Alignment between business environment characteristics, competitive priorities, supply chain structures, and firm business performance

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Abstract:

Purpose
– This paper aims to analyze the relationships between four constructs – business environment characteristics, competitive priorities, supply chain structures, and firm business performance.

Design/methodology/approach
– By establishing a conceptual model and conducting structural equation modeling analysis using collected industrial survey data, the study provides a systemic understanding of the relationships between the individual business environment characteristics, the individual competitive priorities and supply chain structures, and the impact of alignment between these elements on firm business performance.

Findings
– Results of the study reveal that the differences in both strategic and supply chain responses to business environment between high- and low-performing firms in the US textile manufacturing industry are striking. The findings provide evidence to corroborate the impact of the alignment between business environment characteristics, competitive priorities, and supply chain structures on firm business performance.

Originality/value
– A conceptual model linking business environment characteristics, competitive priorities, supply chain structures, and firm business performance is first proposed and empirically investigated. The appropriate strategic responses and supply chain structures designed to the

specific business environment characteristics are quantitatively identified. The nature of these relationships and the effect of alignment are revealed.

Keywords: Strategic alignment | Competitive strategy | Supply chain management | Performance management

Article:

Introduction

Since the 1980s, accelerated advances in production, communication, information, and transportation technologies, combined with established free-market ideology, have made business environment progressively more turbulent, through more rapid and unpredictable change, greater diversity, increased complexity, and intensified competitive pressures. Today, firms are confronting unprecedented radical changes to which they must adapt to survive and prosper (Dicken, 2007). Given the increasing challenges in the competitive environment, it is evident that successful firms not only have to perform better than their competitors, but they also have to constantly adapt to changing conditions (Handfield and Nichols, 1999). These changes have been widely felt across many sectors of industry and commerce. There is a broadly accepted view that the success or failure of a firm is ultimately determined by the competitiveness of its supply chain structure (SCS) (Chopra and Meindl, 2007; Fisher, 1997).

In recent years, there is an increasing effort devoted to the study of alignment (a.k.a. congruency, consensus, or fit) between SCS and other key factors using conceptual or empirical methods. The literature embraces that an important corollary of achieving alignment is presumed to be enhanced business performance of a firm, just as misalignment is expected to undermine its performance (Chopra and Meindl, 2007). Among the published research on alignment issues, business environment characteristics (BEC) and firm competitive priorities are two most-considered factors (e.g. Fine, 1998; Randall *et al.*, 2003; Ward *et al.*, 1996). The theoretical support for a model linking BEC, competitive priorities, SCS, and firm business performance has been well established. However, the formal development of a conceptual model and simultaneous empirical investigation of relationships between all these aspects has been lacking in the literature. This study aims to fill this gap.

Based on a structured survey instrument, four constructs – BEC, competitive priorities, SCS, and firm business performance were quantitatively measured by managerial perceptions in the US textile manufacturing firms. The statistical analyses using structural equation modeling (SEM) were conducted to examine the proposed conceptual model and test the relationships (Hypotheses) between these constructs. Overall, this study provides recent evidence of the links between these four constructs from a sample of US textile manufacturers and identifies the nature of these relationships and the effect of alignment.

The remainder of this article is organized as follows. The next section reviews the related literature to provide theoretical foundation for this study, and proposes the hypotheses to be tested and a conceptual model. Then, in the methodology section, the survey subjects, data sets, assessment criteria, and analytical methods used to test the hypotheses are described in detail.

Thereafter, the testing results are presented and discussed. The following section presents the conclusions from the findings and the implications for both academia researchers and industrial practitioners. Finally, we address the limitations of this study and offer extensions for future research.

Literature review, hypotheses, and conceptual model

Business environment characteristics

The business environment has long been identified as an important contingency in conceptual and empirical studies of both competitive strategy and supply chain management (Ward and Duray, 2000). Ward *et al.* (1995) suggested that consideration of environmental factors should be built into virtually all research designs in strategic and operations management. In general terms, the business environment consists of the myriad of forces that are beyond the control of management in the short run, and thus pose threats as well as opportunities to firms.

The literature identifies four dimensions that collectively shape the business environment: their degree of dynamism, complexity, diversity, and munificence (Dess and Beard, 1984; Harris, 2004; Mintzberg, 1979; Ward *et al.*, 1995). These are held to be the most critical dimensions of the business environment with respect to strategic decision-making (Lawless and Finch, 1989). Dynamism refers to the speed and predictability of change in the environment, stemming from sources such as technological change, demand shifts, and competitive moves. Complexity refers to the extent that organizations are required to have a great deal of sophisticated knowledge about products, customers, or any others. Diversity refers to the degree to which an organization is faced with homogenous or diffuse conditions. Munificence is the degree to which an environment supports the growth of organizations within it, which relates to the level of competitive pressures in the environment as exemplified by the intensity of competition and the bargaining leverage applied on companies by buyers and suppliers. (Harris, 2004; Mintzberg, 1979) Munificence is often measured in a reverse scale as environmental hostility (Ward *et al.*, 1995). The measurement variables and corresponding scales for BEC are developed based on previous work and summarized in Table I.

Competitive priorities

Over the last two decades, the acceptance and use of strategic approaches to manage manufacturing organizations has enjoyed a constant growth. The term "competitive priorities" has been widely used to describe firms' choice of their competitive capabilities (Hayes and Wheelwright, 1984). There is a broad agreement that competitive priorities can be generally expressed in terms of low cost, quality, delivery performance (speed and reliability), and flexibility (Sarmiento *et al.*, 2008). These items are closely related to the idea of generic strategies from the business strategy literature (Porter, 1980).

With regard to low cost, although today's firms are increasingly concerned with cost, most do not compete solely on this basis. Companies that emphasize cost as a competitive priority focus on lowering production costs, improving productivity, maximizing capacity utilization, and reducing inventories (Ward *et al.*, 1995). Design, production, distribution, marketing, and service functions have often been used to measure the quality possessing a firm. Delivery reliability is the ability to deliver according to a promised schedule. For some types of customers, delivery speed is also imperative to win the order. Although these two dimensions are separable to some extent, long run success requires that promises of speedy delivery be kept with a high degree of reliability (Ward and Duray, 2000). Flexibility in manufacturing firms has traditionally been achieved at a high cost by using general purpose machinery instead of more efficient special purpose-built machinery and by deploying more highly skilled workers than would otherwise be needed (Ward *et al.*, 1998). In recent years, the implementation of advanced manufacturing technologies has effectively reduced the cost of achieving flexibility.

