

미국 중소기업의 SCM전략과 Best Practice 실행 현황조사 연구

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SCM Strategy and Best Practices Implementation in SMEs

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■ Abstract ■

Over the last decade, the field of supply chain management (SCM) and e-business has received an enormous amount of attention from practitioners and academicians. However, little has been known about how and to what extent small- to medium-sized enterprises (SMEs) are implementing SCM initiatives and e-business practices. This paper proposes a comprehensive research model and presents the survey results of these practices of SMEs located in Wisconsin and Illinois, U.S., in terms of competitive strategy and priority, value chain activity priority, supply chain and e-business integration focus, SCM best practices implementation focus and challenges, and business performance. The analysis reveals several valuable insights into how SMEs should run their businesses in today's volatile, rapidly changing customer economy.

Keyword : Supply Chain Management, E-business, SME, Best Practices, Supply-chain Operations Reference Model

1. Introduction

In the 1980s, many U.S. companies widely

embraced the concept of value chain for creating a firm's value [53,54], with a particular emphasis on their competitive positioning in the

marketplace. Along with increasing global competition, leading companies launched various operational effectiveness programs, including Just-In-Time (JIT)/lean, kaizen, six sigma, and advanced manufacturing technology, to gain competitive advantages over their competitors. In the 1990s, many companies adopted and implemented such concepts as core competency and outsourcing [55], business process reengineering [28], and learning organization [61]. Further, the advances in information and communications technologies, such as the Internet, worldwide web (WWW), web-based electronic data interchange (EDI), extranet, and mobile communication devices, gave birth to new business models including e-commerce, e-business, c(ollaborative)-commerce, m(obile)-commerce, and e-chain [40]. As a result, rules of competition and business paradigms today have shifted from products to customers, transactions to relationships, functions to processes, information to knowledge, enterprise focus to extended enterprise and network focus, and internal quality and cost performance to external speed/responsiveness and flexibility performance [9, 14, 25, 31, 40].

In this new e-economy, the dynamics of competition does not exist simply in “company vs. company” but rather in “supply chain vs. supply chain.” [14] According to the Supply-Chain Operations Reference (SCOR) model version 5.0, a supply chain “spans : all customer interactions (order entry through paid invoice), all physical material transactions (supplier’s supplier to customer’s customer, including equipment, supplies, spare parts, bulk product, software, etc.) and all market interactions (from the understanding of aggregate demand to the fulfillment of each

order.” [63] (for more about its definitions and scope, refer to [8, 13, 14, 29, 40, 42, 43, 46, 48, 50, 51]) Thus, supply chain management (SCM) can be understood as managing the forward and/or reverse flow of materials/goods/services, information, and capital from supplier’s supplier to customer’s customer effectively and efficiently.

Consequently, from a customer-centric, integrated process perspective, a number of leading companies have increasingly transformed not only their internal business processes but also external supply chain processes to achieve an optimal performance across the supply chain and hence further enhance their business performance [4,32]. Unfortunately, however, despite the abundant literature and anecdotal success stories of the SCM and e-business practices of large companies, there have been a few comprehensive empirical studies about e-business and SCM strategy, practices, and performance. Moreover, *little has been known about how and to what extent small- to medium-sized enterprises (SMEs) are implementing SCM and e-business initiatives.* Therefore, this study aims to expand the body of knowledge about SMEs’ SCM and e-business practices through a comprehensive research model, by integrating not only research from strategic management, organization theory, e-business and SCM, SME and operations management, but also practitioners’ perspectives of SCOR model and best practices. Through an empirical study, it explores key characteristics of SMEs in terms of competitive strategy and priority, value chain activity priority, supply chain and e-business integration focus, best practice implementation focus, business performance, and obstacles to SCM and e-business implementation. The rest

of the paper is organized as literature review, research model, research method, research findings and discussion, and concluding remarks.

