SUPPLY CHAIN STRATEGY, STRUCTURE, AND OPERATIONAL PERFORMANCE: A STRUCTURAL EQUATION MODELING APPROACH

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ABSTRACT

The MSc thesis (of which this article is a highly condensed version) seeks to advance our understanding of the SSP (strategy, structure, performance) paradigm in the supply chain structure, but in a broader context by covering supplier relationships and customer relationships, technology and planning integration, and measurement system, in the context of Bowersox (1999 and 2002), by incorporating the impact of uncertainty. The impact of supply chain uncertainty on supply chain strategy and that supply chain structure fit is associated with a firm's operational performance. It is an extension of existing research on the SSP paradigm. Empirical data was collected from the consumer packaged goods industry in Thailand.

This study provides considerable support for the literature from the previous studies of Stank, Defee (2005) and Rodrigues, Stank, and Lynch (2004). It proposes a conceptual framework, the proposition of hypotheses and illustrated models; which were derived from the models in these previous studies, together with the model of Lee (2002) related to the supply chain strategic response to supply chain uncertainties.

Three types of proposed models, Supply Chain Strategies (as measured by Supply Chain Uncertainties), Elements of Supply Chain Structure, and Firm's Operational Performance, are demonstrated and explained.

First, the focus of the model was to examine the impact of supply chain uncertainty on supply chain strategies. The research result showed that the 'fit' strategy is not measured by supply chain uncertainties. Therefore, further investigation of certain factors that determine supply chain strategies should be addressed. Second, the focus was to investigate the relationship between supply chain strategies and types of supply chain structures; and, the research result revealed a significant relationship between each of them. Finally, the focus was to investigate the 'fit' between supply chain strategy and types of supply chain structure which directly affect the firm's operational performance; but the research result showed a significant relationship only with the structural element of technology and planning integration, although with marginal effects.

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INTRODUCTION

Increasing uncertainties within supply chains led companies to seek for ways to gain and sustain competitive advantage in the 1980s. They tried approaches such as just-in-time, total quality management, and reengineering, but found that the performance advantages gained from these were soon mitigated as their competitors tried similar methods (Atkinson 1986; Bechtel and Jayaram 1997; Boghossian 1988).

The CPG Industry (Consumer Packaged Goods) in most countries faces the challenge of managing the distribution of its goods through multiple retail channels. The supply chain includes suppliers in many countries and retailers of various sizes and types. The progressive retailers have established collaborative relationships with key manufacturers to decrease out-of-stocks, increase category sales and differentiate assortment offerings. These retailers are also asking manufacturers to take on a greater role in managing replenishment of inventory in exchange for information on retail operations.

In Thailand, the retail sector has consistently been a significant component of the economy. In 2003 it accounted for 26.2% of GDP. It accounts for 44% of consumer expenditure. However, there is a high level of pipeline inventory due to unreliable demand forecasting, demand variability from heavy promotional activity and unreliable operations with low service levels. The common trade practice in the industry, especially the traditional channel, is 'pushing' rather than 'pulling' products. As actual demand is not communicated (even when it is captured through Electronic Point Of Sales (EPOS) scanners), supply chain partners tend to carry high stocks.

Because of its importance of the CPG industry in the Thai economy, and because it is very dynamic and has much growth potential, it has been chosen as the focus of this empirical research.

'***Does fit between supply chain strategy and structure lead to a greater level of the Firm's Operational Performance?***' is the research question which should lead to a better understanding of how the relationship between supply chain strategies and supply chain integration can produce a high level of performance. While uncertainty is claimed to be a major driving force for the management of supply chain relationships, there has been only a very limited amount of work that investigates the relationship between them, particularly in relation to a firm's operational performance, and especially in the Thai context.

LITERATURE REVIEW

Strategy-Structure-Performance (SSP)

The SSP paradigm provides a foundation for extension into a supply chain environment that will be related to the research framework and its concept (presented later). Previous use of SSP theory in a supply chain logistics context is described here and Defee and Stank 2005; Rodrigues, Stank, and Lynch 2004; Stonebraker and Afifi 2004, point to the need to further study and test the relationship between strategy-structure-performance (SSP) paradigm and the supply chain environment.

Extending SSP into the supply chain context hinges on the suggestion that competition is found at the supply chain level (Christopher 1992). The shift in the unit of analysis from the firm to the supply chain is evidenced by the attention directed toward SCM and supply chain strategies by many of the discipline's most accomplished scholars (Bowersox et al. 2002; Christopher and Ryals 1999; Lambert, Cooper, and Pagh.1998; Mentzer 2001). Chow, Henrikssen, and Heaver (1995) described the need for an appropriate structure extending across a firm's boundaries to the whole supply chain; however, the authors warned that finding the best structure was contingent on the situation.

Supply Chain Uncertainty

Researchers generally agree that uncertainty is a major driving force behind the effective establishment of supply chain relationships between strategy and structure. This is because under uncertainty, firms establish interorganizational relationships to be able to be adaptable to the environment and to be able to predict environmental change and promote stability in changing environments (Haunschild, 1994; Ven and Walker, 1984). It is defined as decision-making for situations in the supply chain in which the decision-maker does not definitely know what to decide as he is indistinct about objectives, lacks information, is unable to accurately predict the impact of control action on supply chain behavior, or lacks effective control action (Van der Vorst and Beulens, 2002).

Demand Uncertainty

This is defined as the downstream: demand uncertainties take the form of unforeseen demand variability which in turn creates problems in planning and controlling that jeopardizes delivery performance (Fisher et al, 1994).

