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Technical note

Toward a measure of competitive priorities for purchasing

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Abstract

The purpose of this paper is to develop a set of measures of purchasing's competitive priorities. We maintain that purchasing is a strategic contributor to the firm, and that the selection and retention of external suppliers is a fundamental and strategic purchasing task that manifests the function's competitive priorities. Researchers and managers increasingly view the operations and purchasing functions as intimately linked, and as playing important roles in supply chain management. Ultimately, the performance of the operations management system, measured in terms of quality, cost, delivery and flexibility, depends on inputs secured by the purchasing function from the firm's suppliers. However, in a search for substantive relationships, the purchasing literature has largely overlooked methodological issues such as measurement. Using empirical data collected from North American purchasing executives, a confirmatory factor analysis provides evidence that purchasing's competitive priorities may be conceptualized similarly to the competitive priorities in operations, with key differences. The measures satisfy key measurement criteria including unidimensionality, convergent validity, discriminant validity, and reliability. Five competitive priorities form the basis of a multidimensional measure of purchasing's competitive priorities, the individual factors of which will allow for the examination of linkages between purchasing, operations and other parts of the supply chain.

Keywords: Multi-dimensional scaling; Purchasing; Supply chain management

1. Introduction

The operations management (OM) function, while critical to the overall success of the typical manufacturing firm, is merely one element of what is increasingly referred to as the supply chain. The supply chain represents all activities associated with the movement and transformation of raw materials to finished goods, from primary suppliers, to assemblers and through to the end user (Thomas and Griffin, 1996).

Increasingly, managers view the operations and purchasing functions as intimately linked parts of the supply chain, each with the ability to contribute strategically to the firm. Since the typical manufacturing firm spends approximately 60% of each sales dollar on purchased components, materials and services from external suppliers, the manufacturing firm's final products are significantly affected by the performance of external suppliers in terms of cost, quality and so

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on (Burt, 1989). The purchasing function is largely responsible for (1) determining the characteristics of purchased materials, components, and services, (2) selecting suppliers capable of providing the required items at the requisite levels of quality and price, and (3) managing the transaction so that the goods or services are delivered in a timely manner (Burt, 1989).

Watts et al. (1992) noted that "since the core of purchasing's role is to support the production and operations activities with an uninterrupted flow of materials and service, the purchasing and manufacturing strategies must be consistent with each other, and they must be able to support the corporate level competitive strategy" (p. 5). This corporate competitive strategy has traditionally been based on the four basic competitive priorities of cost, quality, dependability and flexibility (Buffa, 1984), with innovation added as a fifth priority more recently (Ward et al., 1990).

The traditional notion of competitive priorities has been used as the primary vehicle for operationalizing the concept of operations strategy and has been the major building block in operations strategy research (Kim and Arnold, 1993; Ward et al., 1998). This research has been built on the theoretical framework promulgated by previous research (e.g. Hayes and Wheelwright, 1984). According to this framework, purchasing strategy research also requires the identification of competitive priorities (Watts et al., 1992). Moreover, the concept of purchasing strategy and its functional priorities must be fully operationalized before the relationships among the various parts of the supply chain, such as operations and purchasing can be empirically examined.

Currently, the purchasing literature lacks an empirically validated measure of purchasing's competitive priorities. Therefore, the objective of this research was to develop a set of measures of purchasing's competitive priorities. Based on the extant literature, we maintain that purchasing is a strategic contributor to the firm, and that the selection and retention of external suppliers is a fundamental and strategic purchasing task that manifests the purchasing function's competitive priorities. Using empirical data collected from North American purchasing executives, a confirmatory factor analysis provides evidence that purchasing's competitive priorities may be conceptualized similarly to the competitive priorities in operations, with key differences.

Subsequent sections of this paper review relevant literature and operationalize the concept of purchasing's competitive priorities. We then describe the test of the measures and their psychometric properties, which incorporates a confirmatory factor analysis approach. Section 8 concludes with implications and recommendations for extensions of this research.

2. Review of literature

This literature review focuses on several areas that we believe are pertinent to operationalizing a measure of purchasing's competitive priorities. First, we briefly examine purchasing's primary responsibilities and its role as a strategic supply chain player. Second, we examine strategy from a process/content perspective and focus on the notion of competitive priorities. Additional literature is reviewed in Section 3, which addresses the development of measures for purchasing's competitive priorities.

2.1. The strategic importance of purchasing

The recognition of the strategic importance of purchasing in many organizations has increased in recent years (Spekman and Hill, 1980; Reck and Long, 1988; Spekman et al., 1994; Dyer, 1996; Carter and Narasimhan, 1996; Narasimhan and Das, 1999). A competitive global business environment has served to magnify this recognition. Moreover, recent efforts by firms to concentrate on their core competencies, and subsequently downsize non-core areas, have resulted in increased levels of outsourced parts and services. Increased outsourcing has increased the need for increased competency in supplier management. These changes have led to increased representation by purchasing at the executive-level in many organizations (Tully, 1995).

Porter's value chain recognized the importance of the purchasing function and supplier management to achieve competitive success (Porter, 1986). As manufacturers strive to increase customer value by providing improved products at a lower cost, they are turning their attention to purchasing for a number of reasons. These reasons include price competitiveness, reliability and cost concerns, the speed of new product introductions and so on (Monczka et al., 1998).