2. Literature Review

Over the last decade, the field of **supply chain management (SCM) and e-business** has received an enormous amount of attention from practitioners and academicians alike. However, despite the abundant literature of e-business and SCM concepts and anecdotal success stories of e-business and SCM practices of large companies (as evidenced by many recent presentations at Supply-Chain World, Council of Logistics Management (now Council of SCM Professionals), and other practitioners' conferences), there is a lack of empirical studies examining relationships among e-business and SCM strategy, practices, and performance. Among a few, Tan, Kannan and Handfield [66] and Tan [65] investigated a relationship between SCM practices and performance. They showed significantly positive correlation between certain SCM practices and performance. Basnet, Corner, Wisner and Tan [3] conducted an empirical survey of 69 regional and global manufacturing and distribution firms in New Zealand to investigate their uses of 25 SCM activities (practices) and implementation concerns (barriers). Min and Mentzer [48] investigated relationship among supply chain orientation (firms' SCM implementation philosophy), supply chain management (management actions for realizing the SCM philosophy), and business performance. Using a structural equation modeling technique for 302 responses from manufacturing, services and distribution firms, they showed positive re-

lationships between supply chain orientation and SCM and between SCM and business performance.

Furthermore, little has been known about how and to what extent small- to medium-sized enterprises (SMEs) are implementing SCM initiatives and e-business practices. In the area of **SCM in SMEs**, there are a few empirical studies. Dewhurst, Spring and Arkle [17] conducted a case study of four UK-based SMEs (manufacturing, service, and agriculture) and a large company about their response to Y2K compliancy, stockpiling, and SCM views and practices. Quayle [56] studied company priorities, perceived customer priorities and supplier priorities of 288 SMEs (manufacturing, distribution, services, and construction and agriculture) in UK and their SCM practice trends. Lajara and Lillo [41] analyzed 122 Spanish manufacturing SMEs' strategic alliance practices in terms of their management of supplier-auto-maker relationships with American, Japanese and Korean firms, using factor analysis.

In the area of **e-business in SMEs**, there are also only a few empirical studies, except for those about perceived service quality and customer satisfaction (see [16] for summary). Lawson, Alcock, Cooper and Burgess [44] examined barriers to adopting e-commerce technologies through a survey of 170 Australian SMEs (manufacturing firms). Daniel [16] explored the relationship between the level of e-commerce and information system integration and perceived benefits realized from increased integration through a survey of 678 SMEs in UK (manufacturing, services, and public sectors). Hughes, Golden and Powell [34] explored the characteristics of successful implementation of

e-enabled inter-organizational information and communication systems through in-depth interviews of 25 innovative SMEs (manufacturing, services, and distribution firms).

As can be seen from the above literature review in the area of SCM and e-business, there is clearly a lack of *comprehensive* research model and empirical studies from a *strategic* perspective. In the fields of **strategic management and organizational theory**, however, there have been various theoretical models and empirical studies of explaining full or partial relationships among environment, strategy and performance [2, 7, 23, 24, 39, 68, 70]. In both fields, strategic decision-making is at the heart of the process of aligning or matching the organization and its environment. The prevalent theory of explaining the elements in various models has been based on a contingency perspective. In examining the relationship between environment and performance, Bourgeois [6] looked at three attributes of an organization's task environment : complexity or heterogeneity (the number and diversity of external factors facing the organization), dynamism or volatility (the degree of change exhibited in the factors), and uncertainty (managerial perceptions of environmental uncertainty). Sharfman and Dean [62] investigated a relationship between environment and performance, along with a review of research on environmental factors. Further, the classic strategic management (business policy) literature has examined relationships among strategic content, structure and performance from a normative strategy [59] or a contingency perspective [33]. Many studies, including the review by Venkatraman and Ramanujam [71], explored an important issue of performance, in terms of fi-

nancial performance [5, 59], business performance including both financial and non-financial performance [2, 6, 26, 60], and more broadly organizational effectiveness [11, 57]. Further, the relationships among environment, strategy, and performance were investigated by Schendel and Patton [60], Porter [53, 54], and many other industrial economists. Various contingency perspectives, including resource-dependency and population ecology models, are well summarized in Venkatraman and Camillus [69].