The measurement variables selected were originally developed for use in the Boston University Manufacturing Futures Survey (Miller and Vollmann, 1984). These measures have been successfully employed in the following studies (e.g. Vickery *et al.*, 1994;Ward *et al.*, 1996) and have exhibited good reliability. The measurement variables and corresponding scales for competitive priories are summarized in Table II.

The literature reveals that competitive priorities have close and strong relationships with the business environment. Traditional contingency literature suggests that the business environment influences firms' decisions on competitive strategy (Burns and Stalker, 1961; Hambrick, 1983). Ward *et al.* (1998) indicated that the notion of competitive priorities has long served as a foundation for strategy research. Therefore, in order to statistically identify how BEC affects firm competitive priorities the first hypothesis is advanced to test the relationship between BEC and firm competitive priorities.

H1. There is a significant causal relationship between BEC and firm competitive priorities.

Table I. Measurement variables and corresponding scales for BEC

	Very low	Low	Moderate	High	Very high
Diversity					
The number of major end-use markets	1	2	3	4	5
The number of foreign markets	1	2	3	4	5
The number of operations processes embraced within the company	1	2	3	4	5
Complexity					
The complexity of knowledge required to meet customer needs	1	2	3	4	5
The degree of segmentation within major end-use markets	1	2	3	4	5
The complexity of effectively managing the supply chain	1	2	3	4	5
Hostility					
Importance of producing to the customers' quality requirement	1	2	3	4	5
Importance of unreliable supplier quality	1	2	3	4	5
Importance of rising business costs	1	2	3	4	5
Importance of shortage of labor	1	2	3	4	5
Intensity of competition in market	1	2	3	4	5
Profit margins	1	2	3	4	5
Dynamism					
Rate at which products and services become outdated	1	2	3	4	5
Rate of innovation of new operations processes	1	2	3	4	5
Rate of change in customer needs in your industry	1	2	3	4	5
Rate of emergence of new challenges from competitors	1	2	3	4	5
Rate of information diffusion	1	2	3	4	5

Sources: Dess and Beard (1984); Mintzberg (1979); Randall *et al.* (2003); Ward *et al.* (1995, 1998)

Supply chain structures

A supply chain will exist whether a firm actively manages it or not (Mentzer *et al.*, 2001). In general, the SCS of a firm influences the nature of supply chain activities, the efficiency and effectiveness of the supply chain, and relationships with other members within the entire supply chain. Based on the review of literature, research in SCS issues has been largely independent of research in organizational structure and design. Previous research primarily focused on the management improvement, such as logistics and inventory cost minimization (e.g. Stock *et al.*, 2000). There is little published research on the design of organizational arrangements in SCS, although Porter (1985) has indicated the importance of appropriate organizational structure for the value chain and for the firm's overall competitive position.

	No emphasis	Little emphasis	Moderate emphasis	Strong emphasis	Extreme emphasis
Low cost					
Achieve/maintain lowest production cost	1	2	3	4	5
Increase labor productivity	1	2	3	4	5
Increase capacity utilization	1	2	3	4	5
Achieve/maintain lowest inventory	1	2	3	4	5
Quality					
Provide high performance design	1	2	3	4	5
Offer consistent and reliable quality	1	2	3	4	5
Conformance with product design specification	1	2	3	4	5
Delivery performance					
Provide fast delivery	1	2	3	4	5
Delivery on time	1	2	3	4	5
Reduce production lead time	1	2	3	4	5
Flexibility					
Make rapid design changes	1	2	3	4	5
Make rapid volume changes	1	2	3	4	5
Adjust capacity quickly	1	2	3	4	5
Offer a large number of product features	1	2	3	4	5
Offer a broad product variety	1	2	3	4	5
Adjust product mix quickly	1	2	3	4	5

Sources: Miller and Vollmann (1984); Vickery *et al.* (1994); Ward *et al.* (1996)

Table II. Measurement variables and scales for competitive priorities

This study defines and justifies three types of SCS: lean, agile, and hybrid, and identifies the organizational components associated with each individual structure. Organizational theory suggests that firms organized to deal with a mature and stable business environment will not be as effective in a complex, rapidly changing, and unpredictable environment (Gordon and Narayanan, 1984). This classification characterizes the overall state of SCS and is also consistent with the mainstream studies on supply chain typology and characteristics (e.g. Fisher, 1997; Huang *et al.*, 2002; Naylor *et al.*, 1999).

A lean SCS is organized to maximize operational efficiency and minimize overall cost. An agile SCS is organized to achieve flexibility and speed in responding to dynamic market conditions and customer needs. A firm need not choose to be exclusively lean or exclusively agile in its SCS. A hybrid SCS combines features of the previous two. Typically, lean organizational arrangements in a supply chain are used for higher volume product lines that have stable demand and standardized technologies, while agile arrangements are used for the lower volume product lines subject to more uncertain demand and innovative technologies (Fine, 1998; Fisher, 1997; Naylor *et al.*, 1999). The measurement variables and corresponding scales for SCS in this study were developed based on previous studies of supply chain characteristics and organizational structure and design, which are summarized in Table III.

Compared with the recent intense discussion of the factors that determine what kind of SCS a firm should implement, Skinner (1974)had conceptualized the need for “strategic consensus” or “alignment” of competitive priorities throughout an organization. Fine (1998) advocated that the concurrent selection of the SCS and competitive priorities should be based on specific business environment conditions. He addressed that when business environment changed firm SCS and competitive priorities have to be adjusted accordingly. Randall *et al.* (2003) empirically proved that the fit between business environment and firms' supply chain selection affects overall performance. Chopra and Meindl (2007) used the term “strategic fit”, which they say exists only when both competitive priorities and supply chain have the same goal. Doz and Kosonen (2008) indicated that in order to maintain continued growth firms need to make efficient and effective adjustment on organizational strategies and structure to changing business condition. This study proposes that certain SCS are more appropriate, given the particular characteristics of the business environment, and that the SCS implemented should be aligned with competitive priorities on which the firm is focused. In order to statistically determine how BEC and firm competitive priorities affect firm SCS respectively, *H2* and *H3* are proposed to test the relationships between BEC and firm competitive priorities, respectively, with SCS.

