AND PRODUCT PERFORMANCE

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### **Abstract:**

The role of knowledge management in new product development is a hot research topic, yet the impacts of knowledge assets and supply chain integration in terms of supplier coordination and customer coordination to product performance have to be empirically verified. This study aims to explore how knowledge assets of firms in terms of knowledge use and storage; and supplier/customer coordination affect product performance. The study used linear regression models to analyse data from 206 manufacturers. The findings show that knowledge assets have positive relationship with product performance. Customer coordination is found important in affecting product performance for those companies producing industrial products for other manufacturers, i.e. industrial product firms. However, for companies producing products to end-customers, dealers or retailers, i.e. consumer product firms, both supplier coordination and customer coordination are found not important in affecting product performance. The results give a new empirical examination on the role of knowledge management and supplier chain integration to product performance.

*Keywords: Knowledge assets, coordination, product performance*

## 1. INTRODUCTION

In joint product development with business partners, knowledge are generated, stored and exchanged across the supply chain, which improves customer services and provides quick responses in the dynamic market (Lee & Whang, 2001). Existing literatures argue that supplier coordination and customer coordination are useful ways to acquire external resources from suppliers and customers respectively (Lau et al, 2010). Such integration reduces the uncertainties in process, supply, control and demand in business operationd (Towill et al., 2002).

## 2. LITERATURE REVIEW AND RESEARCH MODEL DEVELOPMENT

### 2.1. Knowledge assets

Knowledge assets reflect how much knowledge is possessed and deployed in an organization including the use of existing knowledge and organizational memory. The increase in knowledge stock helps the firm generate new ideas and new knowledge in developing new products. Memory is the archival level of knowledge, experience, and familiarity of the firm operations in new product development (NPD). This study combines the use of existing knowledge and memory into a single factor called knowledge assets which is defined as the capability of the firm to utilize and store existing knowledge and experience. As NPD is a knowledge intensive activity, it is expected that existing knowledge and experience are important for the success of NPD.

### 2.2 Knowledge assets and product performance

Knowledge assets in NPD refer to the use and memory of technological, marketing, production and inventory information across suppliers and customers (Stock and Lambert, 2001, Ayers, 2001) in NPD processes. Many researchers have highlighted the importance of knowledge in firm coordination to enhance firms' competitiveness by better market information, more new product ideas and longer product life cycle (Mentzer, 2004). Others have pointed out the weaknesses of poor knowledge assets in supplier/customer coordination (Singh et al., 2005). Yet, very few empirical studies have focused on the inter-relationships of knowledge assets, supplier/customer coordination and product performance. In addition, there is a concern about how to capitalize knowledge assets across in suppliers and customers (Frishammar and Horte, 2005). In view of the above, it is suggested that knowledge assets in partners firms have a positive relationship with product performance.

### 2.3 Supplier and customer coordination

#### *Co-ordination with suppliers*

To manage the complex NPD processes, manufacturer needs to acquire external resource from the suppliers. Suppliers provide high quality supplies, knowledge sharing, technology and design to support firm's NPD. Frequent communication and coordination with suppliers in NPD not only enable a firm to gain new information or innovative ideas from the diverse viewpoints beyond a single firm, but also create new knowledge for all parties.

#### *Co-ordination with customers*

Co-ordination with customers is a downstream integration to enable firms to proactively seek information on customer preferences and needs, and become more responsive with customers. It also helps to deepen the penetration into customers' products, culture, market and organizations, which enhances firms to respond to the needs of customers faster than their competitors in terms of product improvement possibilities, new product functions, assessment of prototypes and future product trends (von Hippel, 1988).