Also, there have been quite a few studies focusing on examining partial or full relationships among environment, functional strategies and performance. In the field of **operations management**, Ferdows, Miller, Nakane and Vollman [20] studied competitive priorities, strategic directions, concerns and action plans of 1,500 manufacturers in Western Europe, North America and Japan through Global Manufacturing Futures Survey. Swamidass and Newell [64] and Ward, Duray, Leong and Sum [75] used a path analytic methodology to explore relationships among environment, manufacturing strategy and performance, which explains underlying causal processes by estimating the magnitude of linkages between variables. Cleveland, Schroeder and Anderson [15], Vickery [72] and Vickery, Droge and Markland [73] developed and refined a production competence model which assesses the performance of competitive manufacturing capabilities weighed by their importance, relative to business strategy objectives. Roth and van der Velde [58] proposed a competitive service strategy model that links business strategy, competitive priorities, functional strategy contents, strategy execution and business performance, and empirically studied the linkages using

117 retail banks. Miller and Roth [47] examined relationships among competitive capabilities, business strategy/context, action programs and performance for different manufacturing strategic groups through a cluster analysis of 164 manufacturing firms. Ward and Duray [74] examined the alignment among environment, competitive strategy, manufacturing strategy and performance using 101 U.S. manufacturing firms. They showed a sequential relationship of those dimensions upheld for high performance firms, not for low performers, similarly as in Hambrick [27].

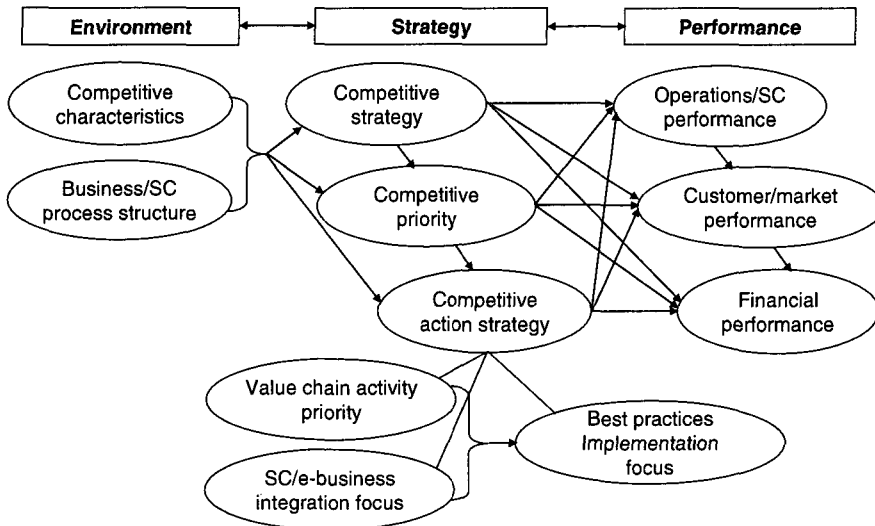
3. Research Model

The literature review reveals that there is a lack of a comprehensive research model from a strategic and holistic perspective in the area of SCM in SMEs. Thus this study proposes an integrated research model of examining the effectiveness of e-business and SCM strategies and practices. The proposed model depicted in Figure 1 is primarily based on the well-known Environment-Strategy-Performance (ESP) construct from a contingency theory in the fields of strategic management and organization theory [7, 39, 62, 70]. The model also integrates research in operations management [30, 47, 74, 75], accounting [37] and practitioners' perspective [52, 63] as well as SCM and e-business in general and in SMEs.

The **environment** (industry and process structure) super-dimension consists of two dimensions : competitive characteristics and business process and supply chain structure. The *competitive industry characteristics* comprise industry hostility (a composite complexity or in-

tensity of five competitive forces such as rivalry among competing firms, bargaining power of suppliers, bargaining power of buyers, potential development of substitute products or services, and potential entry of new competitors), industry uncertainty (perceived difficulties in generating accurate demand forecasts and precisely predicting competitors' actions and future industry trends), and industry dynamism (volatility or speed of changes in product life-cycle, product and process innovations, and customer preferences) [6, 10, 47, 53, 74]. The business and supply chain process structure consists of make-to-stock, assemble-to-order, and make-to-order [12, 63].