Superior management of supplier relationships is credited with providing Japanese automotive companies a US$ 300–600 per car cost advantage during the 1980s (Taylor, 1994). In addition, JIT operations depend on reliable suppliers that can provide high-quality products on-time, in small batches. Clark (1989) noted that effective management of supplier capabilities by purchasing can lead to increased manufacturing flexibility, a technology-based competitive advantage, reasonable protection from price competition in finished goods and an advantage in lead-time-based competition. Moreover, purchasing's involvement early in the new product development process has provided many companies with an advantage in bringing new designs to market faster with fewer quality defects and lower costs (Dyer, 1996).

All of this research recognizes that in order to optimize a supply chain, the effective management of suppliers plays a key role. The importance of the purchasing function, and the recognition that a company needs to optimize its entire supply chain rather than individual elements within the supply chain, suggest that: (1) purchasing is indeed strategic; and (2) if purchasing, operations and other elements of a supply chain are to work together, then their functional strategies should be aligned in support of the firm's competitive strategy (Watts et al., 1992).

2.2. Strategy content

Strategy can be approached from either a process or a content perspective (Adam and Swamidass, 1989). A process perspective involves the formulation and implementation of strategy, while content specifies what the process is intended to accomplish. A content focus is appropriate for addressing a company's strategic intent (Hamel and Prahalad, 1993). In contrast, a process focus only reveals how the strategy was developed, not how the company is attempting to compete. This paper is focused on the content of purchasing strategy, not the process by which the strategy is developed and implemented.

A company's competitive strategy ideally articulates how it will compete in the marketplace and serves as a driver of the various functional strategies (Andrews, 1984). A functional strategy specifies how a functional area will support a firm's business strategy and how it will complement or support other functional strategies (Hayes and Wheelwright, 1984; Porter, 1996). If the various functions make complementary choices among the competitive priorities, the competitive advantage sought by the company may be more likely to be realized (Hayes and Wheelwright, 1984; Watts et al., 1992). This framework is similar to that presented by Schroeder et al. (1986), who noted that the content of manufacturing strategy is composed of four factors: (1) mission; (2) objectives; (3) policies; and (4) distinctive competence. Their findings suggest that manufacturing's distinctive competencies should be aligned with business strategy (mission) and objectives to maximize the firm's performance.

Previous research supports the idea that operations strategies will be composed of choices along the competitive priorities to support the overall operational mission and business strategy. Therefore, the content of operations strategy can be measured at two levels. The first level is the overall mission of the function. Because this mission supports the overall business strategy, it is necessary that both business strategy and functional strategies at this level of analysis be measured in similar ways (Kotha and Orne, 1989; Kim and Lee, 1993). The second level of analysis addresses the choices among the competitive priorities that are made by management for the operations function. Hayes and Wheelwright (1984), Schroeder et al. (1986), and Miller and Roth (1994) suggested that by measuring a company's emphasis among the competitive dimensions, one can discern the company's operations strategy. This approach has been used by a number of researchers in the operations field (e.g. Cleveland et al., 1989; Roth and Miller, 1990; Wood et al., 1990; Ferdows and De Meyer, 1990; Dean and Snell, 1996), and researchers in disciplines outside of operations (e.g. Hambrick, 1983; Dess and Davis, 1984; Varadarajan, 1985).

This study approaches purchasing strategy from this second level of analysis for two reasons. First, measuring overall functional goals is difficult. Companies often define their overall goals in a unique manner using their own nomenclature. While capturing the peculiarity of a company's strategic nomenclature may be a worthwhile endeavor, it does not negate the need for an externally valid set of measures that can be used across organizations and/or supply chains. The set of competitive priorities that we have developed in this study are well defined, and allow comparisons across

a diverse group of manufacturing firms with various operational and purchasing environments.

The second reason for adopting a competitive priority approach is the precedent set by previous research. Researchers have concluded that an examination of competitive priorities provides a good indication of strategic intent, which provides a basis for determining the actual functional strategy (Schroeder et al., 1986; Watts et al., 1992; Miller and Roth, 1994). We believe that the competitive priorities framework has become an accepted standard because of the relative ease of comparing priorities across firms, and because all for-profit firms compete on some combination of these competitive priorities. In contrast, broad strategy categories such as Porter's (1986) differentiators make it difficult to determine the strategy of a company in an industry where quality is very important, but also an order-qualifier (Hill, 1994).

3. Purchasing's competitive priorities: measure development and justification

The intent of this research was to develop measures of competitive priorities for the purchasing function. We did so by building off the extant literature in purchasing and operations strategy. This approach is justified because, as noted by Watts et al. (1992), "purchasing strategy can be viewed as a pattern of decisions related to acquiring required materials and services to support operations activities that are consistent with the overall corporate competitive strategy" (p. 5). Thus, as shown in Fig. 1, if the different functions within a company are pursuing the same goals, they should be pursuing functional level strategies that have similar priorities. In the following subsections, we review the operations and purchasing literature.

3.1. Operations strategy

Various authors have found links between manufacturing strategy, business strategy and performance (e.g. Vickery et al., 1993; Williams et al., 1995). These conclusions support earlier conceptual research (e.g. Skinner, 1969; Hayes and Wheelwright, 1984) that suggested that operations strategy should be linked to corporate strategy. The literature on manufacturing competitive priorities has a long history dating back to Skinner (1966, 1969), Wheelwright (1978), and Schmenner (1981). Hayes and Wheelwright (1984) introduced the term "competitive priorities" and defined it as strategic preferences, or the dimensions along which a company chooses to compete in the targeted market. They delineated four core competitive priorities: (1) cost; (2) quality; (3) delivery; and (4) flexibility.

