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Factors Influencing Supply Chain Competitive Advantage and Performance

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ABSTRACT

This paper investigates the influence of supply chain management practices (strategic supplier partnership, customer relationship, level of information sharing, quality of information sharing, and postponement) on competitive advantage (cost, quality, delivery dependability, product innovation, and time to market) and on supply chain performance. It also explores the moderating effect of supply chain uncertainty (supplier, process, and demand) on the relationship between supply chain management practices and performance. The paper focuses on large-scale manufacturing companies in Indonesia and incorporates the Lie et al. [2006] research model as well as modified research models that include uncertainty (supplier, process, and demand) as a moderating variable. A survey questionnaire of 500 Indonesian CEOs was used to collect data. The author developed four hypotheses, which were tested using simple regression analysis and moderated regression analysis. The results supported three of the hypotheses, but did not support the fourth. From the results, it can be concluded (1) that supply chain management practices have significant effects on both supply chain competitive advantage and performance; (2) that competitive advantage does not have a significant effect on supply chain performance; and (3) that supply chain uncertainty moderates the relationship between supply chain management practices and performance.

Keywords: Supply chain management practices, supply chain uncertainty, competitive advantage, performance

1. INTRODUCTION

The paradigm of modern business has shifted the focus of competition from independent firms to business networks such as supply chains. In this new era of competition among business networks, the role of the company has changed from a manufacturing entity that supplies domestic companies into an international market that operates through local companies [Rudberg and Olhager, 2003; Li and Whang, 2007]. To be able to win, or even to survive, in this new environment – to have products available at the right time and in the right place – a company must remain competitive. This is a difficult challenge for individual companies, which often lack the resources or competencies needed for the task. Now more than ever, therefore, it is essential for individual companies to work collaboratively to develop core resources through supply chain management.

Supply chain management includes a variety of practices carried out within an organization to achieve and maximize effectiveness by managing the flow of finished goods, services, and information from point of origin to point of consumption through a set of directly linked organizations in the chain. Such activities include strategic supplier partnerships, customer relations, information sharing, information quality, and postponement [Li et al., 2006]. The goal of these practices is to enhance supply chain competitive advantage and performance [Stonebraker and Liao, 2004]. To achieve effective supply chain management, the companies involved in such an endeavor must coordinate and integrate these activities to ensure not only effective management strategies, but also quality of service and corporate profits.

Most of the research focusing on supply chain management has occurred in economically developed countries such as the United States and Australia. Only a few studies have been conducted in Asia, particularly in Indonesia. As an archipelago, Indonesia has geographical issues that intensify the challenge of competing successfully in today's global economy through competitive advantage and improved company performance [Anatan, 2012]. The challenge extends to supply chain management in an environment that pits Indonesian companies against competitors that are successful in expanding their markets regardless of geographical boundaries between islands, provinces, regions, and even countries.

In the new era of business networking, successful companies can no longer rely on the ability of a single business, but must be able and willing to collaborate with other companies through interconnected channels. There is a need,

therefore, for research studies focusing on the strategic role of supply chain management in enhancing the competitive advantage of companies. Nowhere is the need more critical than in Indonesia, where there is a scarcity of literature on the subject and where the level of concern among companies and academicians remains low. As a result, there is a gap in the literature relating to supply chain management in the manufacturing firms of Indonesia and a lack of focus on innovative and proactive activities that can boost performance and enhance competition among Indonesian firms in today's uncertain business environment. The current study aims to fill this knowledge gap. The research is motivated by three important considerations:

1. Most of the prior studies in supply chain management present a fragmented perspective of the factors that affect supply chain performance. It is rare to find an integrated study that examines the effects of supply chain management practices on competitive advantage and performance, taking into consideration today's environmental uncertainty.
2. There is still a lack of systematic empirical research that simultaneously examines the effect of management practices (strategic supplier partnership, customer relationship, level of information sharing, information quality, postponement) on competitive advantage (price, quality, delivery, product innovation, and time to market), and its influence on elements of supply chain performance from the perspective of customer facing (reliability, responsiveness, flexibility) and internal facing (expenses and assets).
3. There is a need for reliable contemporary information on supply chain management practices that can be used by practitioners in making decisions to improve company performance and enhance their company's competitiveness in the supply chain.

