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MEASURING THE STRATEGIC FIT OF SUPPLY CHAIN COORDINATION SYSTEMS

By

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ABSTRACT

The benefits of using supply chain coordination systems (SCCSs) to synchronize information among the customers and suppliers of a supply chain are well established, however, recent innovations in flexible e-business technologies have led to a confusing variety of SCCS alternatives. Predicting which SCCS will best fit an organization's strategies is complicated by a lack of a theory for understanding how the various capabilities of SCCSs should be aligned with an organization's strategies. While analyzing all the possible SCCSs available is beyond the scope of this paper, our goal is to help firms determine the SCCS *capabilities* that best fit their strategies.

The objectives of this paper are: (1) to clarify the concept of the strategic fit of SCCS and its role in supply chain performance, and (2) to report on a study that explored potential measures of strategic fit in SCCS implementations. We present a preliminary model of the strategic fit of SCCSs, which was informed by studies from multiple disciplines and refined and validated using a panel of experts and evidence from three Canadian manufacturers. The model proposes that strategic fit is achieved by ensuring the capabilities of an SCCS support a firm's competitive strategy and level of supply chain integration.

The pilot study demonstrates that strategic fit of a SCCS can be determined from the degree to which the capabilities of a SCCS match the theoretically ideal capabilities for a firm's competitive strategy and level of supply chain integration. The survey measures recommended appear to provide reasonable and economical measures of the strategic fit of a SCCS. The model and survey measures have great potential in enabling the rapid identification of possible areas of misalignment in a firm's supply chain coordination systems and strategies.

KEYWORDS

Strategic alignment, corporate strategy, interorganizational information systems, supply chain management.

1. INTRODUCTION

Businesses have recognized the benefits of using supply chain coordination systems[1] (SCCSs) to synchronize information among the customers and suppliers of a supply chain since the early days of Electronic Data Interchange (EDI) [Mukhopadhyay et al, 1995; O'Leary, 2000]. Recent innovations in more flexible e-business technologies have led to a confusing variety of SCCS approaches such as extended Enterprise Resource Planning (ERP) systems, electronic marketplaces, and web services [McLaren et al, 2002]. Predicting which type of SCCS will best fit an organization's strategies is complicated by a lack of a theory for understanding how the various capabilities of SCCSs should be aligned with an organization's strategies.

Numerous information systems (IS) studies have focused on matching IS capabilities with functional requirements [Lucas, 1981]. However, with the complexity of enterprise systems packages, it has become increasingly infeasible to select a system that will meet all of a firm's requirements or even to know what those requirements are [Holland and Light, 1999]. As a result, firms frequently choose a SCCS solution based on its previous successes in other supply chains, without a detailed analysis of whether it truly fits the requirements for supporting the firm's specific environment and strategies [Reddy and Reddy, 2001]. The alignment between SCCSs and the business strategies they support remains a critical yet often overlooked factor in the success of SCCS implementations.

For example, a competitor of Dell Computer tried to mimic Dell's successful "build-to-order" web-based SCCS approach with disastrous results [Singh et al, 2001]. The customer service and inventory problems that resulted were likely due to a poor strategic fit between a SCCS that was designed for optimizing responsiveness and a competitive strategy that required a focus on efficiency rather than flexibility. Strategic fit of an SCCS is defined here as how well the SCCS supports a firm's competitive strategy and supply chain requirements (see descriptions in Table 1).

A lack of strategic fit could also explain why public electronic marketplaces have failed to interest many buyers and suppliers [Stevens, 2001]. Early marketplaces focused on vendor selection and reduced purchasing costs. However, they provided little support for operational efficiency or planning capabilities. As a result, these marketplaces may have had a good strategic fit only for the minority of firms whose strategies are focused solely on flexibility.

The number of SCCS alternatives make it difficult for firms to determine which solution is best for their unique situation. The complexity of cross-enterprise SCCS requirements analysis, implementation, and integration has resulted in frequent mismatches between the strategic objectives of an organization and the capabilities of the IS implemented. For example, Nike's troubled SCCS implementation has been blamed on a mismatch between their specialized requirements for agile distribution and the system's more standardized capabilities [Smith, 2001].

The goal of our ongoing research is to further explore the impact of alignment between IS and competitive strategy (also referred to as business strategy). Existing studies of such alignment deal primarily with high-level IS strategy in general [e.g. Reich and Benbasat, 2000; Sabherwal

and Chan, 2001], whereas this study focuses on the alignment of the *capabilities* or functional attributes of a specific type of information system with competitive strategy. Focusing specifically on supply chain systems reduces the generalizability of the model to other information systems. However, it provides a richer analysis of the factors that contribute to strategic fit in SCCSs and a research methodology extendable to the analysis of other types of IS.

Table 1- Description of Constructs

Construct	**Description**	**Illustrative Examples**
Strategic Fit of SCCS	How well a SCCS supports a firm's competitive strategy and requirements for supply chain integration.	Wal-mart's SCCS has a high level of support for efficiency and external process coordination which fits their competitive strategy and supply chain requirements and is expected to result in a high strategic fit for the SCCS.
Supply Chain Integration	Roughly how coordinated a firm's supply chain strategies, processes, systems, and performance measures are with those of its partners (see Appendix A).	Many firms are primarily focused on achieving internal integration while some have reached higher levels of supply chain integration by coordinating and collaborating with their suppliers and customers.
Competitive Strategy Type	A normative classification of an organization according to the competitive business strategies it uses to ensure profitability within its industry (see Appendix B).	Wal-mart behaves like a "Defender" in their market focusing on operational efficiencies. Their competitors include "Prospectors" using innovation to compete or "Analyzers" adopting other firm's innovations to reduce risks.
SCCS Capabilities	The high-level functional attributes of a SCCS including the level of support for: operational efficiency and flexibility, internal and external process coordination, short-term and long-term planning, and internal and external analysis.	SCCSs connected with EDI have high support for efficiency and external process coordination but low support for flexibility. Web-based B2B systems generally have higher levels of support for flexibility and varying levels of support for planning and analysis.
Satisfaction with SCCS	The degree to which management perceives the SCCS fulfils its requirements.	Some firms are highly satisfied with how well their SCCSs fit their needs, while others are less satisfied.
SCCS Success	How well the SCCS supports the supply chain performance objectives.	A SCCS is successful if it results in optimal supply chain costs, assets performance, responsiveness, flexibility, and reliability.

The objectives of this paper are: (1) to clarify the concept of the strategic fit of SCCS and its role in supply chain performance, and (2) to report on a study that explored potential measures of strategic fit in SCCS implementations. Following Eisenhardt's [1989] recommendations for building theory from case study research, we present a preliminary model of the strategic fit of SCCSs, which is informed by studies from multiple disciplines and refined and validated using a panel of experts and evidence from three Canadian manufacturers (see Tables 2 and 3). We used survey measures adapted from previous studies to pilot test and further refine the model, resulting in an emerging theory that is better grounded in empirical evidence.

The next section of this paper defines and discusses the strategic fit of SCCS construct and its expected role in supply chain performance. The following sections describe the research methods and discuss the candidate measures used to evaluate the level of strategic fit of a firm's SCCS. The final sections present the results and discuss the implications of our findings for researchers and practitioners.

2. A MODEL OF STRATEGIC FIT OF SUPPLY CHAIN COORDINATION SYSTEMS

Achieving strategic fit or alignment has been an important goal for most IS executives [Brancheau et al, 1996; Niederman et al, 1991]. Numerous studies have explored different dimensions of the concept resulting in terms used interchangeably such as alignment, fit, linkage, or coordination. In this study, we use the term "strategic fit" since we are studying the degree to which an SCCSs attributes match the requirements for supporting a firm's strategies using a profile deviation approach [Venkatraman, 1989b]. We avoid the term "alignment" since it is often unclear whether it refers to the "process" or "outcome" of alignment [Reich and Benbasat, 1996]. We focus on the latter (measuring the degree of fit achieved), rather than studying *how* to align the systems and strategies to improve the degree of fit.