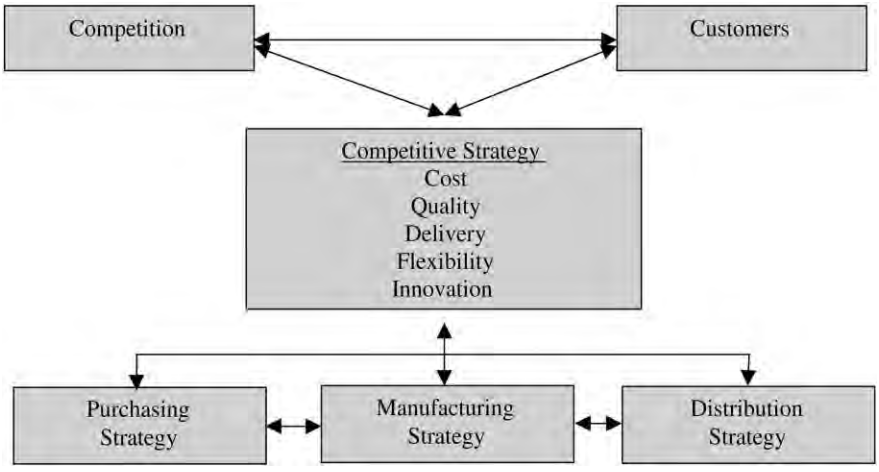

Fig. 1. The relationship between competitive strategy and functional area strategies. Adapted from Watts et al. (1992). Other functions could be represented here as well, e.g. marketing, finance, and so on.

The conclusion from nearly 15 years of empirical research is much the same as Hayes and Wheelwright's original formulation. There is a general consensus in the manufacturing strategy literature that cost, quality, delivery, and flexibility are the four main competitive priorities (e.g. Ritzman et al., 1984; Swamidass and Newell, 1987; Adam and Swamidass, 1989; Cleveland et al., 1989; Ferdows and De Meyer, 1990; Roth and Van Der Velde, 1991; Kim and Lee, 1993; Vickery et al., 1993; Miller and Roth, 1994; Noble, 1995; Ward et al., 1995; Safizadeh et al., 1996; Dean and Snell, 1996; White, 1996). In a comprehensive literature review, Ward et al. (1990) expanded the number of generic capabilities to five: cost delivery performance, quality, flexibility, and innovation. Innovation has become increasingly important for organizations (Ettlie, 1995; Cohen et al., 1996; McGrath et al., 1996). Companies in industries where quality and cost are order-qualifiers, may try to compete through innovation of new products and/or processes in order to differentiate themselves from their low-cost, high-quality competitors.

3.2. Supplier selection and retention as a surrogate for purchasing's competitive priorities

The interdependence between manufacturing and purchasing has long been recognized (Ennis, 1905), yet the potential of that interdependence has only begun to be realized over the past decade (Spekman et al., 1994). If the linkages between corporate competitive strategy and purchasing strategy, and between corporate competitive strategy and operations strategy are consistent, those consistencies should hold between the purchasing and operations strategies (Watts et al., 1992).

Table 1 provides a list of the scale items, we used to assess purchasing's competitive priorities. The list contains many items that are similar to manufacturing's competitive priorities because the

Table 1
Items to assess the degree of strategic importance for purchasing

Item	Survey item[a]
Quality	
Product reliability	The ability of a supplier to provide you with reliable inputs
Product durability	The ability of a supplier to provide your plant with durable products
Conformance to specifications	The ability of suppliers to conform to your specifications
Delivery	
Expediting	The ability, willingness and cost for a supplier to expedite a rush order
New product development time	The amount of time it takes a supplier to develop a new part
JIT	The ability of supplier to provide JIT delivery
Delivery speed	How quickly a supplier can deliver an order
Delivery reliability/dependability	The ability of a supplier to consistently deliver its products on promised due dates
Distance	Supplier location
Flexibility	
Volume flexibility	The ability and willingness and cost for a supplier to change order volumes
Mix flexibility	The ability, willingness and cost for a supplier to change the mix of ordered items
Modification flexibility	The ability of the supplier to design new products or make design changes in existing products
Cost	
Total cost	The total cost associated with the item including price, transportation, inspection and testing, cost of supplier non-conformance, customer returns and other associated costs
Cost information	The ability and willingness of the supplier to share cost data
Competitive pricing	The unit price of an item
Innovation	
Product innovation	The ability of the supplier to design new products or make changes in existing products
Technological capabilities	The level of technological capabilities the supplier possesses and is willing to use for your products
Technology sharing	The willingness of the supplier to share key technological information

[a] Respondents were asked to specify the degree of strategic importance of these items in supplier selection and retention decisions.

competitive priorities of the various functions are set at the corporate level, as shown in Fig. 1 (Watts et al., 1992).

Mintzberg (1978) defined *realized* strategy, as opposed to *intended* strategy, as a discernible "pattern in a stream of decisions" (p. 935). Using "realized" strategy as a logical basis for empirical investigation, researchers should be able to discern a firm's purchasing strategy by observing the stream of decisions made by purchasing personnel in areas that are critical for purchasing. While longitudinal research might be helpful in providing a valid picture of the stream of decisions, key informants should, via a retrospective reporting stance, be able to provide an accurate picture of the stream of decisions (Miller et al., 1997).