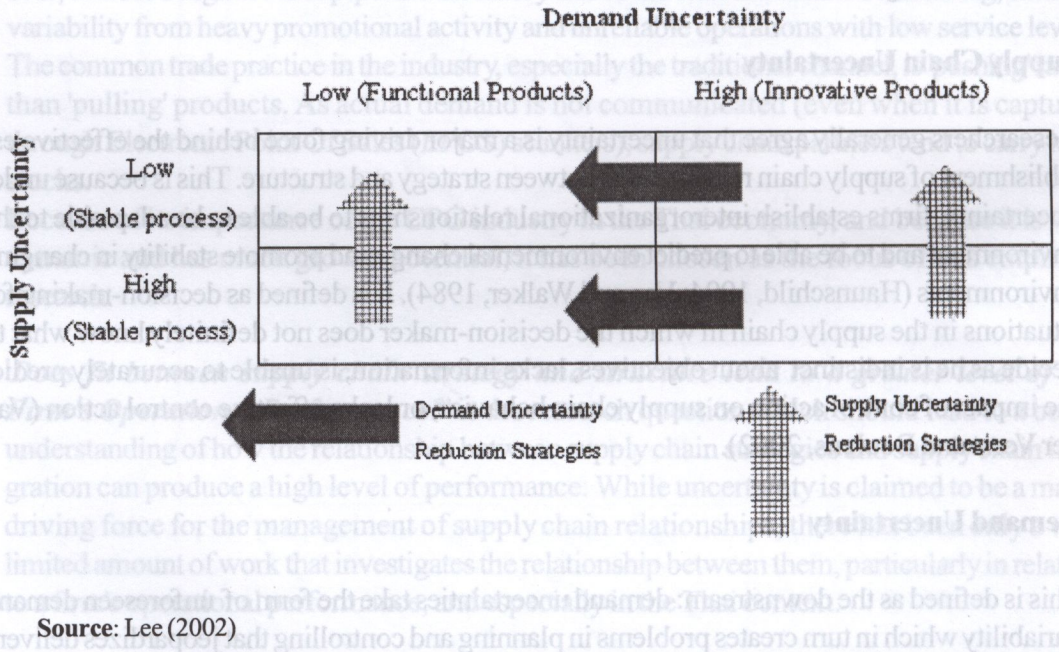
Supply Uncertainty

This is defined as upstream or downstream uncertainties which can be manifested through late deliveries, or poor quality of incoming materials or parts (Davis, 1993).

The model of Fisher (1997), Mason-Jones et al (2000), Christopher (2002), and Towill Nain and Wilkinson (1997), implied that supply chain strategy should be based on levels of demand uncertainty. Lee expanded on Fisher's work in incorporating the level of supply chain uncertainty, and his model emphasised four strategic choices: efficient supply chain: responsive supply chain, risk-hedging supply chain, and agile supply chain.

Supply chain uncertainty is another key driver for the right supply chain strategy. A stable supply process is one where the manufacturing process and the underlying technology are mature and the supply base is well established. But in an evolving supply process these are immature and changing rapidly, thus the supply base may be limited.

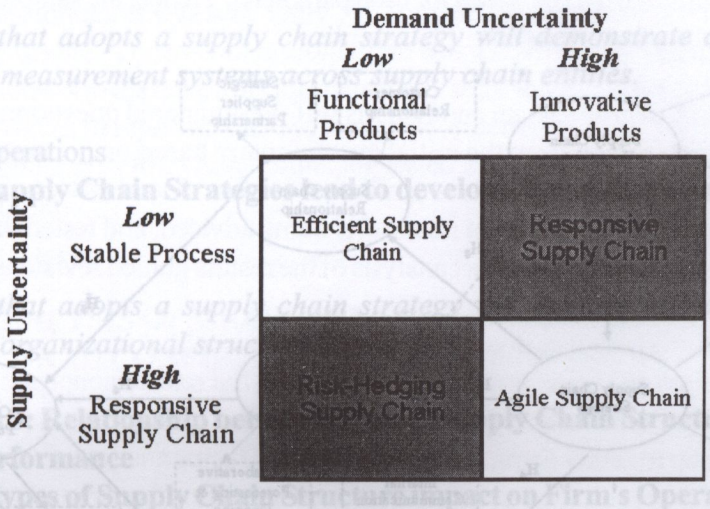
Figure 1: Uncertainty Reduction Strategies



Source: Lee (2002)

It is more challenging to operate a supply chain according to the right column in the next Figure, than in the left. Uncertainties need supply chain strategies which have iniatives and innovations that can provide a competitive edge. Such strategies are classified by Lee (2002) into two types, as in the next Figure.

Figure 2: Matching Supply chain Strategies

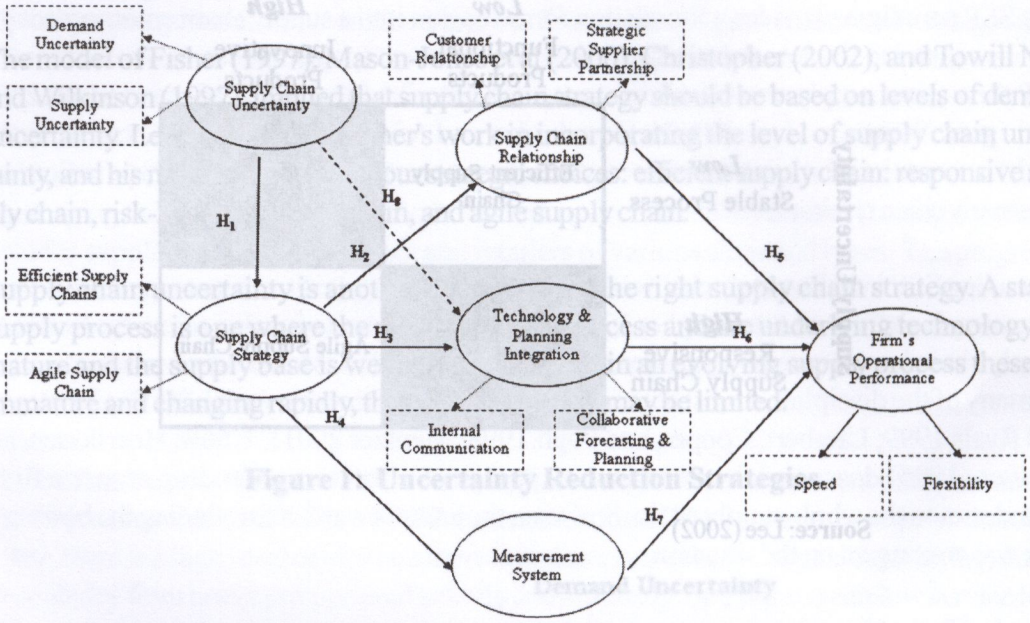


Source: Lee (2002)