It is also important to clarify the dimensions of strategic fit on which this study focuses. Henderson et al [1996] propose that strategic alignment of IS involves achieving fit between competitive strategy, IS strategy, organizational infrastructure and processes, and IS infrastructure and processes. While fit between each of these important, this study looks only at the impact of fit between competitive strategy and the IS infrastructure used specifically for supply chain coordination, which we call the strategic fit of SCCS.

Several studies have focused on the importance of achieving fit between an organization's IS strategy and its competitive strategy [Gupta et al, 1997; Sabherwal and Chan, 2001; Kearns and Lederer, 2001]. Researchers have also noted that strategic fit is important for SCCSs in particular. Fisher [1997] suggested configuring supply chains and SCCSs for either efficiency or responsiveness depending on whether the products involved were "functional" or "innovative" by nature. Fisher's bivariate conceptualization of fit is useful for analyzing extreme supply chain cases where the product type is homogeneous. However, Reddy and Reddy [2001] point out that most supply chains need to optimize both efficiency *and* agility. This "efficiency-agility" paradox occurs in supply chains because of the mix of products and services they must support as well the range of processes that occur, some static and some very dynamic [Reddy, 2001].

To address the shortcomings of reductionist bivariate conceptualizations of fit, our research model attempts a more systems-oriented approach by investigating the relationships and interactions of a larger number of factors simultaneously. For example, firms have different requirements for IS depending not only their need for efficiency or agility, but also on the amount of market surveillance, long-term planning, and interorganizational information sharing they perform [Sabherwal and Chan, 2001]. These factors are represented by a firm's competitive strategy — the strategic decisions, structures, processes firms adopt in reaction to their perceived environment [Miles and Snow, 1978]. Thus, we can determine the suitability of an IS in part by determining the degree of fit between the IS capabilities and the competitive strategies of a firm [Henderson et al, 1996]. However, since SCCSs must also support different degrees of information sharing between firms, we propose SCCS capabilities must not only fit the competitive strategy of a firm, but must also fit the level of supply chain integration[2] between the firm and its trading partners.

We conceptualize the strategic fit of a SCCS as the degree to which it supports a firm's competitive strategy and supply chain coordination requirements, as shown in Figure 1. This

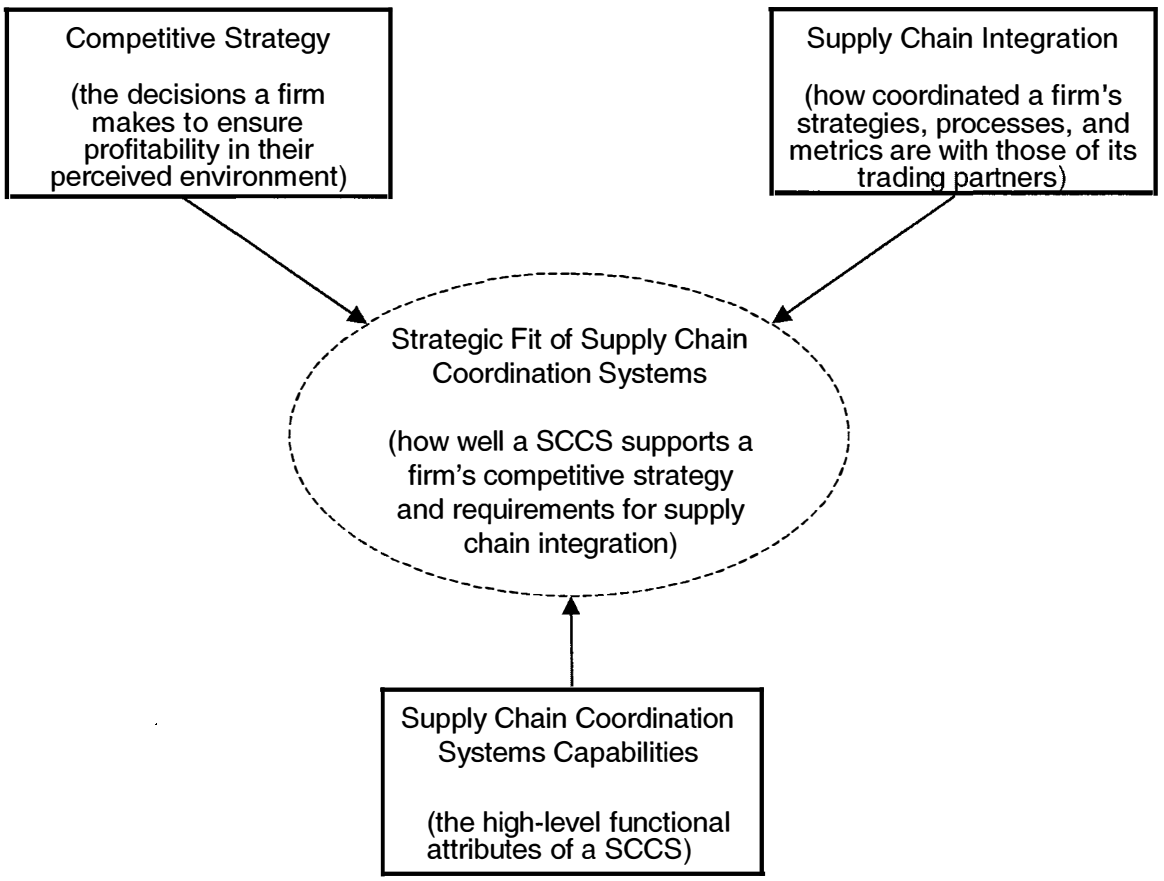


Figure 1 – Strategic Fit of SCCS Conceptual Model

conceptual model is grounded in configurational theories of alignment between competitive strategy and information systems proposed by Sabherwal and Chan [2002], King and Teo [1997], and Gupta et al [2001]. In order to apply these theories to inter-organizational information systems, our model also indicates that SCCSs must fit the firm's level of supply chain integration with its partners [Moncrieff and Stonich, 2001; Poirier and Bauer, 2001]. Thus, the model agrees with propositions by several researchers that supply chain successes are dependent on the degree of integration of the partners [Lee, 2000; Mentzer et al, 2000] but are governed by how well the systems handle a firm's unique requirements for operational efficiency, flexibility, decision support, and other IS capabilities [Reddy and Reddy, 2001].

The remainder of this paper reports on a study that developed measures to operationalize and subsequently test and refine our strategic fit of SCCS construct.

3. RESEARCH METHODS

Sample and Informants

The goal of this study was to explore the concept of strategic fit of SCCSs and its relationship (if any) to supply chain performance. In order to ensure that the model developed was grounded in empirical evidence, we followed recommendations from Strauss and Corbin [1998] and Eisenhardt [1989] to iteratively review and revise the emerging model using evidence from informants in the supply chain field (Table 3).

We developed the initial conceptual model and measures by synthesizing concepts from published studies described in the previous section. However, as this study involves a newly emerging theory, we reviewed and refined the conceptual model and survey measures frequently using the three-person panel of experts described in Table 3.

We then performed an exploratory field study of three Canadian manufacturers (Table 2) to further test and refine the research models, constructs, and survey instruments. The three firms were each selected purposely as their competitive strategies were expected to be representative of each of Miles and Snow's [1978] Defender, Prospector, and Analyzer strategic types. This "theoretical sampling" strategy followed Strauss and Corbin's [1998] recommendations for ensuring that all aspects of the proposed theory are included in the evidence gathered from the informants. For each of the firms, multiple informants (Table 3) were interviewed and given pilot surveys, which measured the firm's competitive strategy attributes, level of supply chain integration, SCCS capabilities, and satisfaction with the SCCS. Following McCracken's [1990] advice for optimizing consistency, efficiency, and flexibility of evidence, we used semi-structured interviews to probe each firm's current and planned SCCS initiatives, the rationale for their approach, and the costs and benefits they are experiencing and expect to encounter.

