

## Introduction to the Special Issue

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### 1. Introduction to this special issue

As we approach the threshold to the next millennium, the competitive environment is getting fiercer than ever, resources are getting tighter, customers are getting more discriminating, and the pressure on businesses to do more with less is getting intense! To add fuel to the fire, recent marketplace trends such as rapidly evolving product and process technology, unbridled globalization of markets, shortening product life cycles, pervasive impact of information technology — particularly Internet based technologies, and the urgency to deliver ever increasing customer value are often creating a seemingly insurmountable challenge for businesses to survive in this battlefield. Now more than ever, firms must continually reassess their competitive operations strategies to maintain their competitiveness in the global marketplace.

Needless to say, the role of a firm's operations strategy is expected to continue to exert strong influence on the competitive performance of the firm. In addition, emerging operations issues dealing with the globalization of operations, global supply chain strategy, management of technology, e-commerce and e-business, integrated product and process development, and mass customization are only a few of the challenging issues that are expected to critically influence the operations competence of a firm.

The focus of this special issue is to explore research in the operations strategy domain that specifically addresses the operations challenges of the next millennium. The intent is to obtain a better understanding of the role of operations strategy in addressing emerging challenges and competitive issues faced by the 21st century firm. Operations is used here to include both manufacturing and services. Before we present a sum-

mary of the papers appearing in this special issue, we want to take the opportunity to point out a few issues that we think are going to have substantial impact on the operations strategy of firms in the short to medium term. It may behoove the operations management community to look at these issues as fodder for future research!

### 2. The resource based view and manufacturing capability<sup>1</sup>

A large body of research in the operations strategy area is based on the premise that operations strategy should be market led. An advocate of this type of thinking is Hill (1989) who argues that market determined order winners should be defined, and manufacturing's role is to support the order winners. Of course, manufacturing management can have a voice in setting the marketing or business strategy, but whatever capabilities or resources are developed by manufacturing, they should be in support of a marketing strategy. For example, if the marketing strategy is to develop a largely undifferentiated product that is sold in high volume at low prices to customers in the eastern US, then manufacturing should define a flow process that is automated, can achieve low cost, and is located with easy access to eastern US markets. At the same time, no prescription is given about how to compete, particularly if another aggressive competitor is also pursuing the same strategy. The best advice in this case is to be sure that manufacturing adopts best practices and stays on the leading edge of

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<sup>1</sup> For more details on the ideas presented in this sections and an empirical study based on these ideas, see Schroeder et al. (2000).

technology which in itself may be inadequate to attain a competitive advantage.

Another body of operations strategy research has called for the development of specific manufacturing led capabilities that can lead to competitive advantage (White, 1996; Wheelwright and Bowen, 1996). Hayes and his colleagues have argued that manufacturing capability should play an important role in achieving competitive performance (Hayes, 1985; Hayes and Clark, 1985; Hayes and Pisano, 1994; Hayes and Upton, 1998; Hayes and Wheelwright, 1984). While they make convincing arguments about the role and nature of manufacturing, their research is not linked to the general strategy literature nor is it typically empirically based.

Ferdows and De Meyer (1990) focus on the role of cumulative capabilities in achieving high performance manufacturing. They argue that quality should be the basis for improving performance followed by dependability, speed and finally cost. They suggest that a particular sequence of capability improvement should be followed. Like the other research in the operations strategy field, they do not prescribe what to do if competitors follow exactly the same strategy.

Other researchers in manufacturing strategy have pointed out that certain practices are likely to lead to high performance. Flynn, Schroeder and colleagues have demonstrated empirically that practices such as JIT, quality management and technology management can lead to high performance if they are used in the right context and supported by a strong human resource and strategic infrastructure (Flynn et al., 1994, 1995; Schroeder et al., 1999).

Finally, there has been a productive line of research on the product-process matrix (Hayes and Wheelwright, 1984) that seeks to show how products and processes should be matched to achieve competitive performance. Some empirical research (Safizadeh et al., 1996) has supported this proposition. But, operating in accordance with prescriptions from the product-process matrix is only a necessary condition to achieve competitive performance, because successful competitors could also choose to operate at the same point on the matrix.

What is lacking from current manufacturing strategy research is a link to the Resource Based View (RBV) literature that provides a means to achieve true sustainable competitive advantage. The RBV litera-

ture assumes that organizations incorporate privately held knowledge that can be used to create idiosyncratic modes of technology at any point in time (Wernerfelt, 1984; Barney, 1991; Conner and Prahalad, 1996). Technologies adopted should be of such a nature that they are not readily imitated or substituted by another technology. As a result, a firm gains a competitive advantage that cannot be easily copied or duplicated by competitors.