The current study focuses on large-scale manufacturing companies in Indonesia. It incorporates the Li et al. [2006] research model, which shows the relationship between management practices and supply chain competitive advantage and business performance. The current study also includes modified research models that incorporate uncertainty as a moderating variable between supply chain management practices and supply chain performance, in reference

to the study by Batnagar and Sohal [2005]. The current study addresses four research questions:

1. Do supply chain management practices have a significant influence on competitive advantage?
2. Does competitive advantage have a significant influence on supply chain performance?
3. Do supply chain management practices have a significant influence on supply chain performance?
4. Does uncertainty in the supply chain moderate the relationship between supply chain practices and supply chain performance?

2. THEORY AND HYPOTHESES DEVELOPMENT

This section discusses research variables in the current study and presents the study's research model and hypotheses.

2.1. Research Variables

Research variables in this study include supply chain management practices, competitive advantage, supply chain performance, and uncertainty in the supply chain.

2.1.1. Supply Chain Management Practices

The increase in economic globalization has intensified competition in the market and increased pressure on companies to provide services and create products at the right time, in the right place, and at the right price level. In such an environment, efficiency alone cannot ensure success, particularly for an individual company facing a chain of companies that share resources and intellectual capital. The key to success is partnership-based collaboration among companies using proven strategies of supply chain management that provide solutions to environmental uncertainty. Supply chain management is a mechanism that regulates business processes, increases productivity, enhances customer service, improves customer satisfaction, and reduces operating costs. Supply chain management practices synchronize and coordinate activities related to the flow of materials/products, both within the organization and between organizations.

A simple supply chain has components called *channels*, which consist of suppliers, manufacturers, distribution centers, wholesalers, and retailers – all of

whom are working to meet the needs of the consumer. A supply chain may involve a number of manufacturing industries in a chain extending upstream to downstream. A supply chain is not always straight. Supply chain management practices play a critical role in creating competitive advantage and improving company performance. These practices include a series of activities that are carried out within an organization to increase the effectiveness of supply chain management. Many researchers have different views on management practices, as shown in Table 1.

Table 1
Focus of Supply Chain Management Practices in Previous Research

Researcher	Supply Chain Management Practices
Tan et al. (1998)	Purchasing, quality, customer relations
Kovarado & Koto (2001)	Core competencies, which include Electronic Data Interchange (EDI) and the elimination of excess inventory by reducing customization at the end of the supply chain
Tan et al. (2002)	Supply chain integration, information sharing, SCM characteristics, customer service management, capabilities just in time (JIT)
Chen & Paultaj (2004)	Supplier reduction, short-term relationships, cross-functional team communication, supplier involvement to measure buyer and supplier relationships
Mon & Mentzer (2004)	Vision and goals, information-sharing, risk-sharing and achievement, cooperation, integration processes, long-term relationship, and supply chain leadership
Li et al. (2006)	Strategic supplier partnerships, relationships with consumers, level of information sharing, information quality, postponement

In the current study, supply chain management practices include five variables that represent:

- Upstream: Strategic supplier partnerships (2.1.1.1)
- Downstream: Relationships with customers (2.1.1.2)
- The level of information sharing (2.1.1.3)
- The quality of information sharing (2.1.1.4)
- Internal supply chain processes: Postponement (2.1.1.5)

2.1.1.1. Strategic Supplier Partnerships. A strategic supplier partnership is a long-term relationship between the organization and its suppliers, which is formed to help each achieve long-term benefits [Sheridan, 1998; Claycomb et al., 1999; Noble, 1997]. Strategic partnerships emphasize long-term relationships that directly support business process planning and problem solving [Gunasekaran et al., 2001]. A strategic partnership allows a company to work more effectively with suppliers willing to share responsibility to ensure success of the product. The partnership begins with the company and the supplier working together to make product design decisions that involve, for example, choosing the best components and technologies and the most effective design, and concludes with an assessment of the product design.

2.1.1.2. Relationships with Customers. “Customer relations” refers to the practice of managing customer complaints, developing long-term relationships with customers, and improving customer satisfaction [Claycomb et al., 1999; Tan et al., 1998]. Noble [1997] stated that managing customer relationships is an essential component in supply chain management because it may be used as a barrier to competition. A good relationship with the consumer generates customer satisfaction and loyalty, which give an organization special advantages over competitors [Magretta, 1998].