### 2.4 Supplier/customer coordination and product performance

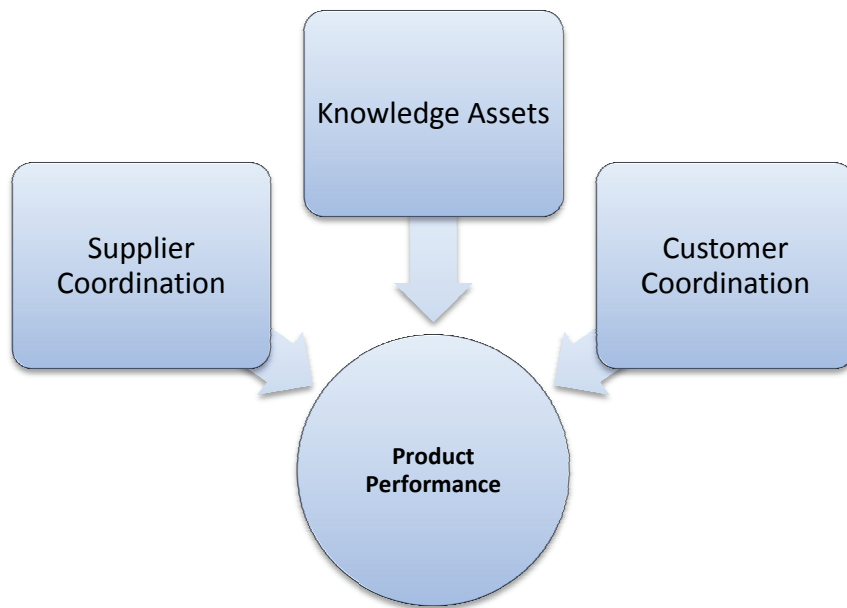
Firm coordination refers to the joint product development among suppliers, customers and the firm itself (Mentzer, 2004) which includes joint product design, process engineering and production. These coordinated activities are useful to improve trust and commitment across business partners to delegate decision making. Mentzer (2004) suggests that these joint activities enhance mutual trust across partners and promote the sharing of risks and resources among suppliers and customers.

When trust has been developed, peoples will commit more in their collaboration which in turn will improve product performance. Even though the importance of firm coordination in joint product development has been emphasized in different literature, yet, few of them have tackled this complex relationship empirically alongside with knowledge assets on product performance. On the other hand, the adverse effect of the extra cost and time of product co-development and the risks of opportunism for knowledge leakage on product performance cannot be overlooked. To summarize, supplier and customer coordination is suggested to be positively related to product performance.

### 3. RESEARCH MODEL

To consolidate the previous sections, the research model of the study is proposed in Figure 1:

Figure 1: The Research Model



### 4. RESEARCH METHOD

To test the research model, a survey was conducted among Hong Kong manufacturers. The targeted respondents were senior product development managers, vice presidents or directors. Of the 1,120 targeted companies successfully contacted, 206 responded to the survey, representing a response rate of 18.4 per cent.

Seven-point Likert-type measurement scales (from “strongly disagree = 1” to “strongly agree = 7”) were used to measure knowledge assets, firms coordination and product performance. The scales of supplier and customer coordination were adapted from Narasimhan & Kim (2002) and Frohlich & Westbrook (2001). “Knowledge assets”, as measured in this study, was defined as knowledge use and organizational memory. “Product performance”, as measured in this study, was defined as customer satisfaction, achievement of sales and profit goals of a company’s products (Griffin and Page, 1993). It measured how well the company did routinely in moving key products through the product development process to become commercial goods. Customer satisfaction was a forward-looking performance indicator of how well customers would respond to a company’s product performance. Achievement of sales and profit goals were performance indicators of how well the company had done in the past. Perceptual measurements were used as companies are reluctant to share objective performance data because of confidentiality issues.

### 5. RESULTS

A total of 206 completed questionnaires were received. Table 1 summarizes the characteristics of the respondent firms.

**Table 1:** Characteristics of the samples firms (N=206)

		Frequency	Percentage
<b>Industry</b>	Electronics	94	45.6
	Electrical appliance	57	27.7
	Plastic products	23	11.2
	Textile and garment	11	5.3
	Fabricated metal products	9	4.4
	Toys	5	2.4
	<b>Size</b>	1-99	50
100-199		30	14.6
200-999		48	23.3
1000-5000		45	21.8
>5000		24	11.7
<b>Customer Type</b>	Industrial firms	70	33.9
	Retailers, End-users/consumers	136	66.1

Prior to testing the research model, validity and reliability of the measures were checked. Table 2 shows the means, the standard deviations and the reliability indices (Cronbach's alpha) as well as the correlation matrix of the constructs.

**Table 2:** Descriptive Statistics and Correlation Matrix

	Descriptive Statistics			Correlation Matrix			
	Mean	S.D.	$\alpha$	1	2	3	4
1. Knowledge Assets	4.90	.922	.896	1.000			
2. Supplier coordination	4.23	1.457	.914	.400**	1.000		
3. Customer coordination	4.60	1.230	.881	.271**	.549**	1.000	
4. Product Performance	4.76	1.156	.900	.552**	.330**	.329**	1.000

\*\*Correlation is significant at the 0.01 level.