One way to create these capabilities is to achieve monopoly control over the resources (Barney, 1986; Schumpeter, 1934). Monopoly power could be achieved by control of resources such as raw materials or patented technology that cannot be easily circumvented. As least for a period of time, the firm then achieves a competitive advantage that cannot be duplicated. The role of such monopoly power in constructing operations strategy has not been explored in the operations strategy literature.

Another way to develop unique resources is to employ the advantage of imperfect information in preventing transfer of capabilities outside of the firm (Teece, 1987; Teece et al., 1997). If a manufacturing plant is able to develop imbedded routines and unique knowledge and skills, competitors may not be able to copy them even if they know what the routines are. This occurs because the culture and conditions leading up to these routines and knowledge are unique to the organization and cannot be easily duplicated or understood.

Another idea is to utilize routine changing routines which emphasizes the role of innovation in developing idiosyncratic capability (Nelson and Winter, 1982; Adler, 1999). Such routines will enable innovative and constantly changing capabilities in manufacturing, so that by the time the competitors are able to copy the current routines (practices, processes and resources), new routines are already being developed and implemented. As a result, the competitors are always one step behind thereby highlighting the role of path dependency (Bates and Flynn, 1995; Pisano, 1994). Little research in manufacturing has focused on the role of routine changing routines as a way of implementing the RBV in manufacturing, nor has the notion of path dependency been studied.

To proceed with research in operations strategy using the RBV requires several steps:

1. Terminology must be carefully defined.

2. Concepts should be clarified and related to specific measurements.
3. Alternative and competing theories should be identified.
4. Appropriate data will need to be collected for empirical research.

The terminology in the manufacturing strategy area and general business strategy literature is confusing and contradictory at times. The terms: resources, capabilities, practices, processes and performance must be carefully defined. Often the confusion in definitions is a result of the unit of analysis. For example a capability at the firm level might be defined as cost, quality, flexibility or dependability. But, at the operations level, these terms would ordinarily be defined as performance measures, and capability would refer to resources and routines that are not easily duplicated, such as internal learning, external learning and proprietary equipment (Schroeder et al., 2000). The term "capability" in the literature has been assigned a variety of meanings and is particularly subject to conflicting interpretations (Cleveland et al., 1989; Kim and Arnold, 1992; Vickery et al., 1993, 1997).

The second problem is that concepts must be clearly defined and stated. For example, how will capability and resources be defined so that they are something not easily imitated by competitors? What kinds of practices, resources and routines are widely available in the factor markets and what kinds of capabilities have some lasting uniqueness or heterogeneity across firms? It is not critical, in fact, that a resource be entirely unique, but rather that it is embedded in the organization and therefore relatively difficult to explain, understand and copy by competitors (Amit and Schoemaker, 1993; Conner, 1991; Dierickx and Cool, 1989). These concepts need to be carefully defined, so that the research is consistent with what has already been written about the RBV.

The third challenge is to develop competing theories (Amundson, 1998). Too many empirical studies in operations strategy have simply presented a theory and then tested it relative to a null hypothesis. But, alternative theories might fit the data just as well as the theory being tested, so little insight is gained. For example, there are at least two competing theories with the RBV that should be tested on the same data set. One is the best practice theory which states that a firm should seek to implement the best practices in the in-

dustry which will lead to competitive performance. Advocates of the RBV argue that it is not sufficient to follow best practice; there must also be some element of difference from the competitors in terms of approach used or path dependency to gain advantage.

Another competing theory, the market-led theory, suggests that when manufacturing is well integrated with the business (market) strategy, superior performance will result. Alternatively, RBV theory would see this as a necessary condition for high market performance, but not sufficient for reasons already stated. A market-led approach by itself provides no advantage that competitors cannot easily imitate or provide substitutes to circumvent the advantage. The results of empirical analysis are only as good as the underlying or competing theories that are postulated.

Finally, the data collected must be of high quality and appropriate to the theory being tested. This has been a particular challenge in the operations strategy area, since good empirical data is not easily obtained. For example, not only should the sample size be sufficient to achieve power in the statistical tests, but the measurement must be reliable and valid and the response rate sufficient to reduce non-respondent bias (Bagozzi and Edwards, 1998; Campbell and Fiske, 1959; Fiske, 1982).

The challenge and opportunity in this area of operations strategy research remains. We need to connect our research using the RBV literature and existing empirical research in the business strategy literature. We need to support theory driven research with appropriate competing theories and we need to pay attention to the difficult areas of measurement and data collection. When this is done we will be making a contribution, not only to the operations strategy literature, but to the general RBV literature, as well.

### **3. Electronic commerce and operations management**

The Internet and electronic commerce has created many dot.com companies, some successful while others less so. When America Online (AOL) and Time Warner merged recently, there was much discussion about the new economy and the old economy. The operations strategy and the way we manage operations will be greatly impacted by the Internet in the

next millennium. According to Ghosh (1998), founder and CEO of Open Market, the Internet provides four types of opportunities for electronic commerce (e-commerce):

1. Companies can connect directly with customers, suppliers, and other related parties;
2. Companies can bypass other players in an industry's value chain;
3. Companies can use the Internet to develop and deliver new products and services to new customers; and
4. Companies can use the Internet to dominate the electronic channel of an entire industry or segment, control access to customers, and set business rules.