Assessments of supply chain characteristics								
Marketplace demand	Predictable	1	2	→	3	4	5	Unpredictable
Quality of information sharing in the supply chain	Low	1	2	→	3	4	5	High
Usage of information technology (e.g. SAP, ERP)	Low	1	2	→	3	4	5	High
Collaboration with customers	Loose	1	2	→	3	4	5	Tight
Collaboration with suppliers	Loose	1	2	→	3	4	5	Tight
Classification of company's approach to supply chain management								
Demand supply chain management roles	Specialists with narrow skill sets	1	2	→	3	4	5	Generalists with broad, multi-skill sets
Locus of supply chain decision making	Functional departments	1	2	→	3	4	5	Multi-disciplinary teams
Management spans of control	Narrow	1	2	→	3	4	5	Wide
Decision-making structure	Hierarchical top-down	1	2	→	3	4	5	Decentralized bottom-up
Coordination methods	Formal rules and procedures	1	2	→	3	4	5	Informal, *ad hoc* arrangements

Sources: Cherrington *et al.* (2001); Fisher (1997); Mintzberg (1979); Randall *et al.* (2003)

Table III. Measurement variables and scales for SCS

H2. There is a significant causal relationship between BEC and SCS.

H3. There is a significant causal relationship between firm competitive priorities and SCS.

Business performance

Typically, firm business performance is measured using financial metrics. Venkatraman (1990) advocated measures of business performance by return on assets (ROA), operating income, cost per sales, and sales per number of employees. Jahera and Lloyd (1992) proposed that return on investment (ROI) is a valid performance measure for midsize firms. Morash *et al.* (1996) measured firm performance relative to competitors using ROA, ROI, return on sales (ROS), ROI growth, ROS growth, and sales growth. Tan *et al.* (1999) linked certain SCM practices with firm performance. Performance in their study was measured by senior management's perceptions of a firm's performance in comparison to that of a major competitor's.

In summary, various key measures of business performance have been used in the literature to assess the impact of business environment, strategic decisions, and supply chain practices on firm performance. Based on prior research, in this study, business performance is measured using the respondent's perception of performance in relation to competitors. The measurement variables are comprised of market share, sales growth, profit margin, ROI and ROA, which are summarized in Table IV.

It has been broadly embraced that an important effect of achieving alignment is presumed to enhance the business performance of a firm, just as misalignment is expected to undermine its performance (e.g. Tarigan, 2005). Therefore, in order to statistically determine how the alignment affects firm business performance, *H4* is proposed to test the effect of alignment between BEC, competitive priorities, and SCS on firm business performance.

H4. The alignment between BEC, competitive priorities, and SCS has a significant effect on firm business performance.

Conceptual model

Based on the review of literature, it is proposed that there is an underlying theme or alignment between BEC, competitive priorities, and SCS, and this alignment influences firm business performance. This study focuses on a single time period in which competitive priorities can be viewed as an antecedent of SCS and BEC are the antecedent to both. The superior business performance is derived from the achievement of the alignment between these constructs.

	Significantly lower	Lower	Approximately equal	Higher	Significantly higher
Market share	1	2	3	4	5
Sales growth	1	2	3	4	5
Profit margin	1	2	3	4	5
Return on assets (ROA)	1	2	3	4	5
Return on investment (ROI)	1	2	3	4	5

Source: Jahera and Lloyd (1992); Morash *et al.* (1996); Tan *et al.* (1999); Venkatraman (1990)

Table IV. Measurement variables and scales for firm business performance

A conceptual model is presented for illustrative purposes in Figure 1. It represents the proposed relationships (hypotheses) between latent constructs: BEC, competitive priorities and SCS of a firm and, ultimately, the firm business performance. BEC are captured by four first-order latent constructs: diversity, complexity, dynamism, and hostility. Firm competitive priorities are also represented by four first-order latent constructs: low cost, quality, delivery performance, and flexibility. Each of these eight first-order latent constructs is measured by multiple measurement variables. SCS is a first-order latent construct measured by ten measurement variables. Firm business performance is also a first-order latent construct measured by five measurement variables. These ten first-order latent constructs compose the conceptual model.

In purpose to reveal the effect of alignment between BEC, competitive priorities, and SCS on firm business performance, the survey respondents were divided into two equal sub-samples in terms of business performance: high performing firms and low performing firms. Hambrick (1983) suggested that dividing the sample into separate high and low performance sub-samples in this manner is a practical analytical technique for strategy research. In this study, the statistical analysis was conducted respectively for high and low performance sub-samples.

Methodology

Subjects

The US textile manufacturing firms were the subjects of empirical investigation. Therefore, the unit of analysis was conducted at the organizational level. A sample of 995 firms was randomly chosen from more than 2,000 member firms in the Industrial Fabrics Association International (IFAI). IFAI represents a majority group of US textile manufacturing firms. The Industrial Fabrics Foundation (IFF), which is an independent organization founded by the IFAI, provided financial support and survey cooperation in this study. The subjects targeted all occupied high-ranking managerial positions with an overview of the firm's business operations, strategy and, in particular, supply chain issues to ensure they possessed knowledge of the issues the survey addressed.