In describing purchasing's fundamental duties, purchasing textbooks routinely note that purchasing departments must buy items at the right price, from the right supplier, at the required specification, in the right quantity, for delivery at the right time to the right customer (e.g. Monczka et al., 1998). These goals imply that the selection of suppliers is of primary importance, a premise that is supported in the purchasing literature. In their review of the strategic purchasing literature, Ellram and Carr (1994) concur by concluding that purchasing plays "a key role in corporate strategic success through the selection and development of suppliers that can support the firm's long-term strategy and competitive positioning" (p. 17). Selection of suppliers is one of purchasing's most basic, yet most important tasks (Monczka et al., 1998). Morris and Calantone (1991) found that purchasing organizations that were striving to become more strategic, emphasized entrepreneurial behavior in the organization. Moreover, they found that the more entrepreneurial purchasing organizations ranked the identification, analysis and selection of suppliers directly behind purchasing planning and strategy as critical strategic activities. Because not all suppliers are in need of development (Handfield et al., 2000), we focused on the selection and *retention* of suppliers. Retention was included in our measures for the purpose of incorporating a longitudinal "stream of decisions" perspective to our measures.

The supplier selection literature can be categorized into two distinct topical areas: (1) the promulgation of various supplier selection tools, such as the analytic hierarchy process (Narasimhan, 1983) or performance indexes (Monczka and Trecha, 1988); and (2) research that attempts to determine the relative importance among the supplier selection criteria of quality, delivery, cost, and flexibility (e.g. Dickson, 1966; Wind et al., 1968; DeMeyer et al., 1989; Wilson, 1994; Swift, 1995; Verma and Pullman, 1998; Vonderembse and Tracey, 1999). The second category, which focuses on identifying the relative importance of supplier selection criteria, has typically addressed the various performance criteria using a single scale item, with notable exceptions (e.g. Choi and Hartley, 1996). Similar to Choi and Hartley (1996), we included innovation and attempted to build multiple-item scales that are focused on establishing construct validity. We included the idea of supplier selection *and retention* of suppliers to focus survey respondents on the long-term ramifications of supplier selection.

Supplier retention is fundamentally important because firms often expend significant amounts of expense and personnel time to choose a supplier. By including retention, we also sought to tap the longitudinal dimension of purchasing strategy (Mintzberg, 1978). The supplier selection effort may include site visits by buying firm personnel to perform in-depth supplier assessment (Spekman, 1988). If a selected supplier lives up to the initial expectations of the buying firm, the two parties may invest in transaction-specific investments, such as EDI, and the relationship becomes more intertwined. As the level of transaction-specific investments increases, the cost of switching, or not retaining, suppliers becomes higher for the buying firm. As a result, some buying firms engage in supplier development activities aimed at improving a supplier's performance and/or capabilities (Ellram and Carr, 1994; Krause et al., 2000). This, in turn, raises the cost of not retaining the supplier even further. As noted previously, not all firms engage in supplier development, nor are all suppliers in need of development (Krause, 1998). However, if the purchasing function's strategy is influenced by the company's competitive strategy in the realm of cost, quality, delivery, flexibility and innovation, then this strategy should be evident in the criteria used to select and retain suppliers (Watts et al., 1992).

Thus, the characteristics of the buying firm's inputs ultimately depends on purchasing's ability to select and retain suppliers that will help the buying firm provide its own customers with a high value end

product or service (Watts et al., 1992; Vonderembse and Tracey, 1999). We, therefore, focused on supplier selection and retention as a *manifestation of, and surrogate for*, purchasing's competitive priorities. Purchasing's competitive priorities were operationalized through the five competitive priorities of quality, delivery, flexibility, cost and innovation (Spekman et al., 1994). The competitive priorities are described in subsequent paragraphs.

Quality: The quality factor was measured in terms of suppliers' ability to provide inputs that are reliable, durable and that conform to the buying firm's specifications (e.g. Vyas and Woodside, 1984; Spekman, 1988; Curkovic and Handfield, 1996; Forker et al., 1996). Supplier quality has been established as a primary concern in the supplier selection process for decades (Dickson, 1966; Wilson, 1994; Vonderembse and Tracey, 1999).

Delivery: The delivery factor was measured based on the importance of the following delivery dimensions in the buying firm's supplier selection and retention process: ability and willingness of a supplier to expedite an order, how quickly a supplier can deliver, the amount of time it takes a supplier to develop a new part, the ability of a supplier to provide JIT delivery, the ability of a supplier to meet due dates, and supplier location (e.g. Vyas and Woodside, 1984; Giunipero, 1990; Billesbach et al., 1991; Handfield and Pannesi, 1992; Tunc and Gupta, 1993; Wilson, 1994; Vonderembse and Tracey, 1999).

Cost: The cost factor was measured based on the importance of the following cost/price dimensions in the buying firm's supplier selection and retention process: total cost, the supplier's willingness and ability to share cost data, and unit price (e.g. Smytka and Clemens, 1993; Ellram, 1993; Wilson, 1994).