2.1.1.3. Level of Information Sharing. Information sharing is the communication of knowledge to business partners within a supply chain. Research has shown that information sharing is an important factor in supply chain management [Lalonde, 1998; Yu et al., 2001; Childhouse and Towill, 2003]. Lalonde [1998] stated that information sharing is one of the "building blocks" that indicate a solid connection among business partners in a supply chain. Supply chain partners that routinely share information become a unitary (single) entity that can better understand customer needs and respond more

quickly to market conditions [Stein and Sweat, 1998]. Childhouse and Towill [2003] found that the smooth movement of materials and information along the supply chain is key to achieving an effective and integrated chain. Basically, information sharing has two important aspects; namely, the quantity of information shared, and the quality of that information. The level of information sharing refers to the importance and the accuracy of information communicated to supply chain partners [Monezka, 1998]. The information shared can vary from strategic to tactical and can include information about logistics as well as customers. The relevance of users and the timeliness of information by functional elements in the chain are keys to achieving competitive success.

2.1.1.4. Quality of Information Sharing. Information sharing is important in achieving supply chain effectiveness, but its perceived impact depends significantly on the kind of information that is shared, with whom it is shared, and when and how it is shared [Monezka et al., 1998]. In other words, the impact of information sharing is strongly influenced by the quality of information that is shared. Quality includes aspects such as accuracy, timeliness, adequacy, and the credibility of exchange. Jarell [1998] noted that information sharing along the supply chain can create flexibility, but this flexibility must not diminish the accuracy or timeliness of the information. To eliminate distortion and to improve the quality of information shared, companies should take steps to ensure that the information is as accurate as possible and that it flows smoothly throughout the chain, without delay.

2.1.1.5. Postponement. Postponement is a business strategy that maximizes possible benefit and minimizes risk by delaying further investment in a product or service until the last possible moment in order to satisfy the preferences of the customer at that moment. A manufacturer, for example, may produce a generic product that can be modified at the last stages to suit the changing needs of customers and the level of demand. Two major considerations in developing a postponement strategy are (1) how much delay is needed, and (2) which steps should be taken to achieve the delay. Postponement strategies allow a company greater flexibility in developing products that meet the changing needs of consumers and in differentiating a product to modify the demand function. These strategies are important because they relate to types of products, market demand, and structural bottlenecks in manufacturing systems and logistics [Pagh and Cooper. 1998].

2.1.2. Competitive Advantage

A company's competitive advantage is its ability to achieve a position superior to that of its competitors. Research has shown that a company's competitive advantage depends on suitability between its internal capabilities and external organizational change [Andrews, 1971; Chandler, 1962; Hofer and Scheler, 1978; Penrose, 1959, cited in Hart, 1995]. Competitive advantage rests on the capability of a company to distinguish itself from its competitors through important management decisions pertaining to cost, quality, delivery, and flexibility [Tracey et al., 1999; Roth and Miller, 1990]. Koufterous [1997] developed a research framework to describe competitive capabilities, in which he defined five key dimensions that affect competitive advantage; namely, competitive pricing, premium pricing, value to customer quality, dependable delivery, and product innovation. In environments characterized by competitive intensity, technological development and product innovation is especially important [Kessler and Chakrabarti, 1996; Zhang, 2001, in Li et al., 2006].

The research dimensions of competitive advantage used in the current study include price, quality, delivery, product innovation, and time to market.

2.1.3. Supply Chain Performance

Pujawan [2005] found that, in order to achieve effective supply management, a company must develop a performance measurement system that is able to holistically evaluate the performance of the chain. One of the models used in performance measurement is SCOR (supply chain operations reference). The SCOR model integrates key elements in the management of business process re-engineering (BPR), benchmarking, and process measurement [Hwang et al., 2008]. In essence, BPR describes the complex processes that occur at present and defines the desired process. Benchmarking is the collection of data on the operational performance of similar companies, which is then used internally to set performance targets. Process measurement focuses on measuring, controlling, and improving the processes of supply chain management.