There are two types of electronic business (e-business), business to business (B2B) and business to consumer (electronic retailing).

### 3.1. Business to business marketplace

Business to business e-commerce makes sense because a large number of buyers and sellers can be brought together, giving buyers more choices and sellers access to new customers and reducing transaction costs. Forrester Research estimates that the total B2B e-commerce to be US\$ 1.3 trillion by 2003 (Young, 2000). To simplify the B2B landscape, Kaplan and Sawhney (2000) classify B2B hubs into four categories:

1. MRO (maintenance, repair and operating goods) hubs — enable systematic sourcing of operating inputs such as office supplies, spare parts, and services;
2. Yield Managers — markets that enable spot sourcing of operating inputs;
3. Exchanges — markets that enable spot sourcing of manufacturing inputs; and
4. Catalog hub — markets that enable systematic sourcing of manufacturing inputs.

Systematic sourcing involves long term contracts, where buyers and sellers typically develop close relationships. Spot sourcing involves short-term purchasing to satisfy an immediate need at the lowest price.

Daimler-Chrysler, Ford and General Motors (GM) have announced plans to develop a super automotive supply chain trading exchange. Commerce One, Oracle, and SAP AG will be working together to make

this exchange work. The exchanges are expected to provide five important functions (Prouty, 2000):

1. Indirect material procurement
2. Production material procurement
3. Demand planning and management
4. Quality management
5. Design collaboration

The Internet will forever change the way businesses and supply chains operate. The Internet will allow manufacturers to connect with dealers, suppliers, and customers and enable companies to reduce the purchasing requirements process and operational costs. In addition, the transparency of supply and demand information will reduce the need to keep high levels of inventory throughout the supply chain. The original equipment manufacturers (OEMs) estimate savings of up to 50% of the US\$ 250 billion total procurement costs (Prouty, 2000). However, there is considerable debate about whether the OEMs will be winners and the suppliers will be losers. Even the estimated savings are subject to challenge since not all types of products are suitable for end-to-end online procurement. These are interesting research issues.

IBM, Nortel Networks, Toshiba, Motorola, Nokia, and LM Ericsson are planning to link their purchasing in the largest B2B Internet exchange, called e2open.com. The consortium is expected to include Solectron, Philips Electronics, Matsushita, Hitachi, Seagate Technologies, and LG Electronics. The e2open.com is expected to be an electronics bazaar, where member companies can trade components and manage their supply chains online. In addition to the US, companies based in Japan, South Korea, Finland, Sweden, Netherlands will provide the vast coverage to allow competitors to cooperate to reduce cost and increase sales. Experts estimate that automating online purchasing can save companies 10–20% (Young, 2000). This is critical for tech companies because products tend to become cheaper over time.

Further research could answer the following questions: (1) how companies can use the Internet to streamline their business processes? (2) How the Internet helps manufacturers improve their production planning and control? and (3) how the Internet can improve cycle time and operations performance? The adoption map for the super trading exchange indicates that tier 4 suppliers are incorporated into the system (Prouty, 2000). An interesting research question is

why the trade exchange included tier 4 suppliers. Should the exchange be better off with 1, 2, or 3 tiers of suppliers? What is the impact of including tier 5 suppliers?

### 3.2. *Electronic retailing*

The Internet has created a new economy, where doing business online is increasing at an exponential rate. In 1994, there was zero online shopping. By 2001, it is estimated that online shopping revenue could reach US\$ 60 billion (Smith and Washington, 2000). In the new economy customer tastes are changing faster than ever. As such, it is even more critical today that companies can identify and react quickly to new market requirements and trends (Winter, 2000). By 2003, GM customers should be able to place an order for a customized vehicle and receive the order within a few days. This approach, similar to the build-to-order arrangement used by Dell Computer Corp. and Gateway to build computers, would challenge basic industry rules and help GM reduce inventories by half. Currently, auto manufacturers build vehicles based on educated guesses and then deliver them to the dealers. Dealers must invest in millions of dollars of inventory to support the factory. If a particular model is not selling, then GM has to provide incentives or cut prices to improve sales and reduce the stock of cars. The build-to-order strategy is expected to allow auto dealers to carry less inventory and therefore incurring a lower investment cost. G. Richard Wagoner Jr., GM Chief Executive, said that “this model gets you closer to the customer. If we understand exactly what’s happening in the market when it’s happening, we’re better off” (Hyde, 2000). This build-to-order concept is similar to mass customization, a term first coined by Davis (1987). Davis and Meyer (1999) pointed out that “today every offer can be customized”. A build-to-order strategy requires all systems working harmoniously. Franco Gonsalves, managing director of the AnswerThink Consulting Group, said, “The order must come from the customer-facing network to the OEM in a meaningful order management process. Then they must drive that information throughout their processes and assembly plants, and then dynamically link to their suppliers” (Rossman, 2000). If the time to deliver a custom car is 3–15 days, then auto manufacturers have to streamline their supply chain and

assembly plants. We would expect to see a lot more modular parts and off line assembly work to reduce the cycle time. Issues related to production planning, supply chain, modularity, outsourcing, and design for manufacturing (DFM) should be studied to provide a clearer picture of this build-to-order strategy.