Flexibility: The flexibility factor was measured based on the importance of the following flexibility dimensions in the buying firm's supplier selection and retention process: the ability and willingness of the supplier to change order volumes, and change the mix of ordered items (e.g. Rajagopal and Bernard, 1993; Narasimhan and Das, 1999).

Innovation: The innovation factor was based on the importance of the innovation dimensions in the buying firm's supplier selection and retention process. These included the level of the supplier's technological capabilities, willingness to share technological information, and ability of the supplier to design new products or make changes in existing products (e.g. Clark, 1989; Ellram, 1990; O'Neal, 1993; Dyer, 1996).

Section 4 of the paper details the research design and actual empirical validation of the proposed measures.

4. Research design

4.1. Data collection

The target sample was 1283 Title 1 members of the national association of purchasing management (NAPM). Title 1 NAPM members are high ranking purchasing executives with titles such as director of purchasing, vice-president of purchasing, vice-president of materials management and purchasing manager. NAPM provided a list of all Title 1 members in manufacturing-based industries, using standard industrial classification codes 20–39.

To achieve as high a response rate as possible, a variation of Dillman's total design method was used (Dillman, 1978). An initial mailing included a cover letter, the survey, and a postage-paid return envelope. After 10 days of the initial mailing, reminder postcards were mailed to non-respondents. Approximately 30 days after the initial mailing, a second mailing of surveys, cover letters, and postage-paid return envelopes were mailed to non-respondents. From the 1283 purchasing executives in the target sample, 276 responses were received. A total of 24 surveys were set aside from the analysis because of incomplete information, thus, the effective response rate was 19.6% (252/1283).

4.2. The sample

The respondent sample comprised of high ranking purchasing executives and included 137 directors of purchasing or materials management (54%), 50 vice-presidents (20%), 22 purchasing managers (9%), and 41 "other" titles (16%).

The respondents were employed by companies in a variety of industries as shown in Table 2. Industries most frequently represented were electrical and electronic equipment, miscellaneous manufacturing, food, transportation equipment, and chemicals. The respondents worked primarily for medium to large

Table 2
Respondents' industries categorized by standard industrial classification

Industry	Frequency
Apparel	2
Chemicals	13
Electrical/electronic equipment	50
Fabricated metal	4
Food	26
Furniture	2
Machinery	15
Miscellaneous manufacturing	48
Other — unclassified	32
Paper and related	12
Petroleum and related	6
Primary metal	6
Textiles	4
Transportation equipment	28
Wood products	4
Total	252

companies. Although many respondents elected not to report sales, companies with gross annual sales greater than US$ 100 million comprised at least 42% of the sample. The distribution of the sample, with respect to sales, is shown in Table 3.

4.3. Non-response bias

Although there is no generally accepted minimum percentage for response rates (Fowler, 1993), non-response bias is always a concern. One method for testing non-response bias is to test for significant differences between the responses of early and late waves of returned surveys (Armstrong and Overton, 1977; Lambert and Harrington, 1990). This method is based on the assumption that the opinions of late responders are somewhat representative of the opinions of non-respondents (Armstrong and Overton, 1977). For the present study, 20 of the survey items used for the analysis were randomly selected, two groups of 50 surveys were chosen from the first and last waves of surveys received, and *t*-tests were performed on the responses of the two groups. The *t*-tests yielded no statistically significant differences among the 20 survey items tested. Although these results do not rule out the possibility of non-response bias, they suggest that non-response may not be a problem to the extent that late responders represent the opinions of non-respondents. Thus, the data analysis proceeded with scale purification and confirmatory factor analysis as described in subsequent sections.

Table 3
Respondents' sales

Sales (dollars)	Frequency
≤1 Million	1
>1–5 Million	4
>5–10 Million	5
>10–50 Million	35
>50–100 Million	28
>100–500 Million	61
>500 Million–1 billion	18
>1 Billion	28
	180[a]

[a] Frequency missing = 72.

5. Assessment of measurement properties

From an operational perspective, the following set of criteria is considered critical for assessing measurement properties of constructs: unidimensionality and convergent validity, discriminant validity, nomological validity, and reliability (Peter, 1981; Venkatraman, 1989). Measures of purchasing's competitive priorities were developed specifically for this study. Measure development was based on procedures recommended by Churchill (1979) and DeVellis (1991). The literature pertaining to operations strategy, purchasing strategy, and related areas was surveyed in detail. Multiple scale items were established to provide insurance against having to drop poor performing items.

The survey instrument was pre-tested with purchasing executives, who were asked to review the questionnaire for readability, ambiguity, and completeness (Dillman, 1978). The questionnaire was also critiqued by several academics who were asked to review survey items for ambiguity and clarity, and evaluate whether individual items appeared to be appropriate measures of their respective constructs (DeVellis, 1991). Several minor changes were made to the survey instrument based on the pre-test results.

The measurement properties of the factor scales were assessed by testing the hypothesized measurement model using confirmatory factor analysis (CFA), that is, the relationship between each questionnaire

item and their respective competitive dimension was tested. With CFA, relationships between the individual items and their underlying factors are specified by the researcher and all factors are allowed to inter-correlate (Hair et al., 1995). A strong a priori basis for the hypothesized five-factor measurement model (quality, delivery, cost, flexibility and innovation) warranted the use of CFA instead of exploratory factor analysis (EFA). EFA is more appropriate for use when researchers do not know what factors underlie a set of measures. In contrast, we developed these measures based on theory and previous research. A CFA constitutes a more rigorous test of factor unidimensionality than coefficient alpha, EFA, and/or item-total correlations (Gerbing and Anderson, 1988; Calantone et al., 1996).