Table 2- Pilot Study Organizations

	Organization Studied (pseudonym)		
	EnergyCo	**ContractCo**	**ChipCo**
Business	Production and distribution of energy products	Contract manufacturing	Design and manufacturing of integrated circuits
Revenues in 2001 (US$)	17,000,000,000	16,000,000,000	93,000,000
Profit Margin in 2001	5.8%	-0.6%	9.8%
Employees in 2001	6740	40,000	500
Stated Corporate Priorities from Public Documents	• Operational efficiency • Quality • Cost performance • Increase production • Increase sales • Increase Return on Assets	• Customer Satisfaction • Quality • Cost performance • Supply chain management and collaboration • Manufacturing and Testing Technology Leadership	• Enter new high-growth markets • Maintain market share in core markets • Increase R&D in new technology • Highly customized products for individual customers

Following de Vaus's [1990] recommendations for increasing the validity and reliability of survey measures, we performed the following steps to evaluate the potential measures of strategic fit:

1. Adapt previously validated instruments from related studies.
2. Administer instruments to 5 senior informants on 3 companies: EnergyCo, ContractCo, and ChipCo (pseudonyms used for confidentiality).
3. Continuously revise wording of instruments based on feedback.
4. Use panel of supply chain experts (2 senior consultants and 1 e-Business Director) to analyze validity and plausibility of instruments and results.
5. Replace invalid instruments and repeat pilot tests until panel satisfied with validity of instruments.

The results of the pilot study (presented later in this paper) include a revised conceptual model of strategic fit of SCCS and recommended survey measures for determining strategic fit of a SCCS. The questionnaires have been pre-tested, validated by previous studies and by a panel with expert knowledge of the issues (Table 3), and further refined. We plan to further validate the measures using factor analyses once sufficient data is collected in a future study.

Table 3- Pilot Study Informants and Panel of Experts

Informant	Source of Knowledge of EnergyCo	Source of Knowledge of ContractCo	Source of Knowledge of ChipCo	Involved in Expert Panel Review Sessions?
1	Employee: e-Business Director	Informal / public documents	Informal / public documents	yes
2	Previous Consulting in IS for company	Informal / public documents	Former Employee: Marketing and IS	yes
3	Informal / public documents	Previous Consulting in IS for company	Informal / public documents	yes
4	Employee: Manager in Strategic Planning	n/a	n/a	no
5	n/a	Employee: Manager in Strategic Planning	n/a	no
6	n/a	Employee: Director, Operations Quality	n/a	no
7	n/a	n/a	Previous Consulting in IS for company	no

Data Collection, Analysis, and Validity Issues

This study is primarily exploratory in nature, as both the theory and research in the study of SCCSs are in the formative stages. However, it also seeks evidence to support or deny our preliminary theories of the strategic fit of SCCSs that have been developed from the studies described in the previous section. In order to support both exploratory and confirmatory research, we use a multiple methods design combining both qualitative and quantitative methods following a systematic data collection and analysis process informed by Creswell [1994], de Vaus [1990], Eisenhardt [1989], and Yin [1984]. The number of variables involved, newness of several of the measures, and difficulty controlling for extraneous variables will likely result in low statistical power and significance of the results. However, we use multiple quantitative and qualitative methods including empirical and exploratory surveys, interviews, and preliminary field studies to provide a richer interpretation of the phenomena of study [Sawyer, 2001] and to compensate for the limitations of any one approach [Benbasat, 1984].

The methods are primarily informed by the positivist research tradition with the conceptual model integrated from theories from multiple disciplines. Following Eisenhardt [1989], we are careful not to be overly biased by pre-existing theories and hypotheses but recognize that specifying *a priori* constructs based on previous studies and experiences helps ground the

measures and ensure that they are more testable. To improve the validity and usefulness of our emerging models, we use survey methods to validate the constructs and relationships proposed in the research model [de Vaus, 1990] and to highlight areas where the results contradict our preliminary theories which must then be further refined [Eisenhardt, 1989]. However, the number of alternative explanatory variables involved and the complexity of their interactions calls for supplementing the quantitative research with qualitative findings and interpretations [Lee, 1991]. Given the exploratory nature of this research, care is taken to discuss potential alternative explanations to the observed phenomena as well as limitations of the theories and instruments used [Klein and Myers, 1999].

As suggested by Benbasat [1984], we have included field study research in the design to provide additional evidence of how the research variables interact in their natural context. Purely experimental research would be inappropriate given the number of extraneous variables involved. Therefore, these field studies do not attempt to manipulate or control the research variables [Benbasat et al, 1987]. Rather than using laboratory controls, we employ Lee's [1989] concept of "natural controls" through a careful sample selection and case analysis process.

The theories presented in this study have not been widely applied to SCCS research. Therefore, the iteration between emergent theory development and validation requires research methods from both the interpretivist and positivist paradigms and quantitative and qualitative methodologies. Indeed, there is increasing support among IS researchers that such multi-methodology studies will provide richer and more reliable results than studies involving single methods or methods from a single research paradigm [Mingers, 2001].

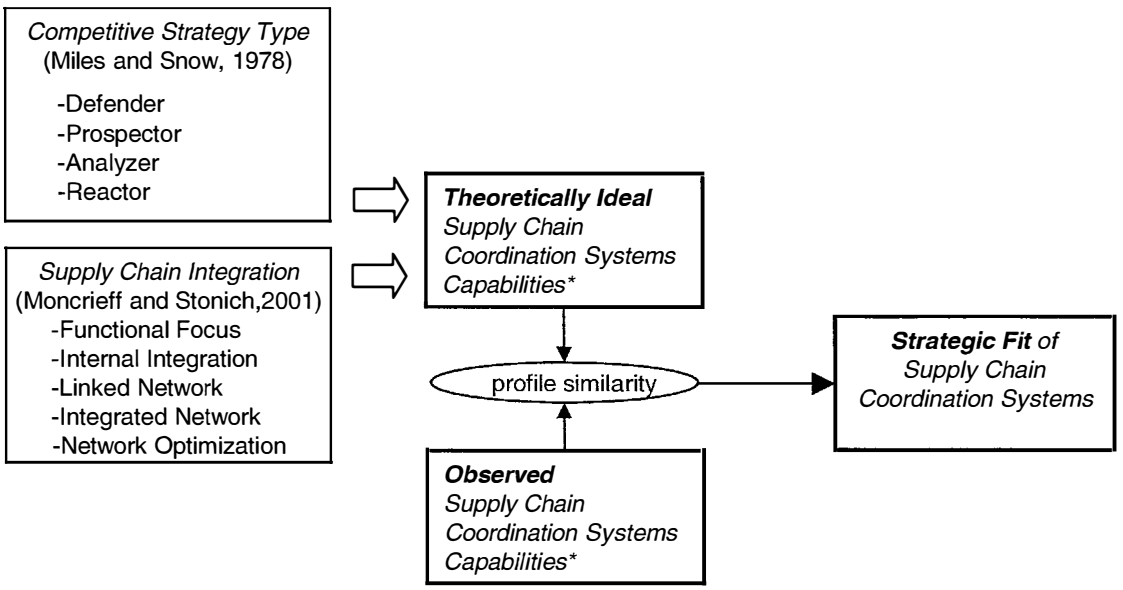
Nonetheless, we have taken care throughout the design of this study to use a disciplined research approach using scientifically rigourous methods. For example, the constructs and instruments shown in Table 1 and Appendix E are grounded in previous studies and theories, and are iteratively refined based on comments and pilot test results from researchers and practitioners. This cycling through exploratory research, confirmatory research, and conceptual refinements should strengthen the validity of both the theories and the findings [Straub, 1989]. Furthermore, the measures used are adapted from previously validated instruments, which increases the ease of determining their reliability. The instrument design follows Straub's [1989] recommendations for assessing and maximizing the content and construct validity and reliability of the instruments, as well as the internal and conclusion validity of the study.

The next section presents the method developed for measuring the strategic fit of a firm's SCCS. Although the measures and the underlying theories continue to be revised as new evidence is analyzed, preliminary results are presented and discussed in the subsequent sections.