THE CONCEPTUAL MODEL

The conceptual model of this study links the impact of Supply Chain Uncertainty with Supply Chain Strategy. The theoretical framework proposes relationships between supply chain Strategy, and Structure (as measured by Supply Chain Relationship, Technology and Planning Integration, Measurement System) as the determinants of a Firm's Operational Performance. The framework also posits that the reduction of Supply Chain uncertainty as measured by Demand Uncertainty and Supply Uncertainty is also determined by the role of Technology and Planning Integration. These relationships are mainly based on theoretical considerations, shown in Figure 3.1 below, followed by the four research focuses and ten hypotheses.

Figure 3.1: Conceptual Framework with Proposition: A Model of Relationship Between Supply Chain Strategy, Structure, and Operational



Research Focus 1: The impact of Supply Chain Uncertainties on Supply chain Strategies

Q1: Does Supply Chain Uncertainty impact on Supply Chain Strategy?

***H_1**: Firms with the different levels of supply chain uncertainty emphasise different types of supply chain strategies*

Research Focus 2: Relationship between supply chain strategy and types of structure

Supply Chain Relationship

Q2.1: Do the Supply Chain Strategies lead to different types of supply chain relationship?

***H_2**: A firm that adopts a supply chain strategy will demonstrate a high level of supply chain relationship*

Technology Integration and Planning Integration

Q2.2: Do the Supply Chain Strategies lead to development of Technology and Planning Integration?

***H_3**: A firm that adopts a supply chain strategy will demonstrate a high level of Technology and Planning Integration across supply chain entities.*

Measurement System

Q2.3: Do the Supply Chain Strategies lead to development of a Measurement System?

H_4: A firm that adopts a supply chain strategy will demonstrate a high level of development of measurement systems across supply chain entities.

Integrated Operations

Q2.4: Do Supply Chain Strategies lead to development of Organizational Structure?

H_5: A firm that adopts a supply chain strategy will demonstrate a high level of development of organizational structure.

Research Focus 3: Relationship between types of Supply Chain Structure and Firm's Operational Performance

Q3: Do the types of Supply Chain Structure impact on Firm's Operational Performance?

H_5: A firm that adopts supply chain relationship structure will demonstrate a high level of firm's operational performance

H_6: A firm that adopts technology and planning integration structure will demonstrate a high level of firm's operational performance

H_7: A firm that adopts measurement system structure will demonstrate a high level of firm's operational performance

Research Focus 4: The impact of Technology and Planning Integration on the reduction of Supply Chain Uncertainties

Q4: Does the Technology and Planning Integration impact on the reduction of Supply Chain Uncertainties?

H_8: A firm that adopts supply chain uncertainty reduction will demonstrate a high level of technology and planning integration structure.

METHODS OF RESEARCH USED

The researcher firstly had 'qualitative' discussions with many manufacturers and retailers in the CPG industry and found that they have realized the importance of working closely together, but only a few have succeeded in doing it right, and there is a lack of understanding what a supply chain is. This information helped in the design of a questionnaire survey, the data from which was analyzed quantitatively.

A probabilistic sampling method is used in this study (Sekaran 1992). A simple random sampling technique is employed to gather the data. Based on Hair et al. (1998), the sample size should have a minimum of five times for each parameter. Hence, the sample size is 16 parameters x 20 samples per parameter = 320 samples.

The main research instrument, an anonymous self-administered questionnaire, with 5-point Likert scales. It is adopted from the initial questionnaire based on previous studies. The researcher developed scales based on several other empirical studies to make an initial list of items, eliminated several redundant items after being advised, and tested the first draft of the questionnaire in pilot tests. Construct analysis of the results guided revisions.

Data coding and cleaning was done through SPSS version 14. Assessing internal consistency of the measures involved examining two independent but related concepts: *Unidimensionality* and *Reliability*. Unidemnsionality exists when all items belonging to an underlying trait can be shown to group together using a technique such as factor analysis. Reliability is assessed after unidimensionality has been established, and measures the amount of error present (or absent) in the item grouping. Cronbach's (1951) (alpha) and Fornell and Larcker's (1981) measure of internal consistency were calculated to determine reliability.

In data analysis, Multiple regression, Factor Analysis, Multivariate Analysis of Variance, Discriminant Analysis, and the other techniques, all provide the researcher with powerful tools for addressing a wide range of managerial and theoretical conceptualized frameworks. But they all share one common limitation: each technique can examine only a single relationship at a time. For this reason the researcher used the technique of Structural Equation Modeling (SEM), an extension of several multivariate techniques, most notably multiple regression and factor analysis (Hair et al.1998). SEM is a confirmatory approach to data analysis requiring the a *priori* assignment of inter-variable relationships. It tests a hypothesized model statistically to determine the extent a proposed model is consistent with the sample data. SEM provides an assessment of predictive validity, specifies the direct and indirect relations among the latent variables, and describes the amount of explained and unexplained variance in the model (Byrne, 1998; Schumacker and Lomax 1996). In SEM there is no single test of significance that can absolutely identify a correct model given the sample data (Schumacker and Lomax 1996). Many goodness-of-fit criteria have been established to assess an acceptable model fit. Consequently, several authors recommend presenting a number of indices to support model fit (Bentler 1992; Garver and Mentzer 1999).