Amazon.com, which was founded in 1995, is now recognized as having the world’s largest selection of products including books, music, videos, toys, consumer electronics, and computer software. Amazon is also the world’s largest retailer on the Internet serving more than 13 million customers in 160 countries. While Amazon is rated the number one shopping destination for online shoppers, it has yet to turn a profit. Herein lies the challenge of online retailers to better manage the supply chain and reduce cost.

### 3.3. *New business models and rules for the new economy*

As we can see, the new economy is not bound by traditional business rules and is “even more cutthroat than the old one” (Krantz, 2000, p. 1A). So what exactly are the new rules? Werbach (2000, p. 86) pointed out that in the connected information-intensive economy, syndication would be an ideal way to conduct business. He defined syndication as selling the same good to a variety of customers, who then combine it with other product offerings and redistribute it. Syndication is viewed as a dramatically different way of managing business than what we have seen in the past. It requires business executives to reformulate strategies and reconfigure their organizations, to alter the approach companies relate with customers and link with other entities. Werbach (2000) observes the following differences between the traditional business and syndication models:

1. The linear supply and demand chains in the traditional business model become loose, web-like networks in the syndication model.
2. Corporate capabilities are sources of advantage to protect under the traditional model, while capabilities are products to sell under the syndication model.
3. The role of outsourcing is to gain efficiency under the traditional model, while the role in the syndication world is to assemble virtual corporations.

4. The strategic focus in the traditional model is to control scarce resources. In the syndication model, the focus is to leverage abundance.
5. Corporate roles are fixed in the traditional model, whereas it is continually shifting under syndication.
6. Traditionally, value added is dominated by physical distribution, whereas in the syndication model, value added is dominated by the manipulation of information.

Similarly, Malone and Laubacher (1998) postulate that in the new economy, which they referred to as an e-lance economy, a “business is not controlled through a stable chain of management in a large, permanent company. Rather, it is carried out autonomously by independent contractors connected through personal computers and electronic networks”. Future research could empirically validate these business models and examine how operations are managed under these models.

Davis and Meyer (1999) attribute speed, connectivity and intangibles as blurring the rules and redefining businesses. Today, electronic communication and computation has accelerated the pace of change. Companies are focusing on reducing cycle time and increasing speed of change.

The Internet has resulted in everything (such as products/services, companies, countries, and people) being electronically connected to everything else. While every product/service has both tangible and intangible value, the intangible is growing at a faster rate. (Davis and Meyer, 1999, p. 7) note that “Buyers sell and sellers buy. Neat value chains are messy economic webs. Homes are offices. No longer is there a clear line between structure and process, owning and using, knowing and learning, real and virtual”.

In the new economy, how companies integrate their physical and virtual assets will determine their success. Traditional businesses feel a strong need to protect existing customers and fear severing ties with their existing channels of distribution. One strategy is to keep the Internet business separate from the traditional business. Gulati and Garino (2000) proposed a road map that a company could use to examine the degree of integration that makes sense with respect to four dimensions: brand, management, operations, and equity. From an operations perspective, the company’s decision process involves three

questions:

1. Do our distribution systems translate well to the Internet?
2. Do our information systems provide a solid foundation on which to build?
3. Does either system constitute a significant competitive advantage?

Office Depot is an example, where integration can provide considerable cost savings, a superior and informative web site, and a competitive advantage over “pure-play” competitors (Gulati and Garino, 2000). Maintaining separate units would allow a company to build sophisticated, customized systems and develop state-of-the-art Internet-specific distribution capabilities that could provide unbeatable customer service. Gulati and Garino provided three examples, Office Depot, KB Toys, and Rite Aid, to illustrate their discussion. As such, future large-scale empirical studies should be conducted to determine the effectiveness of the various integration studies and their impact on firm performance.