The **strategy** (strategy content and conduct) super-dimension consists of three dimensions : competitive strategy, competitive priority, and competitive action strategy. The *competitive strategy* (market positioning strategy and scope) includes market-wide differentiation and low cost and niche-focused differentiation and low cost [53, 54]. The *competitive priority* denotes strategic focus or efforts, time and resources dedicated to quality, delivery, responsiveness/flexibility, cost, and asset utilization [30, 39, 47, 58, 63, 73, 76]. The *competitive action strategy* is further divided into value chain activity priority, supply chain and e-business integration focus, and best practices implementation focus. The *value chain activity priority* refers to strategic focus given to customer relationship management and customer service, product development and lifecycle management, marketing and sales, outbound/inbound logistics and transportation, warehousing, operations/production, purchasing and supplier relationship management [36]. The *supply chain and e-busi-*



<Figure 1> Research model : integrated environment-strategy-performance (ESP) construct

ness integration focus indicates a firm’s emphasis on a progressive maturity level of integration : internal functional integration, internal process integration, supplier or customer integration, entire supply chain integration, and supply chain network or e-marketplace integration [8, 16, 40, 52]. The *SCM best practices implementation focus* refers to a firm’s efforts concentration in implementing best practices of plan, source, make, deliver, and return processes based on the SCOR model version 5.0 [63]. In addition, obstacles and challenges of SCM and e-business implementation are compiled from Kalarchik and Edmond [35].

The **performance** (business performance) super-dimension consists of three dimensions : *operations and supply chain, customer and market, and financial performance* [52, 63, 70]. The operational measures of competitive strategy, competitive priority, and performance are developed in consistency with modified dimensions from a balanced scorecard perspective [37]. Further, the operational measures for all the di-

mensions in the model summarized in Appendix are perceptual measures, as supported by Boyd et al. [10] and Ward et al. [76].

4. Research Method

To provide valuable insights into SCM and e-business strategy and best practices implementation in small- to medium-sized enterprises (SMEs), a preliminary mail survey was conducted in collaboration with an SCM consulting firm in Milwaukee during the fall-winter of 2002. The initial mail questionnaire was developed based primarily on the comprehensive environment-strategy-performance model in <Figure 1>. This preliminary measuring instrument was reviewed and refined through intensive discussions with three practitioners and two academicians specializing in SCM and/or e-business. The resulting survey questionnaire consisted of seven sections : business unit profile, industry competitive characteristics, competitive strategy, competitive priority and capa-

bility, competitive action strategy (supply chain and e-business integration focus, value chain activity priority and capability, SCM and e-business best practice implementation focus), SCM and e-business implementation challenges, and business performance. The refined survey questionnaires were sent out to 500 SMEs with their annual sales revenue of \$500 million or less in the states of Wisconsin and Illinois in the U.S. The sample firms were randomly selected from the consulting firm's corporate database containing general information about manufacturing firms across industries such as chemical products, electric equipments, machinery, metals, printing and transportation equipment manufacturing. One follow-up reminder was sent. Of the responses received, 69 questionnaires were returned as either undeliverable or with letters indicating that they couldn't participate in the survey due to their company policy, and the remaining 26 only were usable. Due to the low response rate, these responses were used as a preliminary study for further refining the questionnaire items. The item and scale details of the final survey questionnaire are summarized in Appendix.