The SCOR model divides supply chain processes into five core categories: *plan*, *source*, *make*, *deliver*, and *return*. *Plan* is a process that balances demand and supply to determine the best course of action in meeting the needs of procurement, production, and delivery. It assesses the needs of distribution, production planning, material planning, and capacity planning, and makes the necessary adjustments to supply chain management planning and

financial planning. *Source* is the procurement of goods and services to meet demand. The process includes selecting suppliers; scheduling shipments from suppliers; receiving and checking goods from suppliers and authorizing payment for deliveries made; and evaluating supplier performance. *Make* is the process that transforms raw materials or components into products that customers want. The process includes production scheduling, production activities, quality testing, management of semi-finished goods, and maintenance of production facilities. *Deliver* is a process to meet the demand for goods and services. It includes order management, transportation, and distribution. *Return* is the return of products for a variety of reasons. The process includes identification of product conditions, return authorization for a defective product, refund scheduling, and repayments.

In the current study, the dimensions of supply chain performance measurement include reliability, responsiveness, flexibility, cost, and asset.

2.1.4. Uncertainty in the Supply Chain

All supply chains suffer the effects of uncertainty caused by factors such as changes in demand, variability in transportation and receiving, seasonality, and quality issues. Competition and uncertainty in the market environment have an impact on the uncertainty that occurs in a supply chain, as well as the uncertainty associated with suppliers, processes, and demand [Wong and Boon, 2008; Kinra and Kotzab, 2008]. Because of this uncertainty, it is essential for companies to have timely, accurate information to address problems that may arise along the supply chain as soon as they arise. Traditional demand forecasting is no longer appropriate to forecast demand patterns that have high uncertainty. In the absence of complete or definite sales data, companies instead need a steady flow of information from downstream in order to determine pattern changes in increasingly fluctuating demand. This situation raises many issues that impact the total cost of production, such as the perceived need to carry excess inventory to accommodate rush orders and to prevent “stock outs.” Another example is the added cost of sales promotions and discounts needed to regain a customer that has been lost because of inaccuracies in the delivery of products.

The phenomenon described above is known as the “bullwhip effect,” in which orders sent to the manufacturer and supplier create larger variance than sales to customers. The effect is caused by the distortion of information requests from the bottom to the top of the chain, so that demand quantity often cannot be met to the fullest. Schroeder [2000] found that four factors might cause the bullwhip effect; namely:

- (1) forecasting demand, which is less precise because there is no sharing of information nor use of a smoothing method for overall sales data;
- (2) order batching, which may occur if there is a build order;
- (3) price fluctuations in which a discount may lead to increased demand for rush orders, causing problems in other supply chains; and
- (4) rationing, which occurs when demand exceeds supply.

2.2. Research Model and Hypotheses Development

The research model developed in the current study depicts the five major dimensions of supply chain management practices and explains how they influence competitive advantage. The five dimensions are strategic supplier partnership, customer relationships, level of information sharing, information quality, and postponement. Competitive advantages and supply chain performance concepts discussed in the literature specifically relate to the operations management of supply chain management issues. Based on the literature, the research model in the current study is developed to show the relationship practices of supply chain management, competitive advantage, and supply chain performance.

Management practices have an influence on supply chain competitive advantage through price, quality, delivery, product innovation, and time to market. Previous studies indicate that various dimensions of supply chain management practices, such as strategic supplier partnerships, have an influence on some aspects of competitive advantage, such as price level. For example, strategic supplier partnerships can improve supplier performance, reduce time to market [Ragatz et al., 2006], and increase customer satisfaction and customer response [Power et al., 2001]. Information sharing has an impact on the level of supply chain integration because it enables organizations to accelerate the speed of service and product delivery to consumers. The level and quality of information sharing has a positive effect on customer satisfaction [Speakman et al., 1998] and quality of partnerships in the supply chain [Walton, 1996; and Lee and Kim, 1999]. Postponement strategy not only increases flexibility in the supply chain, but also increases the balance of global efficiency and customer response capability. Based on these arguments, the following hypothesis is developed:

Hypothesis 1: Supply chain management practices have a significant influence on competitive advantage.