DATA ANALYSIS

The survey was circulated and all responses were received from MNC companies in the CPG industry. The targeted key informants included supervisors to managers, who are typically the

decision maker of the firms on supply chain functions, including sales, marketing, logistics, supply chain, finance, IT, and human resources.

A total of 307 questionnaires was sent. Only 155 completed surveys were returned, of which 146 surveys were usable. The overall response rate was 47.56%. To investigate the possibility of non-response bias in the data, tests for statistically significant differences in the responses of early and late waves of returned surveys were performed (Armstrong and Overton 1977; Lambert and Harrington 1990). These results suggested that non-response bias did not significantly impact the study.

ANALYSIS OF MEASUREMENT MODEL VALIDITY AND CONFIRMATORY FACTOR ANALYSIS

a. 1st Order of Construct

The first measurement model tested was "Supply Chain Uncertainty - Demand (SUD)". The model was checked to ensure that the parameter estimates exhibited the correct sign and magnitude and were consistent with the underlying theory. The modification indices implied that a number of items were correlated.

The second measurement model tested was "Supply Chain Uncertainty - Supply (SUS)". The model was checked to ensure that the parameter estimates exhibited the correct sign and magnitude and were consistent with the underlying theory. The modification indices implied that a number of items were correlated.

The third measurement model tested was "Supply Chain Strategy - Efficiency (SSE)". The model was checked to ensure that the parameter estimates exhibited the correct sign and magnitude and were consistent with the underlying theory. One of the 4 items exhibited error variances or insignificant parameter estimates that affected the scale of reliability. This item was considered unimportant to the model, and thus was deleted (Byrne 1998). The modification indices implied that a number of items were correlated.

The fourth measurement model tested was "Supply Chain Strategy - Agile (SSA)". The model was checked to ensure that the parameter estimates exhibited the correct sign and magnitude and were consistent with the underlying theory. The modification indices implied that a number of items were correlated.

The fifth measurement model tested was "Supply Chain Relationship - Customer (SRC)". This model was evaluated using 4 items. The model was checked to ensure that the parameter estimates exhibited the correct sign and magnitude and were consistent with the underlying

theory. The modification indices implied that a number of items were correlated.

The sixth measurement model tested was "Supply Chain Relationship - Supplier (SRS)". This model was evaluated using 4 items. The model was checked to ensure that the parameter estimates exhibited the correct sign and magnitude and were consistent with the underlying theory. The modification indices implied that a number of items were correlated.

The seventh measurement model tested was "Technology and Planning Integration - Internal Communication (TPI)". The model was checked to ensure that the parameter estimates exhibited the correct sign and magnitude and were consistent with the underlying theory. One of the 4 items exhibited error variances or insignificant parameter estimates that affected the scale of reliability. This item was considered unimportant to the model, thus was deleted (Byrne 1998). The modification indices implied that a number of items were correlated.

The eighth measurement model tested was "Technology and Planning Integration - Collaborative Forecasting and Planning (TPF)". The modification indices implied that a number of items were correlated.

The ninth measurement model tested was "Measurement System - (MS)". Two of the 4 items exhibited error variances or insignificant parameter estimates that affected the scale of reliability. These items were considered unimportant to the model, and thus were deleted (Byrne 1998). None of the results were shown from the test. The modification indices implied that a number of items were correlated.

The tenth measurement model tested was "Firm's Operational Performance - Speed (FPS)". The modification indices implied that a number of items were correlated.
The eleventh measurement model tested was "Firm's Operational Performance - Flexibility (FPF)". The modification indices implied that a number of items were correlated.

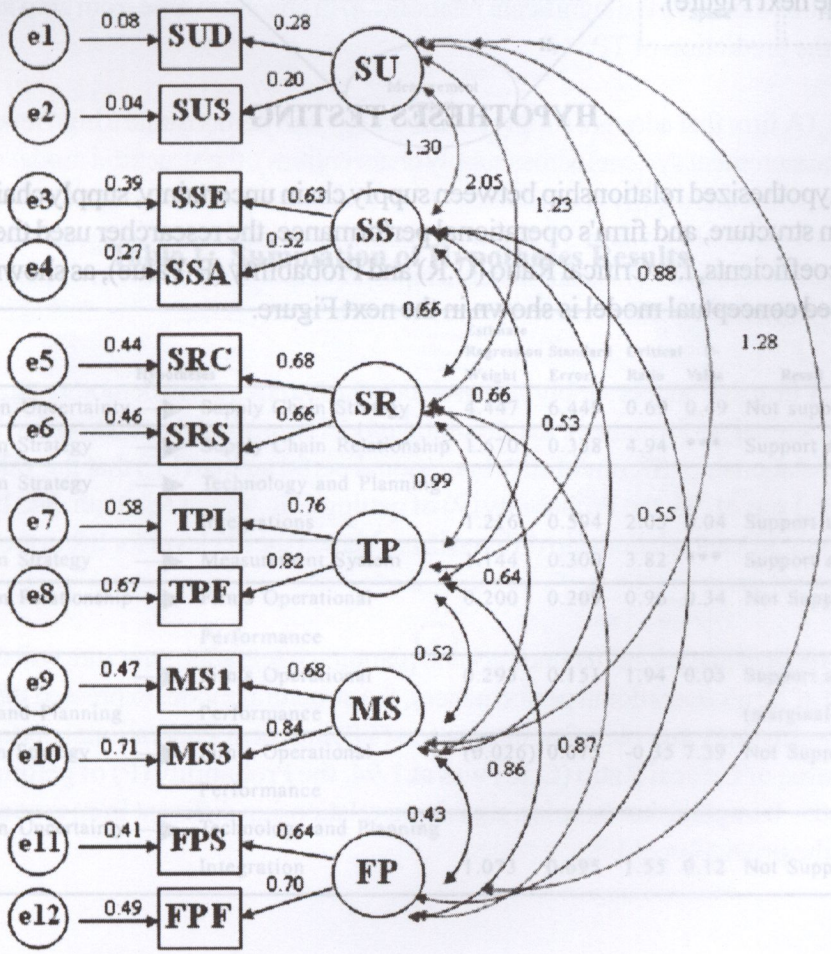
When viewing the model fit indices at the 1st order of construct for each of the measurement models, a good fit is apparent regarding each of the measurement models, except MS. Goodness of Fit Index (GFI), Normed Fit Index (NFI), Comparative Fit Index (CFI), and Incremental Fit Index (IFI) were all, except MS, greater than .90 (Byrne 1998), suggesting excellent model fit. Root Mean Square Residual (RMR) was mostly greater than .03, which could not be accepted according to Bentler and Chou (1987), and Bollen (1989); this value was indicative of non-good fit in the 1st order of construct. And, Root Mean Square of Error approximation (RMSEA) was mostly greater than.1 which could not be accepted according to Chau (1997); this value was indicative of non-good fit in some measurement models.