During the fall-winter of 2003, the final survey questionnaires along with a cover letter were sent out to 431 SMEs excluding those returned unusable, following a total design method by Dilman [18]. One follow-up reminder was sent. Of the responses received, 30 questionnaires were still not usable and the remaining 45 were usable, resulting in an effective response rate of 11.2% (i.e., 45/401). Although the sample size was small, it can be regarded as reasonably acceptable, considering the comprehensive nature and complexity of the survey, the

nature of SMEs mostly private-held and unwilling to reveal their confidential information, and the response rates of some recent empirical studies in SCM, 10.4% by Daniel [16] and 11.0% by Basnet et al. [3]. The bulk of the respondents were executives whose job titles included chief executive officer, chief information officer, chief operations officer, president, vice president of materials, manufacturing/operations, or product planning, and general manager.

The 45 business units that responded to the survey represent an entire company, a specific division, or a specific plant within the organization. The responding firms, on average in 2002, had 228 employees, annual sales revenue of \$76.9 million, total assets of \$21.5 million, net profit of \$4.9 million, and SCM and e-business investment spending of \$1.0 million. Most of the responding firms (82%) employed low- to medium-volume, discrete flow processes, whereas only 18% were engaged in high-volume assembly or continuous flow processes. Similarly, over 70% of the firms operated their businesses in either engineering or order-driven make-to-order (55%) or assemble-to-order (17%) business environment, while only 28% were engaged in forecast-driven make-to-stock business setting.

5. Research Findings and Discussion

This section discusses key findings from the survey, i.e., characteristics of SMEs in terms of competitive strategy, competitive priority, competitive value chain activity priority, supply chain and e-business integration focus, SCM and e-business best practices implementation focus, and business performance in the past

three years (2000–02), followed by obstacles to SCM and e-business implementation.

5.1 Competitive Industry Characteristics

Regarding the characteristics of industry competition based on a five-point Likert scale ranging from 1. “very low” to 5. “very high”, the aggregate mean score was rated moderately high (3.59) with fairly high industry hostility (4.11), moderately high dynamism (3.44), and moderate uncertainty (3.24). Thus, the survey respondents commonly perceived that they have been facing serious business challenges resulting from external competitive forces, that customer preferences have been changing somewhat rapidly with increasing rates of product/process innovations and shorter product lifecycles, and that it was moderately difficult to forecast demand accurately and predict precisely competitors’ actions and future industry trends.

5.2 Competitive (positioning) Strategy

In terms of Porter’s (1980) competitive market positioning strategy and scope in the past three years (2000~2002), most of the SMEs (84.5%) focused their efforts on differentiation-based competitive strategy and well over a half served the entire market. However, the SMEs indicated that they would focus more on low cost-based strategy (from 15.5% to 24.4%) and niche market (from 42.2% to 55.5%) in the future.

5.3 Competitive Priority

The competitive priority refers to the strategic focus or extent to which a company has

dedicated its time and resources to each of the five strategic goals : delivery (on-time delivery, fill rate, perfect order fulfillment), responsiveness and flexibility (order fulfillment lead time, supply chain response time, production flexibility), quality (conformance to requirements and specs, defect rate, return rate), cost (supply chain management cost, cost of goods sold, value-added productivity), and asset (cash-to-cash cycle time, inventory turns, asset turns). Given a five-point Likert scale ranging from 1. “very low”, 3. “medium”, to 5. “very high”, the SMEs put fairly high priorities on quality (4.41) and delivery (4.27), high priorities on responsiveness/flexibility (3.96) and cost (3.96), and moderately high priorities on asset management efficiency (3.37). This shows some consistency from the differentiation-based competitive strategy.

5.4 Competitive Value Chain Activity Priority

Given the same measurement scales as before, the SMEs focused their efforts fairly high on improving customer relationship management (CRM) and customer service functions (4.16); high on operations/production (4.02); moderately high on product development and lifecycle management (PLM) (3.38), marketing and sales (3.43), purchasing and supplier relationship management (SRM) (3.30); and moderate on inbound and outbound logistics/transportation (2.93) and warehousing (2.73).

These action priorities do not clearly exhibit consistency from competitive priorities. Further, the pattern is different from that of leading firms today focusing more on speed and flexibility, which require superior supply chain execution

capabilities in the areas of order, transportation and warehouse management, closely related to delivery and responsiveness/flexibility capabilities. Moreover, it should be noted as well that web-based implementation of purchasing and SRM can offer tremendous cost savings opportunities to SMEs [36].