Companies that have competitive advantage have the capabilities to compete successfully with regard to lower prices, higher quality, and faster delivery times. These capabilities, which are inherent in competitive advantage, can improve not only overall company performance [Mentzer et al., 2000], but also overall supply chain performance. In other words, competitive advantage will have an impact on corporate performance, customer satisfaction, customer loyalty, and effectiveness of the relationship among companies in the supply chain, especially with regard to reliability, responsiveness, flexibility, cost, and assets [Moran, 1981]. Companies that are able to offer goods at lower prices and higher quality will be able to increase sales, which, in turn, will increase profit margin and return on investment. Furthermore, companies with innovative products and fast delivery time are likely to increase their market share and sales, which is an indication of their high level of responsiveness, flexibility, and reliability, all of which increase the possibility of higher company assets [Mentzer et al, 2001]. Based on the arguments and results of empirical studies conducted by several researchers, the current study develops the following hypothesis:

Hypothesis 2: Competitive advantage has a significant influence on supply chain performance.

It has been shown that supply chain management practices have a direct impact on supply chain performance [Shin et al., 2000; Stock et al., 2000], and that strategic supplier partnerships have a direct influence on the cost and level of response to consumer needs [Carr and Person, 1999]. Furthermore, it has been shown that customer relationships have an influence on the level of corporate response to customer needs [De Toni and Nassimbeni, 2000]. The higher the level of information sharing, the lower the costs [Lin et al, 2002]. The following hypothesis is developed:

Hypothesis 3: Supply chain management practices have a significant influence on supply chain performance.

Bhatnagar and Sohal [2005] found that the complex and dynamic interaction among suppliers in a supply chain has an impact on uncertainty in

supply chain planning. This uncertainty is of three types; namely, supplier uncertainty, process uncertainty, and demand uncertainty.

Supplier uncertainty is associated with changes in product quality and with delays and variability in delivery performance, which cannot be predicted. Lee and Billington [1992] suggested that uncertainties associated with suppliers include the level of mastery of technology, waiting times, delivery performance, and quality of raw materials or ingredients. Some uncertainties caused by suppliers – such as late delivery of raw materials, materials damage, and variability in waiting time – would impede the company's production processes, resulting in inefficiency in all areas in terms of the variability of bookings, increased safety stock, increased logistics costs, and inefficient resource use [Yu, et al., 2001]. Companies with a low-quality supplier and high rates of lateness will find it difficult to provide a good professional service to customers, even in a competitive environment and a stable business. Under the uncertain and unpredictable conditions of competition, this kind of company will be easily dropped from business competition [Power et al., 2001].

Process (or technological) uncertainty is the result of an unreliable production process involving, for example, machine damage. This kind of uncertainty cannot be predicted. The rapid development of information technology, however, provides benefits and opportunities for companies that can use the technology properly. Such benefits include the reduction of transaction costs associated with controlling the movement of goods and materials and the delivery of a rapid response to customers. Although technological developments can benefit a company, they can also pose obstacles and challenges that can be detrimental if the company cannot adapt and master the development of technology. This is especially true for companies that compete individually. Used effectively, rapid developments in information technology can enhance sales and increase competition in the global economy and virtual markets. This condition indicates that business competition is no longer local, but international [Evans et al., 1993].

Demand (or consumer) uncertainty is the most serious problem caused by a company's inaccurate forecast of demand [Davis, 1993]. This kind of uncertainty cannot be predicted. The paradigm of competition has shifted from a supplier-driven focus, where products and services depend on the ability of manufacturers, to a customer-driven focus, where each production decision is determined by the desires and needs of consumers. In this new environment,

consumer demand is uncertain and unpredictable in terms of volume, time, and place. Consumers today want more product choices, better service, higher quality, and faster delivery. Uncertainty of this kind increases the pressure of competition.

Studies by Bhatnagar and Sohal [2005] prove that uncertainty in the supply chain has a significant influence on supply chain performance with regard to waiting time, inventory, quality, customer service, and flexibility. When the level of uncertainty is high and the needs of consumers are volatile, the supply chain that has a good performance record will benefit the companies involved in the chain. It can be concluded, therefore, that the effect of uncertainty in the supply chain against supply chain performance will be greater in a dynamic environment than in a stable competitive condition [Wong and Boon, 2008; Kinra and Kotzab, 2008; Boyle et al., 2008; Trkman and Mac Cormack, 2009]. The hypothesis is developed as follow:

Hypothesis 4: Uncertainty in the supply chain moderates the relationship between management practices and supply chain performance.