b. 2nd Order of Construct

The 2nd order of construct for each measurement model continued the measurement to ensure the good fit of the model. This was to measure the full conceptual model, and exhibited the correlations.

The full measurement model tested was 'Strategy-Structure-Performance (SSP)'. This model was evaluated using 18 constructs with 60 items. Reliability was at 0.95, which is above the 0.70 acceptance level of Nunnally and Bernstein (1994). The model was also checked to ensure that the parameter estimates exhibited the determined thresholds and were consistent with the underlying theory. However, 'good fit' was not apparent in this model, all the indices being less than the 0.90 which Byrne (1998) said was the minimum. Other calculations confirmed this non-fit. Therefore, the researcher modified the model, as shown in Figure 4.

Figure 4: Strategy-Structure-Performance Measurement Model - Correlations



This model was evaluated using 12 constructs and 40 items. When viewing the model fit indices that had correlation across all the items; at the 2nd order of construct for each measurement model, a good fit is apparent. The x^2 of 80.507 (degree of freedom = 39) is significant at p = .000, and x^2 /df was 2.064 (less than the 3.0 of Chau, 1997) suggesting the model fits the sample data well, Goodness of Fit Index (GFI),Comparative Fit Index (CFI), and Incremental Fit Index (IFI) were at 0.91, 0.84, and 0.91 respectively, suggesting a good model model fit. Root Mean Square Residual (RMR) was at 0.03, and thus equal to 0.03 (Bentler and Chou 1987, Bollen 1989); this value was indicative of good fit in the 2nd order of construct. Also, Root Mean Square of Error Approximation (RMSEA) was at 0.09: as it was less than 0.10 (Chau 1997) this value was also indicative of acceptable. The critical ratio and p-value is quite acceptable for all constructs. The critical ratios (CR) showed positive signs, and the significant level for all was at p < .001.

Based on the results of both orders of CFA test, at the 1st order, Measurement System (MS) measurement model, RMR, and RMSEA could not be explained for all. At the 2nd order, a good fit has been found for all items as well. The SEM model was used to fit the structural model (in the next Figure).

HYPOTHESES TESTING

To test the hypothesized relationship between supply chain uncertainty, supply chain strategy, supply chain structure, and firm's operational performance, the researcher used the estimates of the path coefficients, i.e. Critical Ratio (C.R) and Probability (P-Value), as shown in Figure 5. The revised conceptual model is shown in the next Figure.

Figure 3.2: Conceptual Framework with Proposition: A Model of Relationship Between Supply Chain Strategy, Structure, and Operational Performance