5.5 Supply Chain and e-business Integration Focus

Regarding supply chain and e-business integration efforts in terms of the level of maturity, most of the SMEs have still focused on internal functional integration (34.1%) and internal business process integration (36.4%); some on external customer or supplier integration (18.2%); and a few on entire supply chain integration (6.8%) and nonlinear supply chain network or e-hub (e-marketplace) based integration (4.5%) beyond the linear vertical supply chain integration. However, more than three quarters of them are planning to move toward external supply chain integration, as the same trend was discovered in Kemppainen and Vepsäläinen [38].

5.6 Supply Chain and e-business Best Practices Implementation Focus

The respondents were asked to rate, on the basis of a five-point Likert scale ranging from 1. "very low" to 5. "very high", their past efforts concentration on the well-known SCM and e-business best practices (BPs) suggested by Supply-Chain Council [63]'s SCOR model which is based on five distinct SCM processes : plan, source, make, deliver, and return. On an ag-

gregate scale, the SMEs showed moderate to somewhat low effort concentration on leading SCM firms' BP implementation in make (2.89), source (2.78), plan (2.72), return (2.52), and deliver (2.46) processes. The details are summarized in <Table 1> ~ <Table 5>.

In "plan" best practices, the SMEs put moderate focus on aligning strategic business plans with long-term capacity and resource planning (3.09), distinct and consistent linkages to ensure quick response and accurate communications/actions upon supply chain disruptions and opportunities (2.87), integrating supply and demand processes (from customer data gathering to order receipt through production to supplier request) (2.80), and integrating business and supply chain planning processes where functional input is leveraged to set business rules (2.73); and somewhat low focus on collaborative planning and data sharing among supply chain members (2.44) and using efficient benchmarking process leveraging cross-industry metrics and definitions (2.33). This finding is consistent with the firms' supply chain integration focus and migration from internal functional and process integration toward external supply chain process integration. It is interesting to note that the SMEs consider streamlining information flows as one of the top priorities in their supply chain planning process, similar to the findings in Kemppainen and Vepsäläinen [38]. In addition, the SMEs seem to have substantial difficulties in gathering and analyzing cross-industry benchmarking data for their performance improvement efforts.

Concerning "source" best practices, the SMEs exerted a moderately high level of implementation efforts in evaluating, selecting and

qualifying suppliers that meet their business requirements and competitive needs (3.23) and establishing clear communication of performance expectations and business rules prior to the initiation of business with suppliers (3.05); moderate efforts in data accessibility across the organization for visibility (2.86); and fairly low efforts in using e-sourcing and negotiation systems (2.35) and collecting and analyzing supplier performance data and reporting to suppliers online in real-time (2.34). This discloses the SMEs' lack of capabilities in utilizing electronic communication and information technologies real-time.

In "make" best practices, the SMEs focused only moderately on every BP, i.e., providing real-time production performance feedback (2.98), implementing demand-pull or lean principles including cycle time and work-in-process reduction through demand-pull mechanisms and visual control (2.93), paperless order tracking and visibility of customer orders (2.88), collaborative planning, scheduling and product development (2.83), and establishing on-demand access to available-to-promise, production schedules and inventory status (2.80). This result reveals that this concentration is not consistent with

their competitive value chain activity priority and that the SMEs have not shown significant efforts in building state-of-the-art operations capabilities.

In regard to "deliver" best practices, the SMEs put moderate focus on integrating order, warehouse and transportation management (2.77); moderately low emphasis on rapid and continuous replenishment, vendor managed inventory (VMI), and electronic data interchange (EDI) linkages (2.41), real-time order, package and shipment tracking (2.40); and low focus on Internet ordering, efficient consumer response (ECR) and quick response (QR) logistics programs (2.28), and performing an integrated operations and distribution/transportation network analysis (2.22). This result exhibits a considerable lack of concern in implementing e-technology based best delivery practices.