4. MEASURING THE STRATEGIC FIT OF SUPPLY CHAIN COORDINATION SYSTEMS

Determining the ideal SCCS capabilities for each possible competitive strategy variable would be infeasible due to the number of relationships and interactions involved. Instead, we simplify the analysis by investigating competitive strategy *types* (see Table 1). This approach, known as an analysis of strategic fit through profile deviation, leads to a more holistic, systems-oriented

view of organizational phenomena rather than the reductionist univariate contingency approaches [Meyer et al, 1993; Venkatraman, 1989b]. It defines fit as how well an observed firm's profile matches the theoretically ideal profile for that firm. As shown in Figure 2, we first determine the theoretically ideal SCCS capabilities for a firm's competitive strategy type and level of supply chain integration. The degree of strategic fit of the SCCS is then how closely the firms observed SCCS capabilities match its theoretically ideal SCCS capabilities.



* Notes:

1) The capabilities determined by a firm's competitive strategy type are the level of support for (see Appendix C):
   - -Operational Efficiency
   - -Operational Flexibility
   - -Short-term Planning
   - -Long-term Planning
   - -Internal Analysis
   - -External Analysis

2) The capabilities determined by a firm's level of supply chain integration are the level of support for (see Appendix D):
   - -Internal Process Coordination
   - -External Process Coordination

3) The degree of strategic fit is determined by comparing the actual capabilities observed at an organization with the theoretically ideal capabilities for that organization's competitive strategy type and level of supply chain integration.

Figure 2 – Determining the Strategic Fit of an Organization's SCCS

A review of the literature reveals several alternative competitive strategy typologies [Ansoff, 1965; Miles and Snow, 1978; Porter, 1980]. The Miles and Snow [1978] typology was chosen for this study as it enables a firm to be easily characterized by the strategies, structures, and processes that it adapts in response to its perceived environment. As opposed to the more one-dimensional models of strategic types, Miles and Snow's [1978] systems approach has good predictive abilities and empirical support [Segev, 1989; Shortell and Zajac, 1990]. It has been widely used and validated in numerous empirical studies of strategic fit [Hambrick, 1983; Doty et al, 1993; Miles and Snow, 1994] including investigations of the strategic fit of IS organizational structures [Tavakolian, 1989; Gupta et al, 1997] and IS systems capabilities

strategies [Camillus and Lederer, 1985; Sabherwal and Chan, 2001]. Furthermore, the Miles and Snow [1978] competitive strategy typology accounts for many of the high level differences between organizations engaging in supply chain initiatives such as product innovativeness, rate of change of processes, or partnership characteristics [Segev, 1989; Sabherwal and Chan, 2002; Conant et al, 1990].

The Miles and Snow [1978] competitive strategy typology characterizes organizations as the conceptual normative configurations of Defenders, Prospectors, and Analyzers, which are associated with business strategies for operational efficiency, innovation, and risk minimization, respectively (see Appendix B). An additional strategic type known as Reactors was not included in our initial classification as these organizations do not appear to have a consistent strategy [Miles and Snow, 1978] and are frequently ignored in studies using the Miles and Snow typology [Sabherwal and Chan, 2001]. However, results of our pilot study investigation and other studies [such as Snow and Hrebiniak, 1980] indicate that the Reactor strategy (or lack thereof) is viable in chaotic environments and it should be included in future operationalizations of our strategic fit of SCCS model.

In order to determine if an organization is a Defender, Prospector, or Analyzer, we initially used Sabherwal and Chan's [2001] approach of mapping Venkatraman's [1989a] Strategic Orientation of Business Enterprises (STROBE) measure to the competitive strategy type. For example, Sabherwal and Chan [2001] found that the current theory suggests that Defenders are expected to score relatively high in the Defensiveness, Risk Aversion, and Futurity attributes, and low in the Proactiveness attribute. Therefore, the responses of the STROBE attributes could be used to determine if a firm matched the Defender, Analyzer, or Prospector profiles the closest. However, results of the pilot study using the STROBE measure yielded results that did not corroborate with other measures of competitive strategy (see Results section). The pilot study was repeated using direct measures of the competitive strategy type adapted from Miles and Snow [1978] and Conant et al [1990]. These measures yielded more plausible results that were corroborated by the other measures and informants.

Several studies have used the Miles and Snow [1978] competitive strategy type to establish the theoretically ideal IS strategies and high-level capabilities for a firm [Sabherwal and Chan, 2001; Segev, 1989; Camillus and Lederer, 1985]. We summarize these findings in Appendix C, which shows the relative level of support (low, medium, or high) a SCCS should provide for each capability according to the firm's competitive strategy type. The capabilities from these studies that relate to SCCSs include the support for: Operational Efficiency; Operational Flexibility; Short-term Planning; Long-term Planning; Internal Analysis; External Analysis; Internal Process Coordination; and External Process Coordination.

However, evidence suggests that process coordination capabilities relate not to the strategy type but rather to the level of supply chain integration. For example, Wal-Mart, usually considered a Defender, has achieved a high degree of process coordination both internally and externally, whereas many other defenders have low levels of process coordination [Gupta et al, 1997]. Appendix D shows the relative level of process coordination support that an SCCS should provide depending on a firm's level of supply chain integration based on studies by Moncrieff and Stonich [2001] and Poirier and Bauer [2001].

To determine the strategic fit of a SCCS for an organization, we first generated the theoretically ideal SCCS capabilities profile for each competitive strategy type and level of supply chain integration, as shown in Appendices C and D. Following an approach similar to Sabherwal and Chan [2001], these capabilities were assessed ratings of high, medium, or low based upon the capabilities that current theory predicts would be ideal. For example, Camillus and Lederer [1985] found that Defenders should have information systems that have a high degree of support for operational efficiency. Although the ideal capabilities ratings were generated from published studies, an expert panel reviewed them to determine their credibility. After reviewing the definitions of the strategy types and levels of integration, the panel of three experts (Table 3) agreed that the each of the ideal capabilities ratings appeared to be valid.

For each firm, we determined their competitive strategy type and level of supply chain integration using multiple respondents to measures adapted from Miles and Snow [1978], Conant et al [1990], Moncrieff and Stonich [2001]. Using Appendices C and D, we determined the theoretically ideal levels of support the firm's SCCS should provide for each capability.

Next, we measured the level of support each firm's SCCS provided using a 3-point Likert-type multi-item survey instrument adapted from measures from several studies of IS capabilities [Sabherwal and Chan, 2001; Zviran, 1990; Venkatraman and Ramanujam, 1987, and Bensaou, 1997].

Finally, we determined the degree of strategic fit of each firm's SCCS following Van de Ven and Drazin's [1985] approach of operationalizing strategic fit as the Euclidean distance between the theoretically expected and the observed profiles for each organization. The degree of strategic fit (Euclidian distance) is the deviation between a firm's competitive strategy type and level of supply chain integration and each of the high-level capabilities of their SCCS, as shown in Figure 2. It is determined by measuring the level of support for each capability on a 3-point scale where 1=low, 2=medium, and 3=high and calculating the square root of the sum of the squared differences:

$$\text{distance} = \sqrt{\sum \left[(\text{theorectically ideal capability}) - (\text{observed capability})\right]_i^2}$$

for each *i* capabilities. A lower distance implies a higher degree of strategic fit.

For example, if the level of support for each of the capabilities of a SCCS matched the theoretically ideal levels for that firm's competitive strategy and level of supply chain integration, then the distance would be zero and the strategic fit would be perfect. However, if theory predicted a firm's SCCS should have a high level of support for flexibility and long-term planning yet the observed SCCS had low levels of support for each, the distance would be greater and hence the fit would be lower. The strength of this operationalization of strategic fit is that it enables the appropriateness of an IS to be determined based on a number of capabilities simultaneously rather than focusing on single dimensions. Thus, firms can develop more holistic or systems-based analyses that include multidimensional profiles rather than looking at bivariate tradeoffs such as Fisher's [1997] flexibility-innovativeness model.

The theoretically ideal SCCS capabilities could also be used to derive the theoretically ideal SCCS for each competitive strategy type at a given level of supply chain integration. As McLaren et al [2002] observe, there are a wide variety of SCCSs available (see Figure 3) and determining the most appropriate SCCS for a given organization is a challenge many would like to address. However, determining the relative capabilities of each type of SCCS shown in Figure 3 is very subjective and complicated by the amount of overlap of capabilities between implemented SCCSs. Therefore, determining the ideal SCCS *type* for an organization is beyond the scope of this research. Instead, the goal of this research is to help determine the ideal SCCS *capabilities* for an organization.