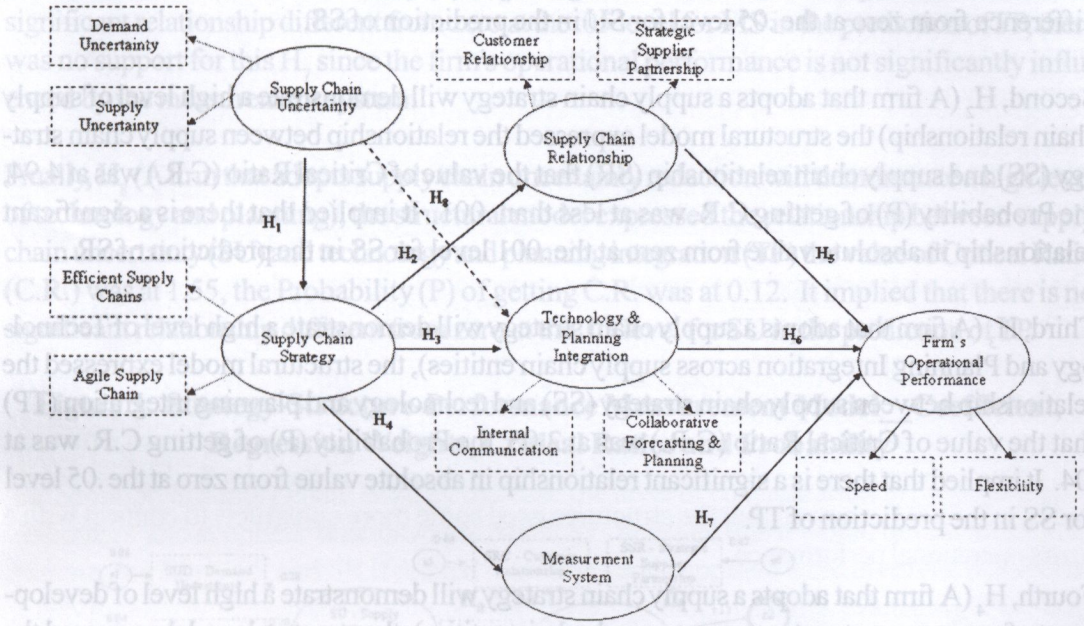


Table 1: Summation of Hypotheses Results

Hypotheses			Estimate Regression Weight	Standard Error	Critical Ratio	P-Value	Result
H1 Supply Chain Uncertainty	→	Supply Chain Strategy	4.447	6.449	0.69	0.49	Not support
H2 Supply Chain Strategy	→	Supply Chain Relationship	1.670	0.338	4.94	***	Support at P<.001
H3 Supply Chain Strategy	→	Technology and Planning Integrations	1.216	0.594	2.05	0.04	Support at P<.05
H4 Supply Chain Strategy	→	Measurement System	1.144	0.300	3.82	***	Support at P<.001
H5 Supply Chain Relationship	→	Firn's Operational Performance	0.200	0.209	0.96	0.34	Not Support
H6 Integration Technology and Planning	→	Firn's Operational Performance	0.293	0.151	1.94	0.05	Support at P<.05 (marginallysupported)
H7 Supply Chain Strategy	→	Firn's Operational Performance	(0.026)	0.075	-0.35	7.39	Not Support
H8 Supply Chain Uncertainly	→	Technology and Planning Integration	1.073	0.695	1.55	0.12	Not Support

First, H_1 (A firm with different levels of supply chain uncertainty emphasize different types of supply chain strategies), the structural model expressed the relationship between supply chain uncertainty (SU) and supply chain strategy (SS) that the value of Critical Ratio (C.R.) was at .69, the Probability (P) of getting C.R. was at .49. It implied that there is no significant difference from zero at the .05 level for SU in the prediction of SS.

Second, H_2 (A firm that adopts a supply chain strategy will demonstrate a high level of supply chain relationship) the structural model expressed the relationship between supply chain strategy (SS) and supply chain relationship (SR) that the value of Critical Ratio (C.R.) was at 4.94, the Probability (P) of getting C.R. was at less than .001. It implied that there is a significant relationship in absolute value from zero at the .001 level for SS in the prediction of SR.

Third, H_3 (A firm that adopts a supply chain strategy will demonstrate a high level of Technology and Planning Integration across supply chain entities), the structural model expressed the relationship between supply chain strategy (SS) and technology and planning integration (TP) that the value of Critical Ratio (C.R.) was at 2.05, the Probability (P) of getting C.R. was at .04. It implied that there is a significant relationship in absolute value from zero at the .05 level for SS in the prediction of TP.

Fourth, H_4 (A firm that adopts a supply chain strategy will demonstrate a high level of development of measurement systems across supply chain entities), the structural model expressed the relationship between supply chain strategy (SS) and measurement system (MS) that the value of Critical Ratio (C.R.) was at 3.82, the Probability (P) of getting C.R. was at less than .001. It implied that there is a significant relationship in absolute value from zero at the .001 level for SS in the prediction of MS.

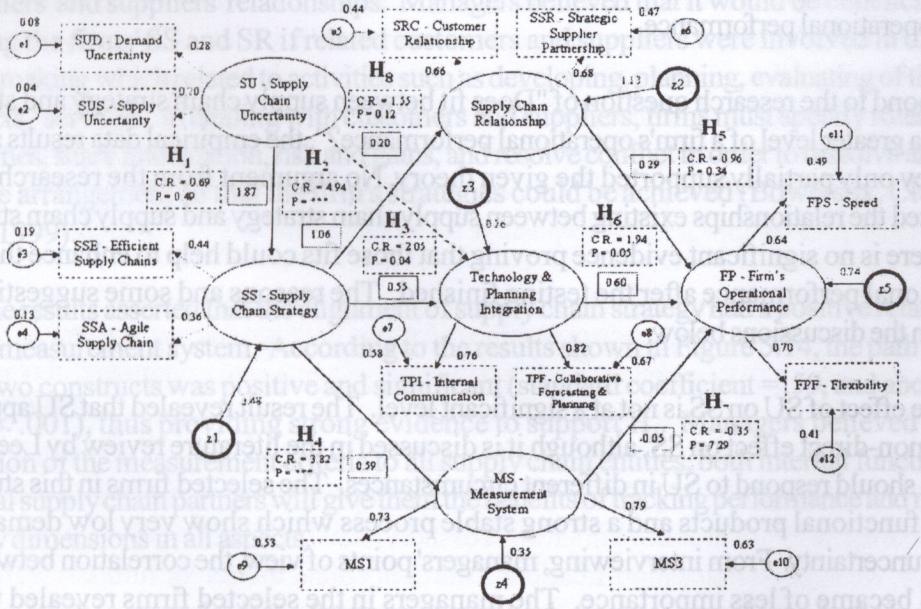
Fifth, H_5 (A firm that adopts supply chain relationship structure will demonstrate a high level of firm's operational performance), the structural model expressed the relationship between supply chain relationship (SR) and firm's operational performance (FP) that the value of Critical Ratio (C.R.) was at .96, the Probability (P) of getting C.R. was at less than .34. It implied that there is no significant relationship different from zero at the .05 level for SR in the prediction of FP.

Sixth, H_6 (A firm that adopts technology and planning integration structure will demonstrate a high level of firm's operational performance), the structural model expressed the relationship between technology and planning integration (TP) and firm's operational performance (FP) that the value of Critical Ratio (C.R.) was at 1.94, the Probability (P) of getting C.R. was at less than .05. It implied that there is a significant relationship different from zero at the .05 level for TP in the prediction of FP.

Seventh, H_7 (A firm that adopts measurement system structure will demonstrate a high level of firm's operational performance), the structural model expressed the relationship between measurement system (MS) and firm's operational performance (FP) that the value of Critical Ratio (C.R.) was at -0.35, the Probability (P) of getting C.R. was at 7.39. It implied that there is no significant relationship different from zero at the .05 level for MS in the prediction of FP, there was no support for this H_7 since the firm's operational performance is not significantly influenced by the measurement system.