In terms of "return" best practices, the SMEs concentrated moderate implementation efforts in establishing product specs and quality test procedures (3.05) and low interest in building a web-based return handling capability (1.76). Again, the SMEs seem to be far short of executing e-technology based best return practices.

<Table 1> "Plan" best practices implementation

"Plan" best practices	Mean	SD
Alignment of strategic and business plans with long-term capacity and resource planning	3.09	0.12
Distinct & consistent linkages to ensure quick response & accurate communications/actions upon supply chain disruptions/opportunities	2.87	0.16
Integration of supply/demand processes (from customer data gathering to order receipt through production to supplier request)	2.80	0.17
Integrated business and supply chain planning processes where functional input is leveraged to set business rules	2.73	0.14
Collaborative planning and data sharing among suppliers, manufacturers, service providers and customers	2.44	0.15
Use of efficient benchmarking process leveraging cross-industry metrics and definitions	2.33	0.15

Note) Scale anchor : 1. very low, 3. medium, 5. very high; SD = standard deviation

<Table 2> "Source" best practices implementation

"Source" best practices	Mean	SD
Evaluation, selection and qualification of suppliers matched to business requirements and competitive needs	3.23	0.14
Clear communication of performance expectations and business rules prior to the initiation of business with suppliers	3.05	0.12
Data accessibility across the organization for visibility by business units	2.86	0.16
Use of online RFQ processes, e-sourcing and negotiation systems	2.35	0.19
Collection and analysis of supplier performance data and reporting to suppliers online and real-time	2.34	0.76

Note) Scale anchor : 1. very low, 3. medium, 5. very high; SD = standard deviation

<Table 3> "Make" best practices implementation

"Make" best practices	Mean	SD
Real-time production performance feedback and result posting	2.98	0.15
Demand-pull or lean principles, including cycle time and WIP reduction through demand-pull mechanisms and visual control	2.93	0.18
Paperless order tracking and visibility of customer orders	2.89	0.19
Collaborative planning, scheduling and product development	2.83	0.16
On-demand access to available-to-promise (ATP), production schedules and inventory status by internal operations and customers	2.80	0.15

Note) Scale anchor : 1. very low, 3. medium, 5. very high; SD = standard deviation

<Table 4> "Deliver" best practices implementation

"Deliver" best practices	Mean	SD
Integrated order, warehouse and transportation management	2.77	0.15
Rapid/continuous replenishment, vendor-managed inventory, EDI	2.41	0.15
Real-time order, package & shipment tracking	2.40	0.19
Internet ordering, efficient consumer response, quick response (QR)	2.28	0.16
Operations and distribution/transportation network analysis	2.22	0.17

Note) Scale anchor : 1. very low, 3. medium, 5. very high; SD = standard deviation

<Table 5> "Return" best practices implementation

"Return" best practices	Mean	SD
Implementation of product specs and quality test procedures	3.05	0.19
Web-based return handling capability	1.76	0.16

Note) Scale anchor : 1. very low, 3. medium, 5. very high; SD = standard deviation

Overall, the SMEs have not paid much attention yet to the use of e-technologies, although

they indicated that they would focus more on building those capabilities in the future.

5.7 Business Performance

The SMEs showed high improvement in operations/supply chain performance (0.94) and moderately high improvement in customer/market performance (0.72) and financial performance (0.71), given a five-point Likert scale, ranging from -2. "highly deteriorated", 0. "no change", to +2. "highly improved."

In the case of operations and supply chain performance, the SMEs have demonstrated high improvement in delivery (1.07), quality (0.95), responsiveness/flexibility (0.95), and cost reduction (0.93); and moderately high improvement in asset utilization (0.79). This performance improvement pattern was less consistent with that of their competitive priority. Regarding customer and market performance, the firms showed high improvement in customers' overall competitive value perceptions (1.07); moderately high improvement in new customer gains (0.79), market share (0.65), and customer retention (0.63); but just moderate improvement in product availability or in-stock positions (0.41). This shows further room for improvement in customer relationship management focusing on customer retention. Concerning the financial performance, the firms exhibited only moderately high improvement in return on investment (ROI) (0.76) and cash flows (0.74); and moderate improvement in return on asset (ROA) (0.67) and net profit or return on sales (ROS) (0.60).