#### 3.4. *Product-service bundle*

The distinction between products and services is blurring quickly in the new economy. Companies that provide products and services simultaneously will be winners. The connectivity provided by the Internet allows companies to think about product-service bundle. Companies that sell products bundled with services or vice versa will be successful (Davis and Meyer, 1999). For example, Dell not only sells customized computers but offer extended warranty/service as well. This powerful combination has allowed Dell to sell directly to customers, reduce inventory significantly, and avoid handling costs of stocking stores. In addition, Dell is able to respond better to customer needs. Michael Dell said that “the Internet for us is a dream come true. It’s like zero-variable-cost transactions. The only thing better would be mental telepathy” (Davis and Meyer, 1999, p. 28). In the long term, the real value is when products and services are so well blended that they are inseparable.

#### **4. Organizational learning and knowledge management**

Achieving high quality in an organization’s people, processes, products, and services is inexorably linked

to the learning process. An article in the special advertisement section on Competing on Knowledge in *Fortune* (9 September, 1996), argues that “many organizations have expanded or connected their quality improvement efforts to the concept of a learning organization” and goes on to state that “nowadays, what a company knows has become as important as what it does. Success is increasingly linked to an organization’s ability to harness its intellectual capital — the intangible assets of knowledge, skill and intellectual property — to meet the needs of the customer and to grow the business”. Garvin (1993) posits that “A learning organization is an organization skilled at creating, acquiring, and transferring knowledge, and at modifying its behavior to reflect new knowledge and insights”. Davenport (2000) points out that while knowledge management is expensive, ignorance is even more so. Bounds et al. (1994) posit that continuous improvement depends upon learning.

Researchers have attempted to define what constitutes a learning organization, the types of activities in which learning organizations engage, and how one might measure an organization’s level of learning (Argyris and Schon, 1996; Sitkin et al., 1994). For the most part, what has been written about organizational learning and knowledge management has been conceptual in nature supported by case study or anecdotal information. Garvin (1993) points out that there have been a number of attempts to define organizational learning, and while there is some agreement concerning the acquisition of new knowledge and performance improvement, there are clearly some areas of disagreement. First, he notes that some definitions focus on behavioral changes wherein the learning must be enacted in some form such as a new procedure being utilized (e.g. Fiol and Lyles, 1985; Huber, 1991; Nonaka, 1991). In contrast, others argue that new modes of thinking are sufficient evidence of learning (Levitt and March, 1988). There is also disagreement about how the learning takes place (e.g. information processing versus shared insights). Researchers have also attempted to provide further details of what learning organizations look like, and have offered sometimes divergent lists of principles to which such organizations would adhere. For example, Senge (1990) suggested the following eight principles:

1. Personal mastery;
2. Challenging and re-evaluating mental models;

3. Building shared vision;
4. Team learning;
5. Mastering the practices of dialogue and discussion;
6. Building and testing prototypes;
7. Open exchanges that go beyond open participation; and
8. Creating localness (local responsibility and freedom).

In contrast, Garvin (1993) put forth four building blocks of learning:

1. Systematic problem solving;
2. Experimentation;
3. Learning from past experience; and
4. Learning from others.

While the lists can seem quite different, they are often very complementary. Essentially, organizations need to find ways to generate new knowledge through things such as training, benchmarking, and new interaction patterns (e.g. cross-functional teams), utilize ways to question and analyze what the organization has done and is planning to do (e.g. assumptional analysis, failure analysis, and learning laboratories), and continuously put new knowledge into practice by properly applying such things as local autonomy and effective reward systems.

Garvin (1993) also tackles the issue of how to assess an organization’s level of learning. Consistent with his definition of organizational learning, he suggested that there are three issues that can be measured. The first is the cognitive changes that occur. Have individual and groups acquired new information that have altered their attitudes or mental models? These are assessed through tools such as questionnaires and interviews. Next, is the knowledge manifested in actual behaviors or altered behavior patterns? Garvin suggested measuring these with direct observation of behavior. Examples he provided are “mystery shoppers” and outside experts. Finally, to what extent have performance indicators changed? As will be seen below, these three levels of learning provide a useful framework for the proposed project.

More recently, a joint project by Arthur Anderson and The American Productivity & Quality Center (1996) resulted in a “Knowledge Management Assessment Tool”. This tool measures the level of knowledge management through ratings (both the level and importance) of leadership, culture, technology, measurement, and knowledge management processes. Its focus

is on a “macro” view of the organization and how major systems are influencing knowledge management.

There have also been attempts to empirically assess different aspect of learning and knowledge management. Szulanski (1994) did a study of the intra-firm transfer of best practices and was able to identify some typical steps in the process as well as numerous facilitators and barriers. Based upon his results, he provided information on when different transfer-related activities are most important (e.g. the use of an audit team when assessing the recipient’s unmet needs, or having the start-up team remain in place for integrating the transferred practice into the recipient’s other operating systems) and when certain types of problems play key roles (e.g. a lack of motivation in the source of the best practice being most problematic when the decision to proceed with the transfer is taken by the recipient unit).