The measure purification process of the multiple-item factors was performed through the use of CFA. Items were eliminated if they had high residuals, insignificant factor loadings, or loaded on factors other than the ones they were intended to measure (DeVellis, 1991). This process resulted in the elimination of several individual items, the eliminated items are identified in Table 4. The fact that some survey items did not perform well in the analysis, while disappointing, is not surprising. This was the first time the measures had been tested with CFA. Dropped items are not unusual when new measures are being developed. Multiple-item scales achieve construct validity only when they have been tested and refined in repeated studies. The results of the analysis are provided Section 6.

6. Results

The measurement model was estimated by maximum likelihood using the SAS program and CALIS procedure. Table 4 shows the factors, their respective scale items, and the items that were dropped during the purification process. As recommended by many researchers, multiple fit criteria are presented to rule out measuring biases inherent in the various measures (Bollen and Long, 1993; Hair et al., 1995). The chi-squared statistic was significant, which was expected given the relatively large sample size (Bagozzi and Yi, 1988; Byrne, 1994; Hair et al., 1995). Other fit indices indicate an acceptable fit of the measurement model to the data, as shown in Table 5. Bentler and Bonett's non-normed index and Bentler's comparative fit indices are both above the desired minimum acceptable 0.90 level (Byrne, 1994; Hair et al., 1995). An additional indication of an acceptable fit of the model to the data is the ratio of chi-square to degrees of freedom, which at 2.02 is below the recommended maximum of 3.0 (Hartwick and Barki, 1994; Hair et al., 1995; Chau, 1997).

Bagozzi and Yi (1988) recommended the use of the adjusted goodness of fit index (AGFI) as a worthwhile indicator of fit, since it is robust to departures from normality and is independent of sample size. Researchers have noted that an AGFI of 0.80 is acceptable (Segars and Grover, 1993; Chau, 1997). Bagozzi and Yi (1988) suggested an AGFI of 0.90 as a very conservative benchmark. The AGFI for the measurement model in the present study was 0.903.

Table 4 also provides non-standardized coefficients, standardized coefficients, standard errors, and *t*-values for each individual item. These numbers provide information about the local fit, that is, how well each individual item related to its respective factor. Each of the coefficients is large and significant at the $P \leq 0.01$ level, which demonstrates that each item is significantly related to its respective factor.

Measures that lack convergent and discriminant validity can cause problems in the interpretation of a study's results. Thus, the procedures to establish convergent and discriminant validity are described in Section 6.1.

6.1. Convergent validity

Convergent validity is concerned with the similarity, or convergence, between individual questionnaire items that are measuring the same construct. For this study, convergent validity was assessed from the measurement model by testing whether each individual item's coefficient was significant, that is, greater than twice its standard error (Anderson and Gerbing, 1988). As can be seen from a cursory look at the figures in Table 4, the coefficients for all items were far greater than twice their standard errors. In addition, all coefficients are high and strongly significant. These results provide satisfactory evidence of convergent validity for these sets of items.

Table 4
Individual items, their respective factors and coefficient alpha for each factor

Factors and their respective scale items[a]	Unstandardized coefficient	Standard error	*t*-Value	Standardized coefficient
Supplier selection and retention decisions made based on, ...				
Quality: $\alpha = 0.727$				
... the ability of a supplier to provide you with reliable inputs	0.993	0.077	12.85*	0.787
... the ability of a supplier to provide your plant with durable products	0.890	0.078	11.34*	0.709
... the ability of suppliers to conform to your specifications	0.735	0.078	9.32*	0.603
Delivery: $\alpha = 0.778$				
... the ability, willingness and cost for a supplier to expedite a rush order	0.994	0.083	11.85*	0.753
... how quickly a supplier can deliver an order	1.006	0.075	13.35*	0.846
... the amount of time it takes a supplier to develop a new part[b]				
... the ability of supplier to provide JIT delivery[b]				
... the ability of a supplier to consistently deliver its products on promised due dates[b]				
... supplier location[b]				
Cost: $\alpha = 0.562$				
... the total cost associated with the item including price, transportation, inspection and testing, cost of supplier non-conformance, customer returns and other associated costs	0.693	0.085	8.12*	0.539
... the ability and willingness of the supplier to share cost data	1.067	0.101	10.53*	0.728
... the unit price of an item[b]				
Flexibility: $\alpha = 0.867$				
... the ability and willingness and cost for a supplier to change order volumes	1.066	0.077	13.73*	0.803
... the ability, willingness and cost for a supplier to change the mix of ordered items	1.246	0.073	16.87*	0.948
Innovation: $\alpha = 0.784$				
... the level of technological capabilities the supplier possesses and is willing to use for your products	1.102	0.073	14.96*	0.836
... the willingness of the supplier to share key technological information	1.164	0.073	15.75*	0.868
... the ability of the supplier to design new products or make changes in existing products	0.757	0.085	8.82*	0.553

[a] All scales 7-point Likert scales, where 1: extremely unimportant, 4: moderately important, 7: extremely important.
[b] These items were dropped during the measure purification process.
* Significant at the $P \leq 0.01$ level.