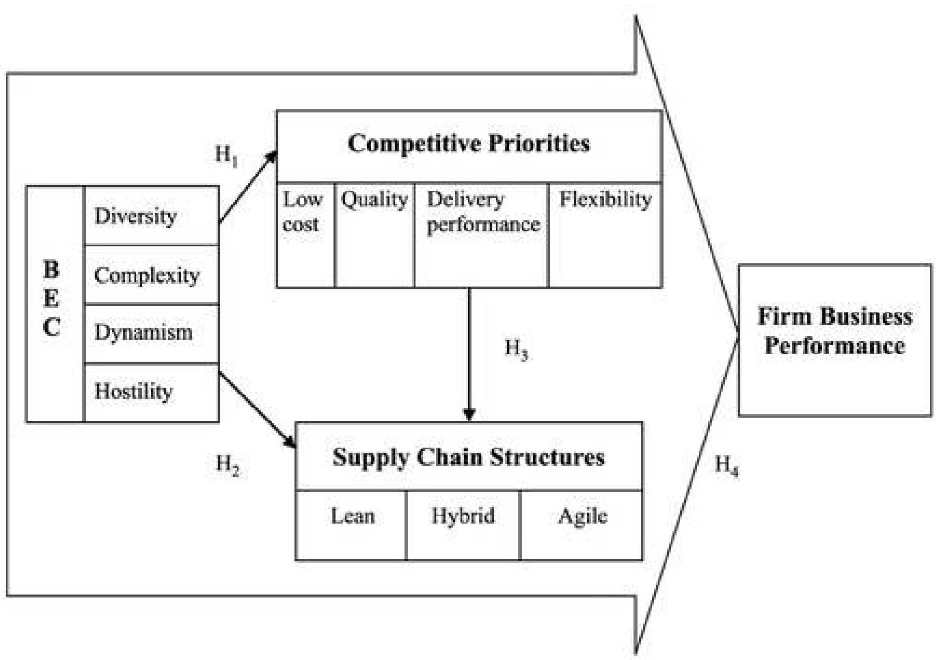


Figure 1.
A proposed conceptual model

Data collection

The survey was conducted in Spring 2006. Among 995 mailed surveys, six were returned due to incorrect contact information. The adjusted survey sample size was therefore 989. A total of 207 responses were received at the completion of the survey. Some 202 out of 207 returns were eligible and complete responses. The adjusted response rate was 20.4 per cent (202/989). Compared to the response rate in the previous industry studies (e.g. Tan *et al.*, 2002; Tracey and Tan, 2001), this response rate was very satisfactory, particularly in the current dynamic US textile industry.

Product end uses	%	Gross sales values (unit: million US$)	%	Respondent position	%
Marine	33	≤5	55	Owner, President, CEO	52
Transportation	10	6 ~ 0	16	Vice President	19
Military	10	11 ~ 50	10	General Manager	6
Construction	9	51 ~ 50	9	Others	16
Medical/hygiene	8	151 ~ 500	4	N/A	7
Agriculture	6	501~ 1,000	1		
Automotive	5	> 1,000	1		
Packaging	4	N/A	4		
Others	6				
N/A	9				
Total	100	Total	100	Total	100

Table V. Profile of survey participating firms

Table V shows the profile of survey respondents. It indicates a broad diversity of businesses, of which, around one-third of responses were from marine awnings and canvas, with military and transportation each accounting for 10 per cent of responses. In terms of gross annual sales values (for the entire firm), some 55 per cent of respondents were equal to or less than US$5 million, 16 per cent had sales between US$6 million and US$10 million, and 10 per cent were between US$11 million and US$50 million. The number of employees shows a similar profile. With regard to the position of respondents, 52 per cent were CEO's, 19 per cent vice presidents, and the remainders were general managers or other positions. This shows that most respondents were high-ranking executives and had the knowledge to provide relatively accurate answers to the survey questions.

Data analysis

The measurement variables for each construct in the model were drawn from a comprehensive review of well-established empirical and conceptual research literature. This provides proof of the content validity of measures (Ward *et al.*, 1995). The determination of content validity is not numerical, but subjective and judgmental (Emory, 1980).

Two steps to SEM approach were employed in this study. Step one was to establish the measurement model adequacy. This was examined in terms of model-to-data fit and parameter estimates via confirmatory factor analysis with SEM. The aim of this step was to assess the unidimensionality, reliability, and construct validity of measurement constructs. Then, step two determined the full structural model adequacy and tested the proposed causal relationships (hypotheses) between the constructs. The LISREL program was utilized to analyze established SEM model because it is the most longstanding and widely distributed.

Non-response bias testing. Non-response bias was evaluated by *t*-tests on demographic variables. As a convention, the responses of early and late groups of returned surveys were compared to provide support of non-response bias (Lambert and Harrington, 1990). Results show there are no significant differences between early and late groups of returned surveys.

High performer sub-sample and low performer sub-sample. When measurement variables in the latent constructs are unidimensional, a single set of composite scores of measurement variables can be used to represent the latent construct (Ward and Duray, 2000). In this study, the business performance construct showed unidimensional. The 202 respondents were sorted in descending order in terms of their mean scores calculated using the five business performance indicators. The first half of the respondents were designated as relatively high performing firms and the second half were designated as relatively low performing firms. Each sub-sample consists of 101 firms.

Factor analysis. Factor analysis using varimax rotation method was utilized to reduce a larger number of variables to a smaller number of factors. SPSS program was used for factor analysis. The varimax rotation method is an orthogonal rotation technique and has been widely used in previous empirical research (e.g. Ward *et al.*, 1998). The extraction criterion was set as eigenvalue above one. Measurement variables with low factor loadings (less than 0.50) (Comrey, 1973), high cross-loadings (greater than 0.4), and item-to-total correlations (less than 0.3) (Janda *et al.*, 2002) were excluded from the factor matrices. The deduction of certain measurement variables required the re-computation of factor loadings, coefficient alpha, and item-to-total correlations, and also a re-examination of factor structure using the reduced number of measurement variables. This iterative procedure was repeated for both the high performer sub-sample and the low performer sub-sample until all requirements were met. The final 31 variables measuring nine latent constructs for both sub-samples are summarized in Table VI.

Structural equation modeling. Full structural model adequacy is evaluated via hypothesis testing, model-to-data fit, and parameter estimates using path analysis with SEM (Byrne, 1998). The purpose behind assessing full structural model adequacy is twofold. The first aim is to assess how well the theoretical model fits the data overall. The other aim is to estimate the structural relationships among the latent constructs via path analysis (Jöreskog and Sörbom, 1998).