3. METHODS

This section discusses the study sample, data collection techniques, and variables and measurements used in the current study.

3.1. Study Sample

The population of the current study includes all manufacturing companies that operate in Indonesia and are listed in the *Directory of Manufacturing* published by the Central Bureau of Statistics. Samples were determined using purposive sampling techniques. The sample selected included manufacturing companies with large-scale operations, which are engaged in automotive products, machinery, electronics, and computers. Industrial classification used in this study is based on the data classification included in Large and Medium Manufacturing Statistics published by the Central Bureau of Statistics. Classification is based on the International Standard Industrial Classification (ISIC), which has been adapted to conditions in Indonesia under the name Industrial Classification Industries/ISIC. The classification scale divides companies into four groups:

- Large, with 100 or more workers
- Medium, with 20 to 99 workers

- Small, with 5 to 19 workers
- Households, with 1 to 4 workers

3.2. Data Collection Techniques

This study uses primary data obtained from questionnaires mailed to manufacturing firms. The target respondent was the company's CEO. The questionnaire was distributed over a two-month period, and respondents were asked to return the completed form within four weeks of the time it was received. If a questionnaire was not returned within the time limit, a letter was sent to the company, along with a supplementary questionnaire directed to the CEO. Recognizing that a low response rate is the major problem associated with mail surveys, this study sought to increase the response rate by including a free stamp and by conducting a subsequent mailing, as suggested by Isaac and Michael [1990].

3.3. Variables and Measurement

This section discusses the variables included in the current study and their measurement.

3.3.1. Supply Chain Management Practices

Management practices are defined as a series of activities carried out within an organization to achieve supply chain effectiveness. In this study, those practices include management of the strategic supplier partnership, customer relationships, level of information sharing, information quality, and postponement [Li, 2006; Chen and Paultaj, 2004]. A 5-point Likert scale is used to measure the level of attention to the company's operating strategy (1 = strongly disagree; 5 = strongly agree).

3.3.2. Competitive Advantage

A company's competitive advantage is the ability to create a position superior to that of its competitors. Dimensions of competitive superiority adopted from research [Li, 2006] include price, quality, delivery, product innovation, and time to market. These are measured using a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree).

3.3.3. Uncertainty in Supply Chain

In this study, the definition of uncertainty in the supply chain was adopted from a study by Bhatnagar and Sohal [2005], which includes the uncertainty of

suppliers, the uncertainty of the process, and the uncertainty of demand. Supplier uncertainty is defined as the rate of change of product quality and delivery performance, which cannot be predicted. Process uncertainty is technological change in an industry that cannot be predicted. Demand uncertainty is the rate of change in consumer demand, which cannot be predicted and perceived. A 5-point Likert scale is used to compare a company's performance with the performance of the industry average (1 = strongly disagree; 5 = strongly agree)

3.3.4. Supply Chain Performance

Supply chain performance is measured using the SCOR method. It includes five important dimensions; namely, reliability, responsiveness, flexibility, cost, and assets [Pujawan, 2005]. A 5-point Likert scale is used to compare a company's performance with the the performance of the industry average (1 = much lower; 5 = much higher)

4. RESULTS AND DISCUSSION

This section includes a discussion of the rate of return and profile of respondents; validity and reliability testing; and hypothesis testing and comments.

4.1. Rate of Return and Profile of Respondents

In the period from May 2010 to June 2010, a total of 500 questionnaires were sent directly to the companies included in the survey sample. Of these, 5 questionnaires were returned by respondents unwilling to participate, and 17 were turned because of change of address or the closing of the company. Of the 84 completed questionnaires that were received, 11 were not filled out completely and, hence, could not be used in the data analysis. The full sample and rate of return are shown in Table 2.

All of the 73 manufacturing companies participating in the survey are "large," according to the criteria defined in this study; that is, they employ 100 or more workers. All 73 are private companies that have been engaged in their respective businesses for more than five years. The majority (58.9%) has been in operation for more than 30 years. In all, 42.5% of the companies are engaged in the manufacture of metal goods, machinery, automotive products, electronics, and computers. Most companies (64.4%) are owned by local entrepreneurs. With regard to the number of workers, 56.2% have a workforce larger than the category of 100-999. A total of 30.1% of the companies have assets of more than 1 trillion yen.