6.2. Discriminant validity

Discriminant validity refers to the degree to which items are measuring a unique construct, that is, the extent to which an item is measuring only its respective theoretical construct of interest (DeVellis, 1991). Table 6 reports the correlations among the factors and the related *t*-values. In addition, the results of pair-wise comparisons among the five factors are provided. A model in which the correlation was constrained to one is compared with an unconstrained model. The condition of discriminant validity is met if the fit of the unconstrained model is significantly better than the fit of the constrained model. The results indicate strong support for discriminant validity for the four

Table 5
Fit statistics and measures for the measurement model

Fit statistics and measures for the measurement model	Value	Recommended value
Chi-square/degrees of freedom	2.02	≤3.0
Bentler and Bonett's non-normed index	0.943	≥0.90
Adjusted goodness of fit index (AGFI)	0.903	≥0.80
Bentler's comparative fit index	0.962	≥0.90

Table 6
Assessment of discriminant validity and nomological validity[a]

Description	Correlation	*t*-Value	Chi-square statistic		
			Constrained model (d.f.)	Unconstrained model (d.f.)	Difference
Quality with					
Delivery	0.495	7.17	98.40 (5)	9.65 (4)	88.75*
Flexibility	0.419	6.52	131.59 (5)	7.84 (4)	123.75*
Cost	0.756	10.373	39.03 (5)	30.07 (4)	8.96*
Innovation	0.631	11.62	93.38 (9)	18.73 (8)	74.65*
Delivery with					
Flexibility	0.606	10.82	76.49 (2)	1.19 (1)	75.30*
Cost	0.547	6.61	23.42 (2)	0.01 (1)	23.41*
Innovation	0.291	4.02	123.50 (5)	6.43 (4)	117.07*
Flexibility with					
Cost	0.615	8.15	21.53 (2)	0.09 (1)	21.44*
Innovation	0.399	6.21	217.75 (2)	9.95(4)	207.80*
Cost with					
Innovation	0.860	14.18	9.01 (5)	4.48 (4)	4.53

[a] The Bonferroni problem of multiple comparisons is incorporated in the results of the analysis (Flynn et al., 1990).
* Chi-square differences are significant at the 0.005 level (for 1 d.f.).

factors of quality, delivery, flexibility and innovation, and weaker, but still significant support for the cost factor.

6.3. Scale reliability

Scale reliability is the proportion of a scale item's variance that is attributable to the true score of the latent factor (DeVellis, 1991). If scale reliability is high, all the items that measure a single factor will share a high degree of common variance. Cronbach's coefficient alpha, which measures the degree of inter-item correlation in each set of items, ranges from 0.0 to 1.0 and is an indication of the proportion of variance in the scale scores that is attributable to the true score. Table 4 also provides coefficient alphas for each factor *after* the measure purification process (Nunnally and Bernstein, 1994). The coefficient alphas ranged from high of 0.867 for the flexibility factor, to low of 0.562 for the cost factor. Flynn et al. (1990) noted that alpha levels above 0.70 are desirable, but in exploratory studies, 0.60 and above are acceptable. The cost factor alpha is under the 0.60 level, which might be considered marginally acceptable (Hair et al., 1995). We address the implications of the analysis later in the paper, and specifically address the relatively poor fit of the cost factor. Section 7 addresses the implications of the confirmatory factor analysis and related assessment efforts.

7. Discussion

In this study we strove to develop and assess the reliability and validity of competitive priorities from a purchasing strategy perspective. We did so by focusing survey respondents on supplier selection and retention as a surrogate for, and manifestation of, purchasing's competitive priorities. The results provide support for the assumptions in Fig. 1 — that purchasing strategy is evident in the decisions related to the acquisition of materials and services in support of manufacturing's activities (Watts et al., 1992; Ellram and Carr, 1994). The results also provide a preliminary substantiation of the four traditional operational competitive priorities of quality, delivery, cost, flexibility, and the additional innovation factor introduced by Ward et al. (1990), as important competitive priorities for the purchasing function. The effort to establish valid measures of purchasing strategy is an important antecedent to substantive supply chain research that incorporates the

operations and purchasing perspectives. The following paragraphs review our results and provide insights and direction for further refinement of our measures.

The purification process resulted in valid and reliable measures for all five constructs. For three of the five constructs (quality, flexibility and innovation) no items were dropped during the development process. However, the results for the delivery and cost constructs suggest a need for further refinement and the possibility that these priorities, while similar across the operations and purchasing functions, may not be identical.

The fact that several items had to be dropped from the final measure for the delivery factor, suggests that delivery may have to be addressed by more than a single factor. The item that addressed the amount of time it takes the supplier to develop a new part did not load well with the delivery items. In addition, JIT delivery and supplier location may be special case factors that involve only a certain percentage of the general population of firms. The item that addressed consistency of delivery, also did not load with the remaining delivery items, which suggests that consistency may be a stand-alone delivery factor. This result is similar to the results reported by Choi and Hartley, 1996. A post-hoc analysis, which incorporated the dropped delivery variables as a separate, stand-alone factor, did not exhibit adequate discriminant validity. Thus, the variables were dropped from further consideration for this work.