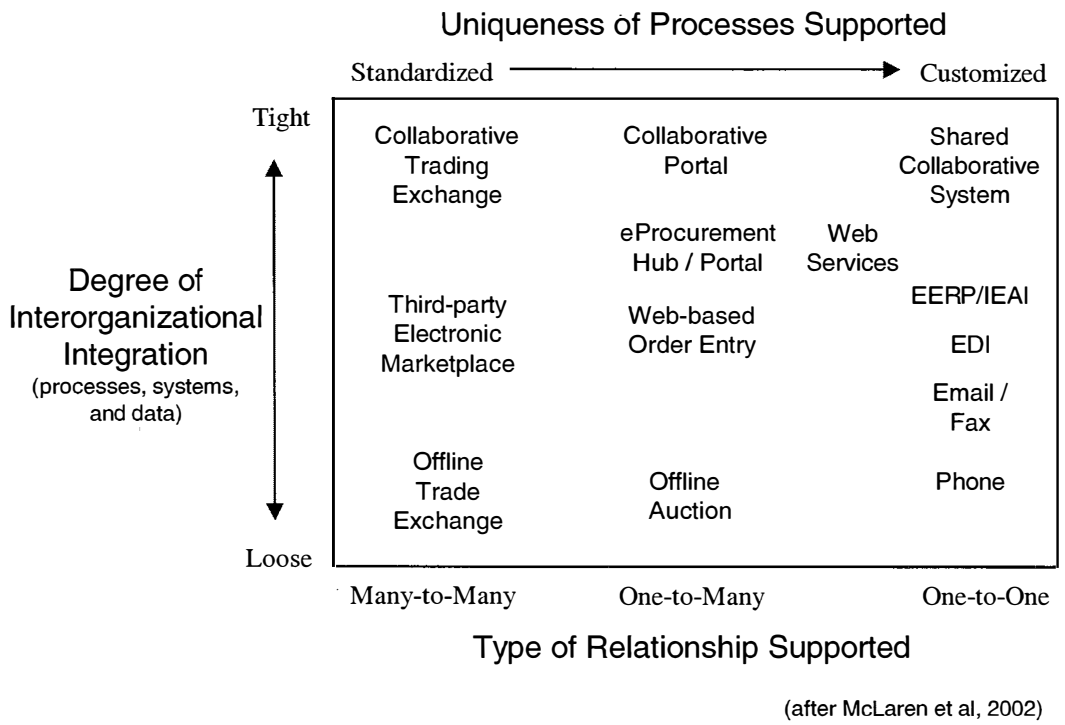


Figure 3 - A Typology of Supply Chain Coordination Systems

5. RESULTS

This study used an iterative approach to theory-building and data analysis [Eisenhardt, 1989] that resulted in the emerging model of strategic fit of SCCS as shown in Figures 1 and 2.

Appendix E summarizes findings on the various measures used to operationalize the constructs. A significant finding from the pilot study was that the STROBE measure yielded results that did not corroborate with other measures of competitive strategy. There was little agreement between respondents from the same firm when using the STROBE measure with some results indicating a firm was a Defender and some an Analyzer. However, each of the panel of experts familiar with the firm and the Miles and Snow [1978] typology classified that firm as a Defender. Further

examination of the STROBE measure revealed the items and constructs did not adequately address the differences between the Miles and Snow [1978] competitive strategy types. For example, the Analysis construct did not distinguish between external (market scanning) and internal (company performance) analysis, which is a key differentiator between Analyzers and Defenders.

Therefore, alternative measures that were more reliably associated with the competitive strategy type construct were located. Miles and Snow's [1978] measure which asks respondents to select a paragraph that best describes their firm's strategy was chosen as it is widely used and enables a quick self-typing to be done. However, several researchers have been critical that the paragraph descriptions in the Miles and Snow [1978] measure do not cover all eleven dimensions that define Miles and Snow's [1978] competitive strategy type construct [Conant et al, 1990]. Thus, the pilot study was repeated using measures adapted from both Miles and Snow [1978] and a more comprehensive 11-item measure from Conant et al [1990]. The results yielded more plausible results that were corroborated by each of the multiple measures and respondents.

In addition, we had expected to be able to investigate the correlation of strategic fit with quantitative measures of supply chain performance such as supply chain costs, assets performance, responsiveness, flexibility, and reliability measures [Supply-Chain Council, 2001]. However, in the three firms studied, the usage of and willingness to disclose the Supply-Chain Council's [2001] supply chain performance measures by practitioners was not to the level expected. The informants indicated that they would either have difficulty producing such "hard" measures from their current systems or that they were reluctant to disclose such sensitive information.

In place of these measures, two survey items adapted from previously validated studies were used to measure the respondents' level of satisfaction with the SCCSs. Respondents were asked to rate their overall satisfaction with their SCCSs on 5-point scales from "very high" to "very low" [Raymond, 1985] and to rate their SCCSs from "a complete failure" to "adequate" to "very successful" [Miller and Doyle, 1987]. The responses were then averaged to obtain a composite measure of user satisfaction. While the two items provide a parsimonious measure of user satisfaction suitable for this preliminary exploration of SCCSs they are admittedly not as comprehensive as more lengthy and time-consuming measures.

Appendix E summarizes the findings on the potential measures and highlights the measures that we recommend for further investigation of strategic fit of SCCS. These measures appeared to give valid results that were corroborated by qualitative evidence gathered through the interviews and analyses of public documents. Furthermore, while the results of the small pilot test sample are not statistically significant, they suggest a positive association exists between the strategic fit of SCCS and overall satisfaction with the SCCS.

6. CONCLUSIONS AND DISCUSSION

After a review of previous studies and consultations with supply chain, information systems, and business strategy experts, we arrived at a preliminary model of strategic fit of SCCS, as shown in Figure 1. The pilot study results support our proposition that strategic fit is achieved by ensuring

the capabilities of an SCCS support a firm's competitive strategy and level of supply chain integration. Strategic fit can be measured by determining how well the capabilities of an SCCS match the theoretically ideal capabilities for a firm's competitive strategy type and level of supply chain integration (Figure 2).

Summary of Results Regarding Measurement of Strategic Fit of SCCS

Preliminary investigations at three manufacturers showed that the Miles and Snow [1978] competitive strategy typology of Defenders, Analyzers, Prospectors, and Reactors is useful in determining the strategic fit of a SCCS. Similarly, the level of supply chain integration [Moncrieff and Stonich, 2001; Poirier and Bauer, 2001] was also shown to play a role in determining the process coordination capabilities a SCCS should possess. Several survey measures are recommended for obtaining an economical measure of the strategic fit of a firm's SCCS (see Appendix E).

Furthermore, the pilot test results suggest that the level of strategic fit of a SCCS derived from these constructs is positively associated with management satisfaction with the SCCS. However, more evidence must be gathered before any statistically supported inferences can be made.

Limitations and Ideas for Future Research

We purposely selected the pilot study sample to explore preliminary theories of strategic fit of SCCSs, rather than to decisively test any hypotheses. While the evidence gathered was useful in developing preliminary models, the small sample size did not allow any sophisticated statistical or qualitative analyses to be performed. However, feedback from the participants involved was extremely positive, and there are indications that further investigations will yield many important insights to help guide decisions in this important area.

The analytical technique of determining strategic fit by calculating the Euclidean distance between theoretically ideal and observed configurations has several strengths and weaknesses. As Van de Ven and Drazin [1985] and Sabherwal and Chan [2001] report, the approach enables a more holistic rather than reductionist analysis of the relationship between multidimensional constructs. Such a systems perspective would be infeasible if a study were to focus on the many interacting relationships and factors individually [Venkatraman, 1989b]. The configuration approach can "offer richer insights by focusing on parsimonious and relatively homogenous groups rather than diverse concepts" [Sabherwal and Chan, 2001].

As Kaplan and Maxwell [1994] note, any study that requires evidence to be converted from qualitative to quantitative formats may result in the loss of context or alternative explanations of the findings. For this reason, we have also used qualitative analyses in our study to allow the validity of the quantitative findings to be further examined within their real world context and to seek out and analyze alternative explanations.