Table 2
Survey Sample and Rate of Return

Item	Number
Total questionnaires sent	500
company closed / changed address	17
Companies refusing to participate	5
Total questionnaires returned	84
Returned questionnaires not filled out completely	11
Rate of return, based on processed questionnaires	$73/500 \times 100\% = 14.6\%$

4.2. Validity And Reliability Testing

Although the survey instrument was adopted and modified on the basis of existing literature, it was still necessary to test the validity and reliability of the instrument. An instrument is considered to have high reliability when the Cronbach's alpha value is higher than 0.6 [Nunnally, 1978]. Additional tests of instrument reliability were conducted by calculating the homogeneity coefficient. Homogeneity is the correlation coefficient between the individual items and the total score for all items. The higher the coefficient, the more reliable the instrument. If the correlation between individual items and the total score is not significant, then the item is not valid.

The results of the reliability and validity testing are presented in Table 3. The results show high reliability of the instrument, with Cronbach's alpha values for each variable ranging from 0.785 to 0.900. Homogeneity coefficients are all significant at the 0.01 alpha. These data indicate that nearly all of the items used in this study are reliable and valid. Question 2 pertaining to strategic supplier partnerships should be discarded, however, because it has an insignificant item homogeneity.

Table 3
Cronbach Alpha and Item Homogeneity

Variable	Number of Items	Excluded Items	Cronbach Alpha	Item Homogeneity
SCM Practices	25	2	0.824	0.327 - 0.672
Competitive Advantages	17	0	0.900	0.270 - 0.625
Environment Uncertainty	9	0	0.785	0.256 - 0.695
SCM Performance	13	0	0.850	0.397 - 0.694

SCM = Supply chain management

4.3. Hypothesis Testing and Discussion

This study used simple regression models to test Hypothesis 1 (supply chain management practices have a significant influence on competitive advantage); Hypothesis 2 (competitive advantage has a significant influence on supply chain performance); and Hypothesis 3 (supply chain management practices have a significant influence on supply chain performance). From the calculation of a simple regression model parameter, the *t* value and the coefficient of determination (R^2) were determined. If the regression coefficient was significant at $p < 0.05$, this means that the independent variables have a significant influence on the dependent variable. The regression coefficient shows the precision and measures the ability of the model to explain the variation in the dependent variable. The greater the R^2 is, the better the model explains the variation in the dependent variable.

Table 4 shows the results of testing the influence of supply chain management practices on supply chain competitive advantage (H1), competitive advantage influence on the performance of the supply chain (H2), and the influence of supply chain management practices on supply chain performance (H3). All deviations from the classical assumptions such as normality, homoscedasticity, non-multicollinearity, and autocorrelation were tested. The results support Hypothesis 1 and Hypothesis 3, but do not support Hypothesis 2.

Table 4
Hypothesis Testing Results for Hypothesis 1-3

Dep Var	Parameter	B	SE	t-Test	Sig	F	Sig	R^2
CA	intercept	0.637	0.471	1.354	0.180	55.732	0.000 ^a	0.663 ^a
	SCM practices	0.885	0.118	7.465	0.000			
SCP	intercept	2.856	0.490	5.827	0.000	2.171	0.145 ^a	0.172 ^a
	CA	0.173	0.118	1.473	0.145			
SCP	intercept	1.906	0.601	3.171	0.002	7.743	0.007 ^a	0.314 ^a
	SCM Practices	0.421	0.151	2.783	0.007			

CA = Competitive advantage; SCP – Supply chain performance

Hypothesis testing for Hypothesis 4 was conducted to provide empirical evidence of the moderating influence of uncertainty in the supply chain with regard to the relationship between supply chain management and supply chain performance. The results are shown in Table 5.