Unidimensionality is a prerequisite to meaningfully interpret reliability (Levine, 2005). In order to prove unidimensionality, the following criteria should be met:

- the first indicator should explain a large proportion of the variance in the constructs (i.e. > 40 per cent);
- subsequent indicators should explain fairly equal proportions of the remaining variance, except for a gradual decrease;
- all or most of the constructs should have sizeable loadings on the first indicator (i.e. > 0.3); and
- all or most of the constructs should have higher loadings on the first indicator than on the subsequent indicators (Carmines and Zeller, 1979).

Latent constructs	Measurement variables
Diversity	The number of major end-use markets (V1) The number of foreign (V2) The number of operations processes embraced within the company (V3)
Complexity	The complexity of knowledge required to meet customer needs (V4) The degree of segmentation within major end-use markets (V5) The complexity of supply chain (V6)
Dynamism	Rate at which products and services become outdated (V7) Rate of innovation of new operations processes (V8) Rate of change in customer needs in your industry (V9)
Hostility	Importance of producing to the customers' quality requirement (V10) Importance of unreliable supplier quality (V11) Importance of rising business costs (V12)
Low cost	Achieve/maintain lowest production cost (V13) Increase labor productivity (V14) Increase capacity utilization (V15)
Quality	Provide high performance design (V16) Offer consistent and reliable quality (V17) Conformance with product design specification (V18)
Delivery performance	Provide fast delivery (V19) Delivery on time (V20) Reduce production lead time (V21)
Flexibility	Make rapid volume changes (V22) Adjust capacity quickly (V23) Offer a large number of product features (V24) Offer a broad product variety (V25) Adjust product mix quickly (V26)
Supply chain structure	Supply chain management roles (V27) *Locus* of supply chain decision making (V28) Management spans of control (V29) Decision-making structure (V30) Coordination methods (V31)

Table VI. The final measurement variables for both sub-samples after factor analysis

After all measures showed unidimensionality, the reliabilities were also tested. Cronbach's coefficient alpha and the construct reliability for each latent construct were calculated respectively to compare to criterion value. A Cronbach's coefficient alpha of 0.60 and above suggested adequate reliability (Nunnally, 1978). Construct reliability values of greater than 0.50 indicated adequate reliability (Fornell and Larcker, 1981).

Construct validity consists of convergent validity and discriminant validity. All of the measurement loadings were significantly high and all of the goodness of fit indices met recommended values to suggest convergent validity. An additional indication of convergent validity was the average variance extracted (AVE), which is the percentage of the total variance of a measure represented or extracted by the variance due to the construct, as opposed to being due to error (Fornell and Larcker, 1981). The desired threshold for the AVE is 0.5. Discriminant validity is shown by the confidence interval of two standard errors around the correlation between each respective pair of factors in the model. If the confidence interval does not include 1.0, then discriminant validity is demonstrated (Anderson and Gerbing, 1988).

Goodness-of-fit indices were used to assess the model-to-data fit, which is the extent to which the data matches the proposed model. There are numerous goodness-of-fit indices and no single test best describes the model-to-data fit. The most often used measures: normed Chi-square, the room mean square error of approximation (RMSEA), the goodness-of-fit index (GFI), the normed fit index (NFI), the non-normed fit index (NNFI), and the comparative fit index (CFI) were employed in this study.

Results and discussion

Measurement model testing results

The Appendix (Tables AI-AV) summarizes the testing results for all measurement models in model-to-data fit, unidimensionality, reliability, and construct validity. The results showed all measurement models met the model-to-data fit requirements for both high and low performer sub-samples. The standardized loadings comparisons for each latent construct individually modeled and that construct in the context of the structural model showed little or no difference in value, which established the evidences of unidimensionality for both high and low performer sub-samples. For both sub-samples, all latent constructs showed that Cronbach's coefficient alphas were above 0.60 and construct reliability scores were above 0.70. The evidence of reliability was established. All of the measurement loadings were significantly high (loadings > 0.50 and *t*-values > 1.96) and all of the goodness of fit indices met recommended values, suggesting convergent validity. Also, the AVE scores for all latent constructs in the both sub-samples were above the desired threshold of 0.5. None of the confidence intervals (of two standard errors around the correlation between each respective pair of factors in the model) capture 1.0. Therefore, the criteria of discriminant validity were met for both sub-samples.

Structural model testing results

Once unidimensionality, reliability, and construct validity for the measurement models were demonstrated for both high and low performer sub-samples, the overall structural model fits for both high and low performer sub-samples were tested. Table VIIsummarizes the structural model goodness of fit indices for both sub-samples. The results showed that the adequate fit was achieved.

Then, the full SEM model was run separately for high performers and for low performers data sets that estimates path coefficients through an iterative process. This process provides the necessary evaluation criteria to test the significance of the coefficients simultaneously between all paired latent constructs to confirm the existence of the relationships, and also to establish the differences in the emphasized strategies and implemented supply chain structure by high and low performers in the similar environment. Figures 2 and 3 represent the statistically significant relationships (at $p<0.05$ level) in the SEM model for high and low performer sub-samples respectively.