One outcome of using a Euclidean distance calculation to determine fit is that the distance (i.e. lack of fit) is the same regardless of whether the SCCS has a higher or lower level of support for the capability than the theoretically ideal level. This may seem counterintuitive as one might

expect a high level of support for all capabilities to be desirable. However, our approach assumes that such a system would be "overkill" and would not perform as effectively since it would be overly complex, costly, or difficult to use compared to a system that met the exact level of capability required. In reality, we expect that it is slightly better to have a system that exceeds the required level of support rather than one that fails to meet it, however, we have yet to gather empirical support for this proposition and thus have used the simpler Euclidean distance calculation proposed by Van de Ven and Drazin [1985].

Similarly, we expect that each of the eight capabilities should be given different weights in determining the strategic fit of a SCCS. However, with the exploratory nature of this study, we have given each equal weighting until sufficient evidence is gathered to determine appropriate weightings.

Due to the emergent nature of the theories proposed, we take care to ensure the theories are derived from evidence rather than by solely attempting to find data that validates the theories [Strauss and Corbin, 1998]. However, a purely interpretivist field study or case research approach has not been chosen, as the conceptual model and theories presented herein have been partially informed by our practical experience with IS as well as by other positivist studies and theories about organizations and information systems. We continuously test our assumptions and refine the models and beliefs employed in this study using Eisenhardt's [1989] principles for developing theories from positivist case study research as well as Klein and Myers' [1999] principles for interpretive field research. A key point is that we continuously examine alternative explanations and biases that may distort the findings.

In future studies, once sufficient data is gathered, the instruments and methodologies employed will be further validated using Straub's [1989] recommendations for ensuring conclusions are supported by the evidence. Furthermore, following Baroudi and Orlikowski's [1989] recommendations, we will continue to use purposeful sampling strategies and care in the research design and analysis to increase the statistical power of any findings.

Expected Contributions

Several IS studies have focused on the importance of implementation success factors such as change management or executive leadership [Wixom and Watson, 2001; Holland and Light, 1999; Parr et al, 1999; Lucas, 1981]. Similarly, others have recognized that success is dependent on achieving strategic alignment between business strategies and IS strategies [Gupta et al, 1997; Sabherwal and Chan, 2001; Kearns and Lederer, 2001]. However, this study is one of the few to examine how success can be influenced by aligning business strategies with the functional capabilities of an IS as proposed by Henderson et al [1996].

Ultimately, we expect to further the understanding of success factors for SCCSs and assist organizations in ensuring that their chosen systems better fit their unique supply chain requirements. The model presented proposes that the success of a SCCS initiative is related to the degree of fit between these SCCS capabilities and the competitive strategy and level of supply chain integration for an organization. Understanding these relationships is increasingly

important as organizations seek to intensify the level of collaboration with their partners while minimizing the risks of these strategic initiatives.

The strength of the preliminary model and survey measures appears to be their ability to quickly highlight areas of potential misalignment in an organization's chosen supply chain strategies and systems. For researchers, the study will provide an interdisciplinary systems approach to understanding success in SCCSs, which could also be adapted for use in other strategic IS domains. Practitioners will gain a better understanding of the strategic levers to focus on to reduce risk and maximize the success of their SCCSs. Thus, rather than choosing to implement a SCCS because a competitor has had success with it, firms can analyze how the capabilities of the SCCS will fit with each of the dimensions of their competitive strategy and level of supply chain integration.

In conclusion, this study provides a much-needed framework for analyzing SCCSs, which are increasingly important in today's hyper-competitive business environment. This paper describes a parsimonious approach for determining the strategic fit of supply chain coordination systems, which was developed from an analysis of the literature and three pilot study organizations. However, given the emergent nature of theories proposed, further empirical studies are clearly required.

NOTES

[1] Supply chain coordination is the coordination of a firm's suppliers, customers, distributors, and their partners; synonyms and variations include: *supply chain management, -integration, -collaboration; value chain management*. SCCSs are enterprise or interorganizational systems used to coordinate information in a supply chain. As with ERPs, a subjective set of capabilities and attributes identify SCCSs rather than deterministic classification schemes. One such classification scheme is shown in Figure 3.

[2] Supply chain integration is roughly how coordinated a firm's strategies, processes, systems, and performance measures are with those of its partners. The scale, adapted from Roloff et al (2001) and Poirier and Bauer (2001), ranges from an operational focus on internal integration to a focus on full network optimization, as shown in Appendix A. This study avoids using the related term "supply chain maturity" as it implies that tighter integration is better in all cases.

APPENDIX A - LEVELS OF SUPPLY CHAIN INTEGRATION AND TERMINOLOGY USED IN OTHER MODELS

Level of Supply Chain Integration (levels used in this paper)	**Level 1** **Functional Focus**	**Level 2** **Internal Integration**	**Level 3** **Linked Network**	**Level 4** **Integrated Network**	**Level 5** **Network Optimization**
Description (after Moncrieff and Stonich, 2001; Poirier and Bauer, 2001)	Discrete processes managed at department level. Performance measured at functional level.	Company-wide processes managed at both functional and cross-functional process levels. Performance measured at the company, process, and diagnostic levels.	Core processes managed internally with information sharing with external partners. Outsourcing of non-core processes. Individual metrics definition. Joint performance monitoring and correction with external partners.	End-to-end process management, coordination, and collaboration with strategic partners. Alignment of business objectives and processes of each partner Joint performance metrics definition, monitoring, and correction with external partners.	Standardized, modular business processes coordinated in real-time and executed by most capable partners. Standardized performance metrics monitored and corrected jointly at the company, process, and diagnostic levels.
Term used in Supply-Chain Maturity Model (Moncrieff and Stonich, 2001)	Functional Focus	Internal Integration	External Integration		Cross-Enterprise Collaboration
Term used in Poirier and Bauer Maturity Model (2001)	Internal Supply Chain Optimization		Network Formation	Value Chain Constellation	Full Network Connectivity

APPENDIX B - MILES AND SNOW COMPETITIVE STRATEGY TYPOLOGY

Competitive Strategy Type (after Miles and Snow, 1978)	**Business Profile** (after Miles and Snow, 1978)	**Expected Examples**
Defender (operational efficiency)	• High-quality standard products • Low prices • Economies of scale • Mechanistic organizational structure • High fixed-asset intensity • Highly cost-efficient but relatively few core technologies	Wal-Mart ExxonMobil
Prospector (innovation)	• High research and development and market intelligence investments • Lower level of controls and operational efficiency • Organic organizational structure • Low fixed asset intensity • Flexible technologies	Nike Leitch Technology (electronics components design)
Analyzer (minimize risk with proven opportunities)	• Maintains core products and adopts proven innovations • Large matrix organizational structure • Mix of technologies for efficiency and flexibility	Hewlett-Packard Toyota

APPENDIX C - COMPETITIVE STRATEGY AND EXPECTED SCCS CAPABILITIES

Competitive Strategy Type (after Miles and Snow, 1978)	**Supply Chain Coordination Systems Capabilities** (after Sabherwal and Chan, 2001; Segev, 1989; Camillus and Lederer, 1985)					
	Operational Efficiency Support	**Operational Flexibility Support**	**Long-term Planning Decision Support**	**Short-term Planning Decision Support**	**Internal Analysis Decision Support**	**External Analysis Decision Support**
Defender (operational efficiency)	**High**	Low	**High**	Low	**High**	Low
Prospector (innovation)	Low	**High**	Low	**High**	Low	**High**
Analyzer (minimize risk with proven opportunities)	Medium	*Medium*	*Medium*	*Medium*	**High**	**High**

APPENDIX D - SUPPLY CHAIN INTEGRATION AND EXPECTED PROCESS COORDINATION CAPABILITIES

Level of Supply Chain Integration (after Moncrieff and Stonich, 2001; Poirier and Bauer, 2001)	**Supply Chain Coordination Systems Capabilities** (after Moncrieff and Stonich, 2001; Poirier and Bauer, 2001)	
	Internal Process Coordination Support	**External Process Coordination Support**
Functional Focus	Low	Low
Internal Integration	**High**	Low
Linked Network	**High**	***Medium***
Integrated Network	**High**	**High**
Network Optimization	**High**	**High**