Table 5
Hypothesis Testing Result for Hypothesis 4

Model		SC	t-Test		R ²	Δ R ²	ΔF	Sig
			B	t-Test				
1	(Constant)	1.906	3.171	0.002	0.098	0.086	7.743	0.007 ^a
	SCM Practices	0.421	2.783	0.007				
2	(Constant)	2.083	3.586	0.001	0.181	0.158	7.741	0.001 ^a
	SCM Practices	0.687	3.896	0.000				
	Uncertainty	-0.334	-2.660	0.010				
3	(Constant)	-1.817	-0.392	0.696	0.190	0.154	5.380	0.002 ^a
	SCM Practices	1.631	1.448	0.152				
	Uncertainty	0.769	0.589	0.558				
	Moderator	-0.266	-0.848	0.399				

SC = Standardized coefficient; SCM = Supply chain management

In Table 5, Block 1 shows that the first variable is supply chain management (SCM) practices, with an R² value of 0.098. When uncertainty in the supply chain variables is included in the equation (Block 2), the R² value increases to 0.181 and ΔF to 7.741. The increase has a significance value of 0.000 < 0.05 (sig 5%). It shows that 18.1% of supply chain performance variables variation can be explained by supply chain management practices and uncertainty, whereas 81.9% is explained by other factors. At a later stage (Block 3), when the interaction variables are entered into the equation, the value of R² increases to 0.181 in Block 2 to be 0.190 and Δ F = 5.380. The increase is significant because the significance value of 0.01 is smaller than 5% (sign <5%). Based on criteria stated in the section on methods of research, it can be concluded that the variables of uncertainty in the supply chain are quasi-moderator.

5. CONCLUSIONS AND SUGGESTIONS

This study was conducted to provide empirical justification of a framework that identifies five dimensions of supply chain management practices; namely, strategic supplier partnership, customer relationships, level of information sharing, information quality, and postponement [Li, 2006; Chen and Paultaj, 2004]. The study also examined the relationships among supply chain

management practices, competitive advantage, and supply chain performance with regard to level of reliability, responsiveness, flexibility, and internal facets, including assets and costs. This study also tested the role of uncertainty in the environment affecting the relationship between supply chain management practices and supply chain performance.

Testing results for Hypothesis 1 show that supply chain management practices have a significant influence on the achievement of competitive advantage. These results support the prevailing theory and previous research showing that the implementation of various supply chain management practices (such as strategic supplier partnership, customer relationships, information sharing, and postponement) affect the achievement of competitive advantages in cost, quality, dependability, flexibility, and dimensional time to markets. Supply chain management practices are also shown to influence improvements in supply chain performance, as indicated by the results of testing Hypothesis 3, which is supported in this study. Hypothesis 2, which states that competitive advantage has a significant influence on supply chain performance, is not supported, however. This can be explained by the role of competitive advantage related to the research of supply chain management.

Some studies have suggested that supply chain management practices have a direct influence on supply chain performance. The study by Li et al. [2006], however, provides empirical evidence that supply chain management practices have no direct influence on supply chain performance, but are instead mediated by a competitive advantage in cost, quality, flexibility, and response capabilities. The current study does not test the influence of the mediating or intervening variable of competitive advantage. The study instead posits four hypotheses that examine the role of moderation. The results support empirical studies that suggest that environmental uncertainty variables act as variables that moderate the relationship between supply chain management practices and supply chain performance.

This study has a several limitations; notably:

1. The research sample included a number of industries. The composition of the sample may indicate performance variability among industries; hence, the effects of the industry may need to be controlled, which was not done in the current study.
2. In the measurement of supply chain performance, respondents used a method that can lead to perceptual biases.

3. This study used data obtained primarily from a mail survey. Although the questionnaire was tested for validity and reliability of measurement, the respondent's failure to completely or appropriately answer the research questions could lead to bias resulting in poor result analysis

4. This study used a simple regression analysis and moderated regression analysis to analyze the data obtained because of the limited amount of data that was available and because of time limitations. To obtain better test results, particularly with regard to the role of intervening variables, it may be preferable to use SEM or the path analysis method.

In spite of its limitations, the current study is expected to benefit companies seeking to implement supply chain management practices and formulate appropriate strategies in order to compete effectively in an increasingly turbulent and unpredictable business environment. Furthermore, the results are expected to contribute academically to the development of literature in operations management, supply chain management, and strategic management in particular.

Theoretically, the results may help subsequent researchers better understand the concept and application of supply chain management practices and may support the development of intellectual capabilities and professional knowledge for researchers in the field of management through the application of theory. Practically, the results are expected to be taken into consideration by practitioners in making decisions related to the implementation of supply chain management practices. The study may also support the development of research partnerships between academicians and practitioners as a platform for resolving problems in the real world through practical solutions derived from the formulation of appropriate policies and strategies.

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