In spite of the significant work that has taken place on organizational learning, one can be left with a sense of uncertainty about what organizational learning really is in specific, operational terms and what impact it has on organizational performance. Aside from some notable exceptions, much of the literature on organizational learning is not at the operational level. In addition, there are some important issues to which the existing literature on organizational learning has given little attention. One critical question concerns the possible relationships between the activities that organizations undertake in the pursuit of organizational learning.

The implicit assumptions are that all of the things that organizations undertake in the name of learning will have positive effects and that they will work together in a synergistic fashion. In contrast, Ackoff (1993) has pointed out that simply sharing information between internally competitive units can lead to dysfunctional conflict. Further, activities like sharing rallies and work teams appear to function at a different level than a decision support system or an information system used to link employees so that they can share specific, job-related information. There are also activities like environmental scanning and certain strategic alliances that are part of learning that would appear to fit into an even broader or more macro level category. Some researchers (e.g. Marquardt and Reynolds, 1994) have attempted to model these multiple layers of learning.

Many unanswered questions remain concerning the types of learning activities and how they fit with organizational characteristics. Given finite resources, organizations are faced with determining where to best invest in learning-related activities. Even within organizations, there are significant differences among the various functional units. Are there learning based activities that best fit the differing functions and uncertainties/challenges facing these separate, yet related, organizational units? Finally, while current assessment efforts (e.g. “Knowledge Management Assessment Tool”) assume that certain cultures and systems need to be in place, these suppositions have not been empirically demonstrated.

## 5. Papers in this special issue

The contributions to this special issue cover a variety of issues that are relevant for the next millennium, and provide directions for future research in operations strategy. A brief summary of these papers follow.

In “Change Drivers for the New Millennium: Implications for Manufacturing Strategy Research”, St. John, Cannon, and Poudier identifies technological, global and workforce trends that have an impact on the formulation and implementation of manufacturing strategy, specifically manufacturing scope, advantage, integration, and management. They describe several theories from the socio-economic-psychology fields to explain these trends. Based on an extensive literature review, the paper provides four themes that frame interesting manufacturing strategy research: manufacturing scope, manufacturing advantage, dissipating or accumulating knowledge, and manufacturing management.

In “The Rediscovery of Postponement”, van Hoek provides a comprehensive literature review on postponement. Postponement is defined as “an organizational concept whereby some of the activities in the supply chain are not performed until customer orders are received”. This concept can be applied along the entire supply chain from sourcing to final distribution. When the order is received, the final product can be finalized in accordance with customer requirements. The postponement approach improves the efficiency of various operations, avoids uncertainty associated with orders, and allows companies to cope with product

complexity without having to reduce product variety. Based on an extensive literature review, he identifies opportunities and challenges in this area, and proposes specific research activities to meet these challenges.

In their paper “Arcs of Integration: An International Study of Supply Chain Strategies”, Frohlich and Westbrook empirically investigates supplier and customer integration strategies in a global sample of 322 manufacturers. Each of the strategies is characterized by a different “arc of integration”, representing the direction (towards suppliers and/or customers) and degree of integration activity. Their analysis supports consistent evidence that the widest degree or arc of integration with both suppliers and customers had the strongest association with performance improvement. Their study raises the interesting prospect that manufacturing strategy needs to be aligned across the supply chain, not just inside its own organization. They provide implications of their findings on future research and practice in the new millennium.

Tu, Vonderembse, and Ragu-Nathan, in “The Impact of Time-Based Manufacturing Practices on Mass Customization and Value to Customer” proposes a model for investigating the relationships among time-based manufacturing practices, mass customization, and the organization’s ability to create customer value. They first develop an instrument to measure mass customization, and then use it to collect data from 303 manufacturing organizations. The results of their analysis using structural equation modeling indicates that firms with high levels of time-based manufacturing strategies have high levels of mass customization and offer value to the customer; as well as firms having high levels of mass customization also offer high levels of value to the customer. They suggest that mass customization helps to build a loyal customer base, and expand production volumes by manufacturing different products for different market segments using the same equipment and facilities.

In “Integrating Product Mix and Technology Adoption Decisions: A Portfolio Approach for Evaluating Advanced Technologies in the Automotive Industry”, Morgan and Daniels develop a broad decision framework for evaluating new technologies. They explicitly consider the interrelationships between the product line decisions that ultimately dictate the portfolio of products offered by the firm, and the technology decisions that drive both functionality and manufac-

turability of the firm’s product mix. They use representative data and other relevant information from a Tier I automotive systems supplier to populate their technology adoption decision model, and show that more robust consideration of opportunities to adopt advanced technologies are needed, and the analysis must extend beyond cost trade-offs in manufacturing.