APPENDIX E - EVALUATION OF SURVEY MEASURES

Construct	Measure Evaluated	Results and Observations from Pilot Study	Recommendations
Competitive Strategy Type	Mapping of STROBE [Venkatraman, 1989a] attributes to Miles and Snow [1978] competitive strategy type [after Sabherwal and Chan, 2001]	• Did not agree with experts • Insufficient discrimination between external and internal analysis. • Lack of theoretical support for mapping to Miles and Snow.	• Replace with more direct measures of Miles and Snow Competitive Strategy Type.
Competitive Strategy Type	Miles and Snow [1978] Paragraph Self-Typing (respondents read four paragraphs describing competitive strategy types and choose the one that most closely matches their firm)	• Had fastest response times. • Results from each informant agreed with Expert Panel assessment in 5 of 6 cases. • Risk of mistyping errors due to paragraph not covering all 11 dimensions of the theoretical construct. • Reactors appeared to be a valid strategic type.	• Use along with a more robust measure such as Conant et al [1990]. • Reactors should be included as a valid strategic type.
Competitive Strategy Type	Conant et al's [1990] 11-dimension scale for determining Miles and Snow [1978] competitive strategy type	• Results from each informant agreed with Expert Panel assessment. • Useful for analysis of underlying dimensions of competitive strategy (e.g. can highlight misalignment between different dimensions of competitive strategy).	• Use along with Miles and Snow paragraph type for triangulation.
Level of Supply Chain Integration	15-dimension and 4-dimension scales adapted from Moncrieff and Stonich [2001] and peer-reviewed by Supply-Chain Council [2001] (not in an academic journal).	• Four dimension scale of overall supply chain integration produced similar results to 15-dimension scale that measured Make, Build, and Deliver processes separately. • Three firms had very similar levels of integration (consistent with larger studies of integration.	• Use parsimonious 4-dimension scale. • Need wider sample to determine if variable important enough to retain in models (likely important in extreme cases).

Construct	Measure Evaluated	Results and Observations from Pilot Study	Recommendations
Supply Chain Performance Indicators	Quantitative measures of supply chain costs, assets performance, responsiveness, flexibility, and reliability that have been developed, peer-reviewed, and published by Supply-Chain Council [2001] (not in an academic journal).	• No informants provided responses for these measures. Respondents indicated these "hard" measures were more objective but were difficult to provide without substantial initial effort. None of the respondents had access to such data and each indicated they would be reluctant to provide such data citing confidentiality risks.	• Replace with perceptual measures of overall satisfaction with SCCS to see if there is a relationship with strategic fit of SCCS.
Satisfaction with SCCS	A two-item composite of overall perception of satisfaction with the SCCS [from Raymond, 1985] and their rating of its adequacy at fulfilling requirements [from Miller and Doyle, 1987].	• Perceived level of satisfaction agreed between multiple informants from same organization and appeared to be corroborated by anecdotal evidence from additional informal respondents. • Level of satisfaction was positively associated with strategic fit of SCCS (low statistical power and significance).	• Use to assist understanding of cases. • Use in a larger sample to determine if statistically significant.
SCCS Capabilities	Multi-dimensional scale of level of support a SCCS has for each capability. Each capability measured by 2 items from previously validated studies [Sabherwal and Chan, 2001; Zviran, 1990; Venkatraman and Ramanujam, 1987; Bensaou, 1997].	• Pilot results showed very low inter-item ranges and low inter-rater ranges suggesting good reliability and validity. • A longer measure using 3 items per capability was deemed to be too time-consuming by the respondents.	• Use 2 items per capability to determine the level of support a SCCS provides for each high-level SCCS capability.
Strategic Fit of SCCS	Calculation of Euclidean Distance between theoretically ideal and observed SCCS capabilities for a firm [Sabherwal and Chan, 2001; Van de Ven and Drazin, 1985].	• Pilot results showed strong associations with expected results (i.e. degree of fit was high where expected and low where expected). • Pilot results showed good association with Competitive Strategy Type; even stronger associations with the underlying competitive strategy dimensions.	• Use to analyze levels of fit between SCCSs and competitive strategy type (and underlying competitive strategy dimensions) and compare with satisfaction levels

REFERENCES

Ansoff, H. I. (1965) *Corporate Strategy*, New York, NY: McGraw-Hill.

Baroudi, J. J., and W. J. Orlikowski (1989) "The Problem of Statistical Power in MIS Research", *MIS Quarterly* (13)1, pp. 87-106.

Benbasat, I. (1984) "An Analysis of Research Methodologies", in McFarlan, F. W. (ed.), *The Information Systems Research Challenge,* Boston, MA: Harvard Business School Press, pp. 47-61.

Benbasat, I., D. K. Goldstein, and M. Mead (1987) "The Case Research Strategy in Studies of Information Systems", *MIS Quarterly* (11)3, pp. 369-386.

Bensaou, M. (1997) "Inter-Organizational Cooperation: The Role for Information Technology. An Empirical Comparison of US and Japanese Supplier Relations", *Information Systems Research* (8)2, pp. 107-124.

Brancheau, J. C., B. D. Janz, and J. C. Wetherbe (1996) "Key Issues in Information Systems Management: 1994-1995 SIM Delphi Results", *MIS Quarterly* (20)2, pp. 225-242.

Camillus, J. C., and A. L. Lederer (1985) "Corporate Strategy and the Design of Computerized Information Systems", *Sloan Management Review* (26)3, pp. 35-42.

Conant, J. S., M. P. Mokwa, and P. R. Varadarajan (1990) "Strategic Types, Distinctive Marketing Competencies, and Organizational Performance: A Multiple Measures-based Study", *Strategic Management Journal* (11)5, pp. 365-383.

Creswell, J. W. (1994) *Research Design: Qualitative and Quantitative Approaches*, Thousand Oaks, CA: Sage Publications.

de Vaus, D. A. (1990) *Surveys in Social Research*, Winchester, MA: Unwin Hyman.

Doty, D. H., W. H. Glick, and G. P. Hubner (1993) "Fit, Equifinality, and Organizational Effectiveness: A Test of Two Configurational Theories", *Academy of Management Journal* (36)6, pp. 1196-1250.

Eisenhardt, K. M. (1989) "Building Theories from Case Study Research", *Academy of Management Review* (14)4, pp. 532-550.

Fisher, M. L. (1997) "What is the Right Supply Chain for your Product?", *Harvard Business Review* (75), March/April, pp. 105-116.

Gupta, Y. P., J. Karimi, and T. M. Somers (1997) "Alignment of a Firm's Competitive Strategy and Information Technology Management Sophistication: The Missing Link", *IEEE Transactions on Engineering Management* (44) 4, pp. 399-413.

Hambrick, D. C. (1983) "Some Tests of the Effectiveness and Functional Attributes of Miles and Snow's Strategic Types", *Academy of Management Journal* (26)1, pp. 5-26.

Henderson, J. C., N. Venkatraman, and S. Oldach (1996) "Aligning Business and IT Strategies", in J. N. Luftman (ed.), *Competing in the Information Age: Strategic Alignment in Practice*, New York, NY: Oxford University Press, pp. 21-41.

Holland, C. P., and B. Light (1999) "A Critical Success Factors Model for ERP Implementation", *IEEE Software*, May/June, pp. 30-36.

Kaplan, B. and J. A. Maxwell (1994) "Qualitative Research Methods for Evaluating Computer Information Systems", in J. G. Anderson, C. E. Aydin and S. J. Jay (eds.), Evaluating Health Care Information Systems: Methods and Applications, Thousand Oaks, CA: Sage Publications, pp. 45-68.

Kearns, G. S. and A. L. Lederer (2001) "Strategic IT Alignment: A Model for Competitive Advantage", in *Proceedings of the 22nd International Conference on Information Systems*, New Orleans, LA, December 2001.

King, W. R. and T. S. H. Teo (1997) "Integration between Business Planning and Information Systems Planning: Validating a Stage Hypothesis", *Decision Sciences* (28)2, pp. 279-308.