Cronbach's alphas of the constructs ranged from 0.881 to 0.914, which exhibit high internal consistency of the scales. There were significant correlations between the constructs in the hypothesized direction, laying the groundwork for the subsequent regression analysis.

Result of the regression analysis for all firms (Table 3) indicates that product performance is affected by knowledge assets and customer coordination, whereas supplier coordination is not a significant predictor. When separate regression models were built for the two types of firms (industrial products and consumer products), two different results were observed. Table 4 shows the model summary of industrial product firms (n=70) and Table 5 shows the model summary of consumer product firms (n=136).

**Table 3:** Regression Result for all firms (n=206)

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.591 <sup>a</sup>	.349	.339	.94759

a. Predictors: (Constant), Customer coordination, Knowledge Assets, Supplier coordination

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.771	.398		1.937	.054
	knowledge Assets	.631	.079	.498	7.958	.000
	Supplier coordination	.033	.058	.041	.569	.570
	Customer coordination	.162	.065	.171	2.482	.014

a. Dependent Variable: Product Performance

**Table 4:** Regression Results for Industrial product Firms (n=70)

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.572 <sup>a</sup>	.327	.295	.86209

a. Predictors: (Constant), Knowledge Assets, Customer coordination, Supplier coordination

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.085	.694		1.562	.123
	knowledge Assets	.507	.149	.422	3.406	.001
	Supplier coordination	.015	.087	.021	.168	.867
	Customer coordination	.235	.121	.233	1.950	.050

a. Dependent Variable: Product Performance

b.

**Table 5:** Regression results for Consumer product Firms (n=136)

**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.613 <sup>a</sup>	.376	.359	.98585

a. Predictors: (Constant), knowledge Assets, Customer coordination, Supplier coordination

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.448	.529		.846	.399
	knowledge Assets	.705	.100	.545	7.023	.000
	Supplier coordination	.029	.082	.034	.355	.723
	Customer coordination	.149	.086	.163	1.736	.085

a. Dependent Variable: Product Performance

For industrial product firms, knowledge assets and customer coordination have positive effects on product performance. For consumer product firms, only knowledge assets have positive effects on product performance. Indeed the levels of customer coordination are significantly higher among industrial product firms (mean score = 4.81) than among consumer product firms (mean score = 4.45).

## 6. DISCUSSION AND CONCLUSION

Consistent with the literature, the findings of the present study indicate a direct, positive relationship between knowledge assets and product performance. However, in contrast to previous studies, no empirical evidence was found to support direct effects between supplier coordination and product performance for the industrial product firms and no relationship between supplier/customer coordination with product performance for the consumer product firms.

The results that customer and supplier co-ordinations are not important to improve product performance for the consumer product firms are the findings controversial to existing literature as supplier and customer co-ordinations are mostly viewed as important elements in NPD. One point to note is that not all customers can foresee future changes. If companies are too attentive to the current customers, they may fail to develop innovative products. Customer may be confined to familiar things restricting product innovation. To protect their existing resources, suppliers may also provide familiar ideas to manufacturers. Frishammar and Horte (2005) argue that if a product market is characterized by constantly changing technologies and customer preferences, manufacturers may not have enough time to improve product performance.

The results of testing supplier coordination and product performance for the industrial product firms show that supplier coordination does not affect product performance. One possible explanation for

this finding is that there is a trade-off between the cost of supplier coordination and its benefits. The adoption of supplier coordination is costly as it may involve frequent travel to partners' offices, inter-organizational information technology (IT) systems, mutual understanding and trust building activities and complex contract agreements. Although closely integrating supply chain partners may help to reduce manufacturing costs, it complicates the product development processes. Thus, it is possible that the high cost of supplier coordination offsets its benefits in product development. A number of empirical studies also find negative effects of supplier coordination, such as increased development time for building supplier coordination and expensive coordination costs.

The present study has demonstrated that knowledge assets and supplier/customer coordination affect product performance in different ways. To achieve product co-development with suppliers and customers, managers should identify, assess and qualify competent suppliers as a major supply base for product design and production (Mentzer, 2004). Managers should also understand better how their customers will use their products and anticipate their needs.

Hong Kong industries are made up by a high proportion of small and medium-sized enterprises working on contract manufacturing. This structure may be different from that in other regions. Thus, the conclusions of this study may not be generalizable to other industries (Rosenzweig et al., 2003). Future studies in other regions would enhance the understanding of the inter-relationships among supplier/customer coordination and product performance.

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