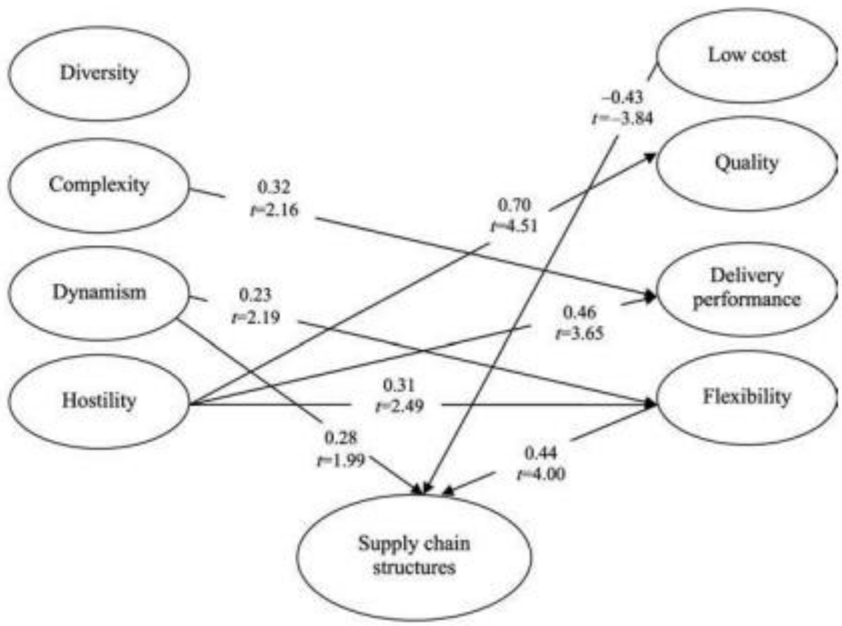
Discussion

Relationships between BEC and firm competitive priorities

As shown in Figures 2 and 3, in the high performer sub-sample, the path from environmental complexity to delivery performance is positive and statistically significant at $p<0.05$ (path coefficient=0.32, *t*-value=2.16); the path from environmental dynamism to flexibility is positive and statistically significant at $p<0.05$ (path coefficient=0.34, *t*-value=2.19); and the paths from environmental hostility to quality, delivery performance, and flexibility, respectively, are positive and statistically significant at $p<0.05$ (path coefficient=0.70, t-value=4.51; path coefficient=0.46, t-value=3.65; path coefficient=0.31, t-value=2.49). The results are consistent with previous studies (e.g. Porter, 1980; Ward *et al.*, 1995), that differentiation (quality, delivery performance, and flexibility) is an appropriate strategy in an increasingly complex, dynamic and hostile environment.

Sub-sample	Normed Chi-square	RMSEA	GFI	NFI	NNFI	CFI
High performers	1.52	0.06	0.92	0.94	0.93	0.95
Low performers	1.89	0.08	0.90	0.92	0.91	0.93
Recommended values	≤2	≤0.08	≥0.90	≥0.90	≥0.90	≥0.90

Table VII. The structural model goodness-of-fit indices



Note: Path coefficients and corresponding t-values at $p<0.05$

Figure 2. The significant relationships in the SEM model for high performer sub-samples

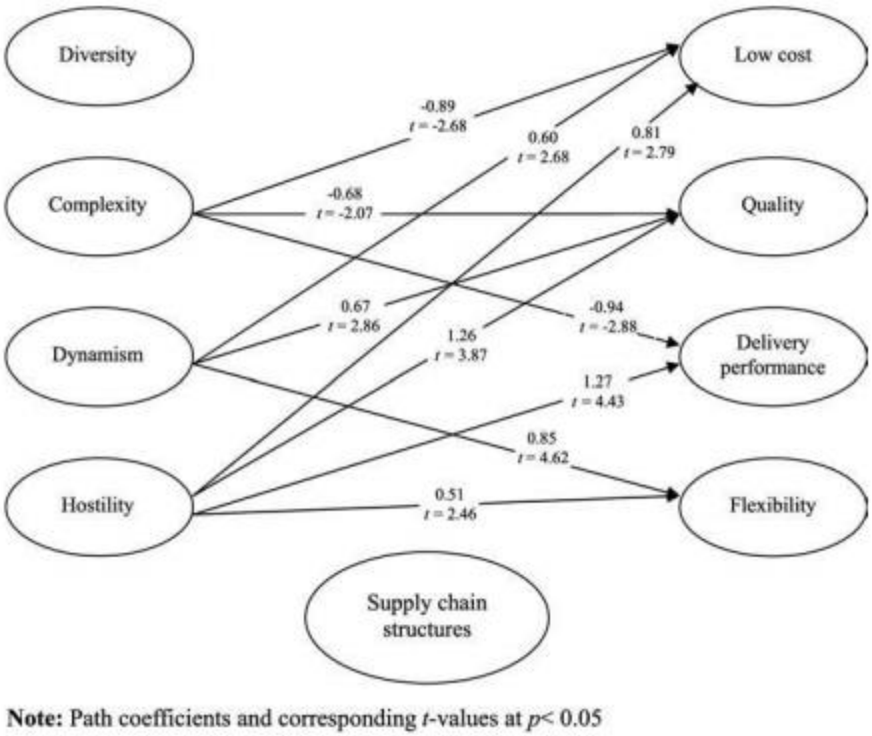


Figure 3.
The significant relationships in the SEM model for low performers sub-samples

For low performers, the paths from environmental complexity to low cost, quality, and delivery performance are negative and statistically significant at $p<0.05$ (path coefficient=−0.89, *t*-value=−2.68; path coefficient=−0.68, *t*-value=−2.07; and path coefficient=−0.94, *t*-value=−2.88, respectively.); the paths from environmental dynamism to low cost, quality, and flexibility are positive and statistically significant at $p<0.05$ (path coefficient=0.60, *t*-value=2.68; path coefficient=0.67, *t*-value=2.86; and path coefficient=0.85, *t*-value=4.62, respectively.); and the paths from environmental hostility to low cost, quality, delivery performance, and flexibility are positive and statistically significant at $p<0.05$ (path coefficient=0.81, *t*-value=2.79; path coefficient=1.26, *t*-value=3.87; path coefficient=1.27, *t*-value=4.43; and path coefficient=0.51, *t*-value=2.46; respectively.). The relationships between environmental complexity and competitive priorities are quite contrary to the high performers group and to previous studies, where increasing complexity is associated with decreasing emphasis on low cost, quality, and delivery performance strategies. Also, when facing increasing environmental dynamism and hostility, cost reduction is always emphasized by low performers.

These results also support the statement that there is a significant causal relationship between BEC and firm competitive priorities for both high and low performers. *H1* is accepted. Since the relationship between BEC and firm competitive priorities has been specified at the level of individual environmental dimensions' impacts on individual competitive priorities, the differences, including the direction of relationships and significance between high and low performers, are clearly revealed.

Relationships between BEC and SCS

As shown in Figures 2 and 3, in the high performer sub-sample, the path from environmental dynamism to SCS is positive and statistically significant at $p<0.05$ (path coefficient=0.28, t-value=1.99). Among the four environmental dimensions, dynamism has the most significant impact on SCS. Increasing environmental dynamism prompts firms to implement more agile SCS that is focused on responsiveness. For low performers, there is no significant evidence in the data that demonstrates environmental characteristics influence the SCS firms implemented. In other words, there is a disconnection between BEC and SCS.