In “Service Design and Operations Strategy Formulation in Multicultural Markets”, Pullman, Verma, and Goodale present a conceptual framework and method for determining the extent of service product and process attribute standardization versus customization in multicultural markets. An approach is developed to evaluate the preferences of multicultural segments, the differences between the segments, and determining the appropriate service strategy. Two research propositions are examined: (i) in their evaluation of service designs, cultural segments will prefer service product and process attributes that are in line with their cultural norms, and (ii) cultural segments will share similar preferences for promoted attributes of service concepts that have universal appeal. A detailed case analysis of four food service companies was carried out at one of the busiest US international airport terminal handling only international flights.

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## References

- Ackoff, R., 1993. Beyond total quality management. *Journal for Quality and Participation* 16, 66–78.
- Amit, R., Schoemaker, P., 1993. Strategic assets and organizational rent. *Strategic Management Journal* 14 (1), 34–46.
- Amundson, S.D., 1998. Relationships between theory-driven empirical research in operations management and other disciplines. *Journal of Operations Management* 16 (4), 341–359.
- Argyris, C., Schon, D.A., 1996. *Organizational Learning*. Addison-Wesley, Reading, MA.
- Arthur Anderson and The American Productivity & Quality Center, 1996. *The knowledge management assessment tool*.
- Bagozzi, R.P., Edwards, J.R., 1998. A general approach to construct validation in organizational psychology: application to the measurement of work values. *Organizational Research Methods* 1 (1), 45–87.
- Barney, J.B., 1986. Strategic factor markets: expectations, luck, and business strategy. *Management Science* 32 (10), 1231–1241.
- Barney, J.B., 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17 (1), 99–120.
- Bates, K., Flynn, J., 1995. Innovation history and competitive advantage: a resource-based view analysis of manufacturing technology innovations. *Best Paper Proceedings, Academy of Management Journal*, pp. 235–239.
- Bounds, G., Yorks, L., Adams, M., Ranney, G., 1994. *Beyond Total Quality Management*. McGraw-Hill, New York.
- Campbell, D.T., Fiske, D.W., 1959. Convergent and discriminant validation by the multitrait-multimethod matrix. *Psychological Bulletin* 56 (2), 81–105.