Finally, H_8 (A firm that adopts supply chain uncertainty reduction will demonstrate a high level of technology and planning), the structural model expressed the relationship between supply chain uncertainty (SU) and technology and planning integration (TP) the value of Critical Ratio (C.R.) was at 1.55, the Probability (P) of getting C.R. was at 0.12. It implied that there is no significant relationship different from zero at the .05 level for SU in the prediction of TP.

Figure 5: Strategy-Structure-Performance Measurement Model__Coefficient, Regression Weights, Critical Ratios and Probability



CONCLUSIONS

The results confirm the existence of a flow of interrelationships among supply chain strategies and supply chain structures (supply chain relationship, technology and planning integration, measurement system). Firms that achieve the supply chain strategies also appear to demonstrate and adopt high levels of structural development in terms of supply chain relationship, technology and planning integration, measurement system. However, no relationship exists between supply chain structures, except the structural element of technology and planning integration which marginally effects, and a firm's operational performance. Also, no support from supply chain uncertainties and supply chain strategies was found.

The lack of a relationship between supply chain uncertainties and supply chain strategies needs further investigation as it is generally agreed in the theory of Fisher (1997) and Lee (2002). Also, the relationship between supply chain structures and a firm's operational performance needs further investigation to find the causes of the indirect relationship, and a possible way is to have additional mediating variables which may be needed to connect between structures and a firm's operational performance, as doing this in a previous study by Rodrigues, Stank, and Lynch (2004), showed that the structures need some more constructs to connect with a firm's operational performance.

To respond to the research question of "Does fit between supply chain strategy and structure lead to a greater level of a firm's operational performance?", the empirical data results showed that they only partially supported the given theory. No argument from the research results presented the relationships existing between supply chain strategy and supply chain structure. But, there is no significant evidence proving that those fits could help to enhance the firm's operational performance after the testing finished. The reasons and some suggestions are given in the discussions below.

1st* The effect of SU on SS is not at a significant level. The result revealed that SU appears to have a non-direct effect on SS, although it is discussed in the literature review by Lee (2002) that SS should respond to SU in different circumstances. The selected firms in this study had purely functional products and a strong stable process which show very low demand and supply uncertainty. From interviewing, managers' points of view, the correlation between SU and SS became of less importance. The managers in the selected firms revealed that the supply chain strategies for them will be determined by more factors, including corporate objectives and goals with considerations of the competitive environment rather than demand and supply alone.

2nd* the results asserted that the alignment of supply chain strategy had a positive relationship with technology and planning integration. According to the results shown in Figure 5.14, the path relating these two constructs was positive and significant (standard coefficient = .55, and

above C.R. and $p < .05$), thus providing strong evidence to support H_3. This indicated that the adoption of supply chain strategy increases the level of demonstration in technology and planning integration. Managers believed that it would be beneficial in enhancing the firms' SS and TP as this would be the key enabling them to work across supply chain entities, both internal and external. Firms with high levels of achievement in Supply Chain capabilities have accepted the challenge to reengineer the structure of information systems according to the directed strategies, and responding to customers' and suppliers' activities. The challenge is to integrate information technology across a supply chain network to be used as a service differentiator rather than simply a cost reducer. The degree of information technology connectivity is critical to supply chain success (Bowersox, Closs, and Stank 1999).

3rd* In terms of the responsiveness between strategy and structures which show significant relationships, firstly, the results asserted that the alignment of supply chain strategy had a positive relationship with supply chain. According to the results shown in Figure 5.14, the path relating these two constructs was positive and significant (standard coefficient = 1.06, and above C.R. and $p < .001$), thus providing strong evidence to support H_2. This indicated that the adoption of supply chain strategy increase the level of consideration in managing better customers' and suppliers' relationships. Managers believed that it would be beneficial in enhancing the firms' SS and SR if related customers and suppliers were involved in the firm's policy making which related to activities such as developing, planning, evaluating of the firm's products / services. In dealing with customers and suppliers, firms must specify roles, define guidelines, share information, risk and gains, and resolve conflict in order to dissolve an unproductive arrangement so that the firm's strategies could be achieved (Bowersox, Closs, and Stank 1999).

4th* The results asserted that the alignment of supply chain strategy had a positive relationship with a measurement system. According to the results shown in Figure 5.14, the path relating these two constructs was positive and significant (standard coefficient = .59, and above C.R. and $p < .001$), thus providing strong evidence to support H_4. Managers believed that the extension of the measurement criteria to all supply chain entities, both internal functions and external supply chain partners will give them the benefits of tracking performance and monitoring key dimensions in all aspects.

5th* The results asserted that the fit between supply chain strategy and supply chain relationship had a non-impact on a firm's operational performance. According to the results shown in Figure 5.14, the path relating these two constructs was positive (standard coefficient = .29), but this was not significant as shown in the above C.R. and $p < .05$, thus providing strong evidence not to support H_5.

The lack of a relationship between supply chain relationship and firm's operational performance may need further investigation. It is unclear why no such relationship existed in the

study though good operational performance was required The supply-chain-management literature reports a number of studies on the operational performance benefits that a firm derives from linking with suppliers and with customers. Narasimhan and Jayaram (1998) similarly demonstrated that by managing suppliers strategically, a firm could improve its operational performance, in terms of dependability, flexibility, cost, and quality. Furthermore, in Groves and Valsamakis (1998), the strength of the partnership between a supplier and a buyer explained significant differences in the timeliness of delivery both from suppliers to the firm and from the firm to its customers. Most recently, Salvador et al. (2001) reported that when firms interact with suppliers and with customers on issues related to materials flow and quality, firms can expect better time-related operational performances in terms of speed and delivery punctuality.