The results suggest that the statement that there is a significant causal relationship between BEC and SCS can be accepted for high performers but rejected for low performers. It indicates that *H2* should be only valid for high performers and the positively causal relationship is from environmental dynamism to SCS.

Relationships between firm competitive priorities and SCS

As shown in Figures 2 and 3, in the high performers sub-sample, the path from low cost to SCS is negative and statistically significant at $p<0.05$ (path coefficient=−0.43, t-value=−3.84); and the path from flexibility to SCS is positive and statistically significant at $p<0.05$ (path coefficient=0.44, t-value=4.00). Among the four competitive priorities, low cost and flexibility have the most significant impacts on SCS. A low cost emphasis is associated with a leaner SCS, while a flexibility emphasis is associated with a more agile SCS. The results are consistent with previous studies (e.g. Fine, 1998), which indicated that a lean SCS is appropriate for a cost reduction strategy, while an agile supply chain structure is appropriate for a differentiation-based strategy. For low performers, there is no significant evidence that demonstrates competitive priorities influence the SCS that firms implemented. In other words, the SCS implemented in low performers are not closely related to the strategies they emphasized.

The results suggest that the statement that there is a significant causal relationship between firm competitive priorities and SCS is only accepted by high performers but denied by low performers. It indicates that *H3* should be only valid for high performers. The positive causal relationship is from flexibility to SCS, while from low cost to SCS there is a negative causal relationship.

Relationships between alignment and firm business performance

As one of the most important advantages of SEM, all possible causal relationships between latent constructs are tested simultaneously. The significant paths between paired constructs in the model imply the simultaneous existence of relationships and a corresponding set of responses in strategy and SCS to managerial perceived BEC. The differences based on the results of SEM analysis between the high and low performers are clearly revealed as seen in the Figure 4. When the alignment between BEC, firm competitive priorities and SCS is achieved, the firms exhibit relatively high business performance; otherwise, relatively low performance follows. In addition, the variance of SCS (R^2) for high performers sub-sample is 0.70, which means 70 per cent of the variance of SCS can be accounted for by BEC and firm competitive priorities. In contrast, the variance of SCS (R^2) for low performers is only 0.20, which indicates that the SCS implemented in the low performing firms is significantly influenced by factors other than BEC and firm competitive priorities. In other words, for low performers, their SCS design was largely independent of BEC and firm competitive priorities. The results suggest that the statement that congruency between BEC, competitive priorities, and SCS has a significant impact on firm business performance. It indicates that *H4* is supported in this study.

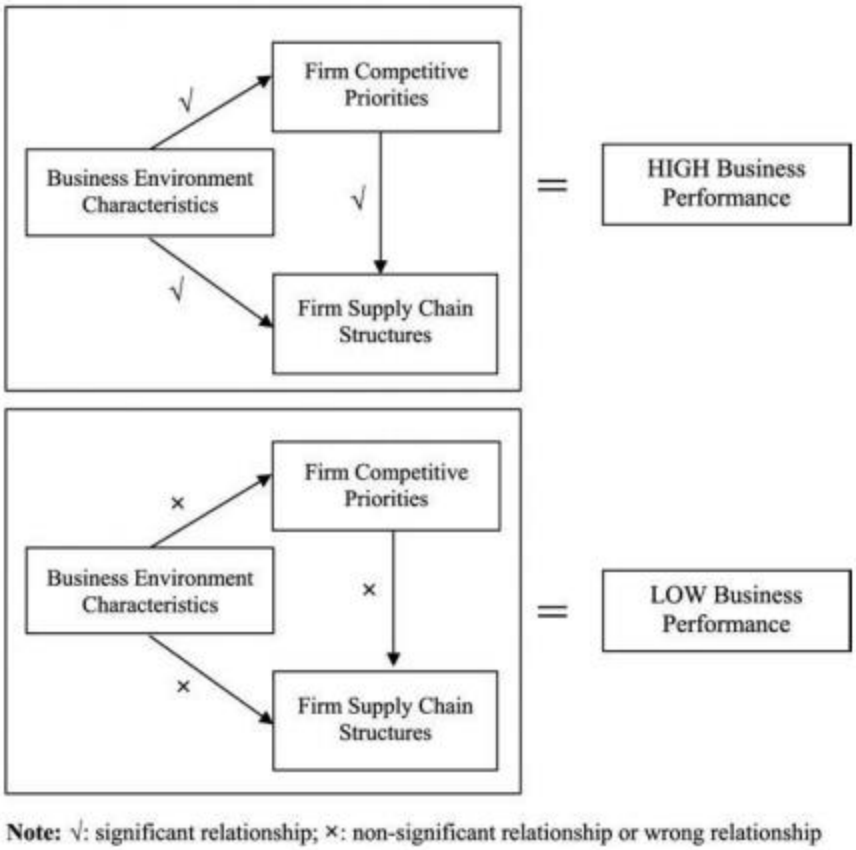


Figure 4.
The differences between the high and low performing firms

Conclusions and implications

Conclusions

This study found that the differences in strategic responses to similar business environment between high and low performers are striking. For both groups, environmental diversity did not significantly affect strategic emphasis and SCS, which is perhaps due to the domestic market oriented nature and low or medium end-use market segmentation. For the high performers, flexibility was particularly valued in a complex and dynamic business environment. The increasing environmental complexity and dynamism caused the firms to put more emphasis on flexibility. In the meantime, increasing environmental hostility sparked high performing firms to treat quality, delivery performance, and flexibility as priorities. These findings are consistent with previous studies (e.g. Porter, 1980; Swamidass and Newell, 1987; Ward *et al.*, 1995), that differentiation emphasizing on quality, delivery performance, and flexibility is an appropriate strategy in an increasingly complex, dynamic, and hostile environment. For the low performers, the relationships between environmental complexity and competitive priorities are quite contrary to high performers and to findings from previous research. The latter showed that increasing environmental complexity was associated with increasing emphasis on quality and delivery performance. However, for low performers, it was found that, as well as low cost, quality and delivery performance priorities were also highly valued in a less complex environment. What is more, when facing increasing environmental dynamism and hostility, low performing firms showed an approximately equal emphasis among all four strategies. In contrast, high performers responded with a differentiation focus. Porter (1985) pointed out that simultaneous emphasis on both cost and differentiation is dangerous and causes poor performance.