- Cleveland, G., Schroeder, R.G., Anderson, J.C., 1989. A theory of production competence. *Decision Sciences* 20 (4), 655–668.
- Conner, K., 1991. A historical comparison of resource-based theory and five schools of thought within industrial economics: do we have a new theory of the firm? *Journal of Management* 17 (1), 121–154.
- Conner, K., Prahalad, C.K., 1996. A resource-based theory of the firm: knowledge versus opportunism. *Organization Science* 7 (5), 477–501.
- Davenport, T.H., Prusack L., 2000. *Working Knowledge: How Organizations manage what they know*, Harvard Business School Press, Boston, MA.
- Davis, S., 1987. *Future Perfect*. Addison-Wesley, Reading, MA.
- Davis, S., Meyer, C., 1999. *Blur: The Speed of Change in the Connected Economy*. Warner Books, New York.
- Dierickx, I., Cool, K., 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* 35 (12), 1504–1511.
- Ferdows, K., De Meyer, A., 1990. Lasting improvements in manufacturing performance: in search of a new theory. *Journal of Operations Management* 9 (2), 168–184.
- Fiol, M.C., Lyles, M.A., 1985. Organizational learning. *Academy of Management Review* 10, 803–813.
- Fiske, D.W., 1982. Convergent-discriminant validation in measurements and research strategies. In: Brinberg, D., Kidder, L.H. (Eds.), *Forms of Validity in Research*. Jossey-Bass, San Francisco, CA, pp. 77–92.
- Flynn, B.B., Schroeder, R.G., Sakakibara, S., 1994. A framework for quality management research and an associated measurement instrument. *Journal of Operations Management* 11 (4), 339–366.
- Flynn, B.B., Sakakibara, S., Schroeder, R.G., 1995. Relationship between JIT and TQM: practices and performance. *Academy of Management Journal* 38 (5), 1325–1360.
- Garvin, D.A., 1993. Building a learning organization. *Harvard Business Review* 7/8, 78–91.
- Ghosh, Shikhar, 1998. Making business sense of the Internet. *Harvard Business Review*, March-April, 127–135.
- Gulati, R., Garino, J., 2000. Get the right mix of bricks and clicks. *Harvard Business Review* 5/6, 107–114.
- Hayes, R.H., 1985. Strategic planning — forward in reverse? *Harvard Business Review* 63 (6), 67–77.
- Hayes, R.H., Clark, K.B., 1985. Exploring the sources of productivity differences at the factory level. In: Clark, K.B., Hayes, R.H., Lorenz, C. (Eds.), *The Uneasy Alliance: Managing the Productivity-Technology Dilemma*. Harvard Business School Press, Boston, MA.
- Hayes, R.H., Pisano, G.P., 1994. Beyond world-class: the new manufacturing strategy. *Harvard Business Review* 72 (1), 77–84.
- Hayes, R.H., Upton, D.M., 1998. Operations-based strategy. *California Management Review* 40 (4), 8–25.
- Hayes, R.H., Wheelwright, S.C., 1984. *Restoring Our Competitive Edge: Competing Through Manufacturing*. Wiley, New York.
- Hill, T.J., 1989. *Manufacturing Strategy: Text and Cases*. Irwin, Homewood, IL.
- Huber, G.P., 1991. Organizational learning: the contribution processes and the literature. *Organizational Science* 2.
- Hyde, J., 2000. GM hopes to deliver made-to-order cars. *Columbus Dispatch* 6, C2.
- Kaplan, S., Sawhney, M., 2000. E-Hubs: the new B2B marketplaces. *Harvard Business Review* 5/6, 97–103.
- Kim, J.S., Arnold, P., 1992. Manufacturing competence and business performance: a framework and empirical analysis. *International Journal of Operations and Production Management* 13 (10), 4–25.
- Krantz, M., 2000. First year of Net index teaches tough lessons. *USA Today* 6, 1A.
- Levitt, B., March, J.G., 1988. Organizational learning. *Annual Review of Sociology* 14, 319–340.
- Malone, T.W., Laubacher, R.J., 1998. The dawn of the E-Lance economy. *Harvard Business Review* Sept.-Oct., 145–152.
- Marquardt, M., Reynolds, A., 1994. *Global Learning Organizations*. Irwin, New York.
- Nelson, R.R., Winter, S.G., 1982. *An Evolutionary Theory of Economic Change*. Belknap Press of Harvard University Press, Cambridge, MA.
- Nonaka, I., 1991. The knowledge-creating company. *Harvard Business Review* 11/12, 96–104.
- Pisano, G.P., 1994. Knowledge, integration, and the locus of learning: an empirical analysis of process development. *Strategic Management Journal* 15, 85–100.
- Prouty, K., 2000. Making sense of the trading exchange. *A Supplement to Ward's AutoWorld* 36 (6), 7–10.
- Rossman, R., 2000. Putting the customer in the driver's seat. *A Supplement to Ward's AutoWorld* 36 (6), 11–15.
- Safizadeh, M.H., Ritzman, L.P., Sharma, D., Wood, C., 1996. An empirical analysis of the product-process matrix. *Management Science* 42 (11), 1576–1591.
- Schroeder, R.G., Flynn, B., Flynn, E.J., 1999. World class manufacturing: an investigation of Hayes and Wheelwright Foundation. *Journal of Operations Management* 17 (3).
- Schroeder, R.G., Bates, K., Junttila, M., 2000. *A Capability-Based View of Manufacturing Strategy and the Relationship to Manufacturing Performance*. Working Paper, Carlson School of Management, University of Minnesota, MN.
- Schumpeter, J.A., 1934. *The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle*. Harvard University Press, Cambridge, MA.
- Senge, P.M., 1990. *The Fifth Discipline: The Art and Practice of the Learning Organization*. Doubleday, New York.
- Sitkin, S.B., Sutcliffe, K.M., Schroeder, R.G., 1994. Distinguishing control from learning in total quality management: a contingency perspective. *Academy of Management Review* 19, 537–564.
- Smith, D.C., Washington, F.S., 2000. Dot-coms vs. detroit. *Ward's AutoWorld* 36 (7), 42–49.
- Szulanski, G., 1994. Intra-firm transfer of best practices project. Executive Summary. American Productivity & Quality Center, Houston, TX.
- Teece, D.J., 1987. Profiting from technological innovation: implications for integration, collaboration, licensing, and public policy. In: Teece, D. (Ed.), *The Competitive Challenge Strategies for Industrial Innovation and Renewal*. Ballinger, Cambridge, MA, pp. 185–219.

- Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* 18 (7), 509–533.
- Vickery, S.K., Dröge, C.L.M., Markland, R.E., 1993. Production competence and business strategy: do they affect business performance? *Decision Sciences* 24 (2), 435–455.
- Vickery, S.K., Dröge, C.L.M., Markland, R.E., 1997. Dimensions of manufacturing strength in the furniture industry. *Journal of Operations Management* 15 (4), 317–330.
- Werbach, K., 2000. Syndication: the emerging model for business in the Internet era. *Harvard Business Review* 5/6, 84–93.
- Wernerfelt, B., 1984. A resource-based view of the firm. *Strategic Management Journal* 5 (2), 171–180.
- Winter, D., 2000. Virtual turnaround. *Ward's AutoWorld* 36 (6), 51–53.
- Young, S., 2000. Tech giants brew hefty B2B venture. *USA Today* 5, 1B.
- Wheelwright, S.C., Bowen, H.K., 1996. The challenge of manufacturing advantage. *Production and Operations Management* 5 (1), 59–77.
- White, G.P., 1996. A meta-analysis model of manufacturing capabilities. *Journal of Operations Management* 14 (4), 315–331.