6th* The results asserted that the fit between supply chain strategy and technology integration had a marginally direct effect on a firm's operational performance. According to the results shown in Figure 5.14, the path relating these two constructs was positive (standard coefficient = .60), and there was as shown in the above C.R. and $p < .05$, thus providing strong evidence to support H_6, although it is a marginal effect. The result from qualitative analysis showed that managers believed that it would be beneficial to invest in information systems to enhance the firm's operational performance and improve customer satisfaction. Generally, Huang and Mak (2001) argued that information technology has been widely adopted in various businesses and industries, and further it has become the infrastructure and essential element of business management and operations; therefore from the manager's point of view the correlation between TP and FP becomes less important. The result is that it is generally accepted by mangers that TP does appear to have a positive relationship, although a marginal effect, on FP.

7th* A measurement system forms the basis for calibrating the many parts of a supply chain by providing timely feedback on strategic initiatives so that management can take corrective action to ensure that goals and objectives are met (Global Logistics Research Team at Michigan State University 1995). Thus, the non-clarity is shown as it is generally agreed that the 'fit' between strategy and structure will positively impact on a firm's operational performance. As Bowersox, Closs, and Stank (1999) stated, the development of a measurement system is to enable managers to monitor key dimensions of individual firm and supply chain operations; therefore, we suggest that a modification in the conceptual model for future research may prove to be worthwhile in terms of including some mediating variables, i.e. integration operation (internal and external) as shown in the previous study of Rodrigues, Stank, and Lynch (2004).

8th* Additionally, there is no supportive relationship, as in Lee (2002), on the reduction strategy as supply chain uncertainties depends on certain structures. In this study, the certain structure is technology and planning integration. As a result, there was no impact on SU to SS: the managers' views showed that this construct, SU, was not relevant to this conceptual model.

And this hypotheses is this researcher's own implication by interpreting what Lee (2002) mentioned, that the reduction of supply chain uncertainty could be made by involving technology integration into the firm. That recommendation showed that a firm engages more technology in order to reduce the supply chain uncertainty, which finally helps to enhance the supply chain efficiency. This implies that uncertainty alone can be harmful for a firm's operational performance unless certain structures, such as technology integration, relationship management, are implemented to reduce its negative impact. Therefore, in future research more investigation on the certain structures that can help to reduce uncertainty could prove to be worthwhile.

RESEARCH IMPLICATIONS FOR MANAGERS

This research provides useful implications for both academics and practitioners. The models have not been previously tested or supported in Thailand. Academics can now reference the empirical support of the SSP paradigm in one specific Global Consumer Packaged Goods Industry. This will enhance understanding of the complex interrelationships inherent in the supply chain environment and provide clarification of a conceptual model describing linkages among SSP.

In general, the data supported the proposed structural equation model. Additionally, both supplier management and customer relationship strategy positively impact supply chain management strategy, which in turn, influences a firm's operational performance. The researcher found a good 'fit' between strategy and structures. Supply chain strategy was found to have a strong influence on such structures. From our findings, firms considered it highly important to establish good relationships with both customers and suppliers, to invest in technology and systems as well as to create tracking control in order to evaluate performance. Therefore, we can conclude that supply chain strategy is stimulated the establishment of good structures. It is believed that this research makes a significant contribution to the literature on the implications for a selected industry regarding supply chain strategies, supply chain structures, and a firm's operational performance. By applying the complementary theory of supply chain uncertainties that addresses the supply chain strategy, this perspective explained the unexplored phenomenon of the effects of supply chain strategy in the SSP paradigm.

The findings of the research will have several implications for, and be meaningful to, managers in the global marketplace. This study elaborates the effects of relationships between strategy and each structural component. Practitioners may utilize this knowledge as a guideline to ensure that 'strategic fit' between a firm and supply chain partners is created, and to support the improvement of decision-making to ensure the right strategic approach to customer and supplier for the best influence on a firm's operational performance. Specifically, the findings support the importance of good collaborative working and knowing your supply chain part-

ners. Therefore, managers should ensure alignment and making a strategic 'fit' to enhance a greater level of a firm's operational performance; especially when considering a new member for the company supply chain. Further, they will provide some justification for the extensive investment in creating a better structure in terms of technology, relationships, and measurement system. The researcher also highlighted the importance of adopting a higher level of technology in the company; it will certainly support the company to cope with supply chain uncertainties, though there is no direct relationship. Relationship is highlighted for the selected industry in which the relationship is very important in achieving the shared goals. This study also highlights that good structuring of measurement systems will create alignment across supply chain entities to achieve business objectives and goals.

LIMITATIONS AND FUTURE RESEARCH

These empirical results only partially support the researcher's conceptual model due to several limitations. Time limitation meant that the survey reached only 307 respondents instead of the desired 320. Also, since the empirical data was provided by individual informants, the existence of possible biases cannot be discounted. The data was collected mainly in Thailand, and it should not be assumed that the results represent a wider case.

The conceptual model did not adequately answer the researcher's questions, and more modifications need to be made to the model. Future research may be needed, with attempts to find more theories and research in an individual industry, and then explain the effects of relationship in different industries and compare across the industries.

The weakness of the researcher's current model firstly was on the non-significance of relationship between supply chain uncertainty and supply chain strategy. Therefore, future research should investigate other factors that will impact supply chain strategy. Secondly, modification of the current model needs to be examined in order to clarify the 'fit' between strategy and structure enhancing a firm's operational performance, as the present results showed an indirect relationship that was opposed to the prior study of Rodrigues, Stank, and Lynch (2004), except technology and planning integration which showed marginal effects. Also, the specific structures to reduce supply chain uncertainties need to be revealed. Furthermore, future research would be useful on how the fit among different industries with the same or different strategies and structures may enhance a firm's operational performance in the presence of global businesses.

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