Klein, H. K., and M. D. Myers (1999) "A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems", *MIS Quarterly* (23)1, pp. 67-94.

Lee, A. S. (1989) "A Scientific Methodology for MIS Case Studies", *MIS Quarterly* (13)1, pp. 33-50.

Lee, A. S. (1991) "Integrating Positivist and Interpretive Approaches to Organizational Research", *Organization Science* (2)4, pp. 342-365.

Lee, H. L. (2000) "Creating Value through Supply Chain Integration", *Supply Chain Management Review*, September/October.

Lucas, H. C. (1981) *Implementation: The Key to Successful Information Systems,* New York, NY: Columbia University Press.

Mentzer, J. T., Foggin, J. H., and Golicic, S. L. (2000) "Collaboration: The Enablers, Impediments, and Benefits", *Supply Chain Management Review*, September/October.

Meyer, A. D., A. S. Tsui, and C. R. Hinings (1993) "Configurational Approaches to Organizational Analysis" *Academy of Management Journal* (36)6, pp. 1175-1195.

McCracken, G. (1990) *The Long Interview*, Newbury Park, CA: Sage Publications.

McLaren, T. S., M. M. Head, and Y. Yuan (2002) "Supply Chain Collaboration Alternatives: Understanding the Expected Costs and Benefits", *Internet Research: Electronic Networking, Applications and Policy,* (12)4, pp. 348-364.

Miles, R. E., and C. C. Snow (1978) *Organizational Strategy, Structure, and Process*, New York, NY: McGraw-Hill.

Miles, R. E., and C. C. Snow (1994) *Fit, Failure, and the Hall of Fame: How Companies Succeed or Fail*, New York, NY: Macmillan.

Miller, J., and B. A. Doyle (1987) "Measuring the Effectiveness of Computer-Based Information Systems in the Financial Services Sector", *MIS Quarterly* (11)1, pp. 107-124.

Mingers, J. (2001) "Combining IS Research Methods: Towards a Pluralist Methodology", *Information Systems Research* (12)3, pp. 240-259.

Moncrieff, B. and Stonich, M. (2001) "Supply-Chain Maturity Model and Performance Assessment", *Supply-Chain Council,* November 2001, http://www.supply-chain.org (current April 10, 2002).

Mukhopadhyay, T., S. Kekre, and S. Kalathur (1995) "Business Value of Information Technology: A Study of Electronic Data Interchange", *MIS Quarterly* (19)2, pp. 137-156.

Niederman, F., J. C. Brancheau, and J. C. Wetherbe, (1991) "Information Systems Management Issues for the 1990s" *MIS Quarterly,* December, pp. 475-495.

O'Leary, D. E. (2000) "Supply Chain Processes and Relationships for Electronic Commerce", in T. Strader and A. Whinston (eds.), *Handbook on Electronic Commerce*, Heidelberg, Germany: Springer-Verlag Berlin.

Parr, A., G. Shanks, and P. Darke (1999) "Identification of Necessary Factors for Successful Implementation of ERP Systems", in *New Information Technologies in Organizational Process*, O. L. Ngwenyama, L. D. Introna, M. D. Myers, and J. I. DeCross (eds.), Boston, MA: Kluwer Academic Publishers, pp. 99-119.

Poirier, C. C. and M. J. Bauer (2001) *E-Supply Chain: Using the Internet to Revolutionize Your Business*, San Francisco, CA: Berrett-Koehler Publishers.

Porter, M. E. (1980) *Competitive Strategy,* New York, NY: Free Press.

Raymond, L. (1985) "Organizational Characteristics and MIS Success in the Context of Small Business", *MIS Quarterly* (9)1, pp. 37-52.

Reddy, R. (2001) "Chasing Windmills: The Paradox of Efficiency and Agility in Supply Chain Management Technology", *Intelligent Enterprise*, October 24, 2001, http://www.iemagazine.com (current November 12, 2001).

Reddy, R. and Reddy, S. (2001) *Supply Chains to Virtual Integration*, New York, NY: McGraw-Hill.

Reich, B. H. and I. Benbasat (1996) "Measuring the Linkage between Business and Information Technology Objectives" *MIS Quarterly* (20)1, pp. 55-81.

Reich, B. H. and I. Benbasat (2000) "Factors that Influence the Social Dimension of Alignment between Business and Information Technology Objectives" *MIS Quarterly* (24)1, pp. 81-113.

Roloff, M., S. Gailius, P. Ibarra, and W. Polese (2001) "Stage of Maturity Correlates with Performance, Profitability, and Sales Growth", *Signals of Performance* (2)6, http://www.pmgbenchmarking.com (current April 12, 2002).

Sabherwal, R., and Y. E. Chan (2001) "Alignment between Business and IS Strategies: A Study of Prospectors, Analyzers, and Defenders", *Information Systems Research* (12)1, pp. 11-33.

Sawyer, S. (2001) "Analysis by Long Walk: Some Approaches to the Synthesis of Multiple Sources of Evidence", in E. M. Trauth (ed.) *Qualitative Research in IS: Issues and Trends*, Hershey, PA: Idea Group Publishing, pp. 163-189.

Segev, E. (1989) "A Systematic Comparative Analysis and Synthesis of Two Business-level Strategic Typologies", *Strategic Management Journal* (10)5, pp. 487-505.

Shortell, S. M. and E. J. Zajac (1990) "Perceptual and Archival Measures of Miles and Snow's Strategic Types: A Comprehensive Assessment of Reliability and Validity", *Academy of Management Journal* (33)4, pp. 817-832.

Singh, M., M. Deagle, S. Cohen, and J. Roussel (2001) "Supply Chain Alignment: Shorten the Synapses between Strategy and Supply Chain", *PRTM's Insight*, Spring 2001, http://www.prtm.com (current April 16, 2002).

Smith, T. (2001) "Call this Efficient?: Supply Chain isn't Place to Experiment", *Internetweek* (852), March 12, 2001, http://www.internetweek.com (current April 15, 2002).

Snow, C. C. and L. G. Hrebiniak (1980) "Strategy, Distinctive Competence, and Organisational Performance", *Administrative Science Quarterly* (25), June, pp. 317-336.

Stevens, D. (2001) "Boom, Bust, and E-hubs", *Backbone Magazine*, July, pg. 30.

Straub, D. W. (1989) "Validating Instruments in MIS Research", *MIS Quarterly* (13)2, pp. 147-166.

Strauss, A. and J. Corbin (1998) *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory (2nd edition),* Thousand Oaks, CA: Sage Publications.

Supply-Chain Council, Inc. (2001) "Supply-Chain Operations Reference Model: Overview of the SCOR Model v5.0", http://www.supply-chain.org (current April 10, 2002).

Tavakolian, H. (1989) "Linking the Information Technology Structure with Organizational Competitive Strategy: A Survey" *MIS Quarterly,* September 1989, pp. 309-317.

Van de Ven, A. H. and R. Drazin (1985) "The Concept of Fit in Contingency Theory", in *Research in Organizational Behaviour, Volume 7,* JAI Press, Inc., pp. 333-365.

Venkatraman, N. (1989a) "Strategic Orientation of Business Enterprises: The Construct, Dimensionality, and Measurement", *Management Science* (35)8, pp. 942-962.

Venkatraman, N. (1989b) "The Concept of Fit in Strategy Research: Toward Verbal and Statistical Correspondence", *Academy of Management Review* (14)3, pp. 423-444.

Venkatraman, N. and V. Ramanujam, (1987) "Planning System Success: A Conceptualization and an Operational Model", *Management Science* (33)6, pp. 687-705.

Wixom, B. H. and H. J. Watson (2001) "An Empirical Investigation of the Factors Affecting Data Warehouse Success", *MIS Quarterly* (25)1, pp. 17-41.

Yin, R. K. (1984) *Case Study Research,* Beverly Hills, CA: Sage Publications.

Zviran, M. (1990) "Relationships between Organizational and Information Systems Objectives: Some Empirical Evidence", *Journal of Management Information Systems* (7)1, pp. 65-84.

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