Only the unit price item was dropped during the measure purification process for the cost factor. Unit price has been of secondary importance to purchasing for several decades, typically taking second priority to quality (e.g. see Dickson, 1966; Wilson, 1994). In contrast, the total cost of acquiring an item or service, and its performance during subsequent use has become more important as a supplier selection criterion. The total cost perspective includes service, maintenance, administrative, and failure costs, and may also include the cost of disposal (Hiromoto, 1988). Given the systematic perspective that is included in total cost, it is not surprising that the unit price did not load together with this item. Thus, the results of our analysis suggest that in future research, unit price should be treated as a standalone factor and further reinforces the idea that price and total cost are distinct issues for the purchasing function. In addition, we would note that cost is an issue that pervades most if not all of the other competitive priorities.

This first effort at measuring and developing a set of scales for purchasing's competitive priorities is certainly imperfect. Development of valid and reliable measures will only be accomplished through the use and refinement of these measures in subsequent studies. However, our results demonstrate support for the proposition implied in Fig. 1, that purchasing strategy can be addressed based on the notion of competitive priorities (Watts et al., 1992; Ellram and Carr, 1994). As these measures are further refined, research in both the purchasing and supply chain areas can progress into many new areas with a higher probability of producing results that are rigorous, repeatable and useful for building and confirming theory.

For example, one could use these measures to confirm existing theory on functional strategies. Specifically, there have been some attempts to link operations strategy to business strategy and performance (Vickery et al., 1993). Intuition suggests that the same relationships should hold for the purchasing function. To further research in this area, this intuition needs to be tested. Confirmation of this theory is a step that could not occur without valid and reliable measures of purchasing strategy.

Beyond confirming theory, these measures may also be useful for building theory, especially in the area of supply chain strategy. The work of Hayes and Wheelwright (1984) suggests that functional strategies need to be internally aligned with each other and the business strategy. However, the literature gives little explicit guidance in terms of defining internal alignment. Valid and reliable measures of purchasing and operations strategy can facilitate the testing of various models of internal alignment for these two core supply chain functions. These models could then be used to form the basis of models of an internal supply chain strategy (e.g. among purchasing, operations, logistics, and so on) that could over time be expanded to the external supply chain strategy (e.g. between suppliers and their customer firms).

7.1. Improving the measures in future research

Measure development is an ongoing process. While our results suggest that the competitive priorities for purchasing can be addressed using the same methods

and somewhat similar items as those used for addressing the competitive priorities for operations, we also suggest that these measures should be improved upon in future research.

The results for the cost and delivery constructs clearly indicate a need for further refinement. While some authors have suggested that flexibility (e.g. Gerwin, 1993) has multiple dimensions in an operational context, our results suggest that cost and delivery may have multiple dimensions in a purchasing context. Our results suggest that while the measures we have presented have good psychometric properties, they may not be as refined as they need to be in terms of content validity. Thus, future research should evaluate our measures for content validity, examine the items that were dropped during our analysis, and reformulate and add new items as necessary to ensure that all of the informational dimensions of each construct have been addressed.

Specific areas that were disregarded in this research include the use of information technology and relationship factors such as trust (e.g. Choi and Hartley, 1996). We view these and other similar factors, such as purchasing power, as enablers that help the purchasing function fulfil the firm's competitive priorities instead of competitive priorities themselves. We explicitly asked respondents to view our questionnaire items in terms of their strategic importance for the purchasing function, thus, using supplier selection and retention as surrogates for purchasing strategy. As noted previously, we took this stance in an effort to capture Mintzberg's (1978) "realized" strategy.

8. Limitations and conclusion

This research represents a preliminary examination of purchasing's competitive dimensions. Overall, the evidence suggests that the sets of items are reliable and valid measures of their respective factors. However, the measures are not perfect and Section 7 provided suggestions for further refinement in future measure development efforts.

This research has limitations related to the sample. The sample was drawn from the membership list of the NAPM. Thus, the results of the research are generalizable to the population of firms only to the extent that the NAPM membership database resembles the population of buying firms. Moreover, our sample was limited to manufacturing firms. While we feel this approach increases the validity of the measures, it also necessitates the development of competitive priority measures that are focused on a service environment.

As with any research, researchers who adapt existing measures for their research should seek to refine those measures. Most of our survey items, we used the wording "ability of the supplier" to accomplish some task. In a few of our survey items, we used the words "ability, willingness and cost" of the supplier to accomplish some task. We did this because, for certain tasks, suppliers might be able, but not willing. In retrospect, the latter wording could be problematic from a semantical standpoint. Although no concerns were raised in our pre-test of the survey with either our academic or industry participants, we would hope that subsequent research efforts would include a critique of these items for validity and parsimony.

An additional area that future measure development could address is our operationalization of the purchasing strategy construct. Supplier selection and retention envelops major tasks accomplished by the purchasing function. To select suppliers, companies should determine what competencies they are buying, the criteria used to buy them, and the costs they are willing to incur. Retention suggests an ongoing process of evaluating suppliers to determine if the selected supplier is performing so as to further the goals of the buying organization over time. However, there are other areas of importance to the purchasing function that may need to be included in the measures to improve their validity. Subsequent research efforts should also re-examine whether "supplier selection and retention" fully tap the dimensions of purchasing's competitive priorities.

The validation of scales is an inexact, ongoing process and validity is established only over a series of studies that further refine and test the measures across different populations and settings (DeVellis, 1991; Hensley, 1999). Future research involving the constructs in this research should include a careful re-evaluation of the measures. In addition, future research endeavors could increase validity by gathering data from multiple respondents within each firm.

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