5.8 Obstacles to SCM and e-business Strategy and Practices Implementation

As discussed in the previous subsections, the SMEs appeared to have made relatively little progress in integrating business processes

across the supply chain and adopting and utilizing the maximum benefits of e-technology based information networks among chain members. Based on a five-point Likert scale ranging from 1. "very low", 3. "medium", to 5. "very high," fairly significant obstacles encountered by the responding SMEs in implementing SCM initiatives to the full extent were high costs of adopting new technology and systems (3.42), followed by matching technology to business needs (3.30), lack of supply chain and e-business expertise (3.22), and organizational change management (3.21). Next, they considered others moderately significant: identifying and developing best business process logic (3.02), ownership of initiatives (3.02), limited technology and system integration (2.98), cultural barriers (2.98), lack of critical mass of suppliers and customers (2.84), and supply chain/e-business blueprinting (2.76). This finding is similar to that of Lawson, Alcock, Cooper and Burgess [44].

Therefore, in order to overcome these challenges, it is recommended that SMEs should develop a sound business case by analyzing key strategy development elements (i.e., environments, capabilities and resources), along with technology and system investment justification considering building/insourcing, buying/out-sourcing, and renting options. Further it is important to have the right, positive attitude and cultural support [21].

6. Concluding Remarks

This paper proposed a comprehensive research model of analyzing the effectiveness of strategy and practices and presented the find-

ings from the survey of small- to medium-sized enterprises (SMEs) in terms of supply chain and e-business strategy planning and best practice implementation. Along with its contributions, however, some limitations to the current study need to be noted as well. First, since the survey utilized a sample of SMEs in the Midwest region in the U.S., the results should be interpreted with caution, particularly with respect to the generalization of research findings to the SMEs in the U.S. as a whole. Next, the sample size itself is small. To accurately evaluate the current state of SCM and e-business activities implemented by SMEs, a larger sample size is desired. Consequently, due to the limited number of responses collected, the interpretation of the survey results was based on rather simple descriptive statistics than more rigorous statistical analyses. Nonetheless, SMEs can gain some valuable insights from the key findings and inferences below.

First, the SMEs are clearly on the right path toward internal process integration and external supply chain integration. And yet they are lacking in building e-technology capabilities especially due to the needs for high capital investments and technological expertise. Thus, it is important to understand the Internet as means for enhancing supply chain relationships through better information sharing and transactions [67]. And it is critical to develop a sound business case, by carefully analyzing build/in-source, buy/outsource, and rent options [13].

Second, the SMEs' competitive priorities are in the decreasing order of importance, quality, delivery, cost, responsiveness/flexibility, and asset utilization. In today's volatile, velocity-based, customer economy, however, quality

and cost became rather prerequisites to competition, and speed and responsiveness/flexibility have emerged as potent competitive weapons. Consequently, the firms need to build strong competitive capabilities in responsiveness/flexibility and delivery on the top of quality, cost and asset management.

Third, it is essential for SMEs to align competitive strategy, competitive priority, value chain activity priority, supply chain and e-business integration focus, and best practices implementation focus [22, 45], as the SMEs have not quite accomplished as evidenced by the statistics.

Fourth, in implementing supply chain best practices in planning, sourcing, operations, delivery and return processes, SMEs need to focus more on supply chain execution areas as well as supply chain planning. Further, it is more desired to have trust-based supply chain collaboration with key supply chain members, as it is crucial for supply chain process synchronization [1]. Also, it is recommended to focus more on initiatives such as six sigma and lean supply chain management [19] for better demand and supply matching.

Finally, it is critical for SMEs to embrace the whole picture of supply chain management and e-business such as the proposed comprehensive research model, and think big and execute small from an orchestrated process perspective with a right business blueprint [40].

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