The SCS responses to similar business environment from high and low performers were also significantly different. For the high performers, all four environmental dimensions had some influence on firm SCS, but only dynamism had a statistically significant impact. Increasing environmental dynamism prompted firms to implement agile SCS. The result meshes with the statement of previous research (e.g. Fisher, 1997), that agile SCS is appropriate in a more dynamic environment and allows firms to react more effectively to uncertainties and marketplace changes. For the low performers, there were no significant linkages between all four environmental dimensions and the SCS that firms implemented. This disconnection between business environment and selection of SCS could be one reason for the lower business performance of these firms.

With regard to the relationships between competitive priorities and SCS, the findings for high and low performers were again significantly different. For the high performers, the competitive priorities of low cost and flexibility had the most significant impact on the firm SCS. A low cost emphasis was associated with a SCS emphasizing leanness, while a flexibility emphasis was associated with a SCS oriented towards agility. These results are consistent with previous studies (e.g. Fisher, 1997), which found that a lean SCS is appropriate for a cost reduction strategy while an agile SCS is appropriate for a flexibility strategy. For low performers, there was no significant evidence that demonstrated firm competitive priorities influenced their SCS. This disconnection between firm competitive priorities and SCS could be another possible explanation for the lower business performance of these companies.

The linkages between BEC, firm competitive priorities, and SCS in high performers were close and statistically significant. The most of the variance in SCS could be accounted for by BEC and firm competitive priorities. This indicates that high performing firms designed their supply chain structures with close consideration of BEC and competitive priorities. In contrast, the SCS of low performing firms were designed independently of BEC they faced and competitive priorities they emphasized. The most of the variance in SCS was not determined by BEC and competitive priorities. The findings of this study provide solid evidence to corroborate the impact of the alignment among these three elements on business performance. Thus, it is advanced that, from the long-term perspective, competitive benefits of supply chain investments are not only derived from investments in state-of art technology alone but also may be realized only if alignment exists among SCS, competitive priorities and BEC; otherwise, a dissonance among these constituent elements could only result in conflicting capabilities and wasted resources, consequently, firms will not realize the complete benefits offered by supply chain investments.

Overall, this study was built on previous theoretical and empirical research. It contributes to the existing body of literature in four ways. First, despite theoretical support for a model linking business environment, competitive priorities, SCS, and business performance, a simultaneous empirical investigation of all of these aspects has been lacking. The study addressed this deficiency in the literature and developed a model linking all of these constructs. Second, it developed a reliable and valid survey instrument for measuring all these constructs. A measurement model for capturing BEC in four dimensions, namely diversity, complexity, dynamism, and hostility, was first proposed and validated in this study. Third, the lean, hybrid and agile SCS classification was proposed. The organizational components of these structures were developed and tested. The results showed the measurement was effective. Lean, hybrid, and agile SCS can be empirically investigated to further the development of supply chain design and management theory. Much of the literature to date is mainly conceptual with little empirical support. Fourth, by establishing conceptual model and developing SEM analysis, the study provides a systemic understanding of the relationships between the individual environmental dimensions, the individual competitive priorities and SCS, and the alignment impacts on firm business performance. The appropriate strategic responses and SCS design to the specific BEC were identified. The sequence of misalignment between these elements was quantified revealed.

It is expected that this study will provide the springboard for further research related to these critical issues. Furthermore, the transition happening in the US textile manufacturing sector is an epitome of the entire US manufacturing industry, the findings from this study could codified and made transparent and the methodology may, therefore, be transferred to studies targeting other firms and market sectors.

Implications

As the US textile market continues to experience increasing international competition, dynamic market needs and continuous technological change, the business environment facing US textile manufacturers is likely to become increasingly dynamic, complex, diverse and hostile. Under such turbulent conditions, the configuration and deployment of effective strategies and appropriate SCS is imperative to achieve superior business performance, and perhaps, even to survive. This work suggests that it is necessary for firms to understand the characteristics of the environment in which they operate and the appropriate configuration of strategies and SCS that will make them most effective in responding to this environment. Further, they should be constantly monitoring the environment for shifts to achieve timely adjustment of this configuration.

The differentiation strategies emphasizing quality, delivery, and flexibility are particularly valued in the increasingly diverse, complex, dynamic, and hostile environments, and corresponding supply chain structure should be agile or mostly agile focused. The simultaneous emphasis on both cost and differentiation is dangerous and could only cause lower performance. A dissonance among these constituent elements could result in conflicting capabilities and wasted resources and fail to maximize the profitability from supply chain investments. Overall, the study provides a basis for modeling alternative business environment-competitive priorities-supply chain structure configurations to optimize firm business performance. This knowledge can assist firms in enhancing their competitiveness through improvements in their choice of competitive priorities and the design of supply chain structures.

Limitations and future research

This study overcame some limitations exhibited in the previous research by using a well-developed survey instrument, an effective industrial survey strategy and the application of SEM techniques for data analysis; however, there are still several limitations that need to be addressed.

First of all, one of most obvious limitations is that the data analyzed in this study is based on managers' self-perceptive answers. Although most respondents were senior executives and the questions were articulately designed, bias, arising from respondent subjectivity and misunderstanding could not be completely avoided. In future studies, more objective measures based on secondary evidence may be included as complementary information. Second, this study presents an analysis of relationships at a single point in time. Since the business environment is constantly changing, longitudinal follow-up studies should be designed to identify these changes and re-examine whether and how these relationships are changing. Third, although the sub-sample analysis is within the acceptable range for SEM (the model is still over-identified for both high and low performers groups), the sample size is relatively small. This is moderated to some extent by the approximately normal distributions of most measurement variables. While the results derived from SEM analysis are promising and exciting, the inferences should be viewed with some caution until further empirical studies confirm these findings. Finally, since a firm has less control over its suppliers' and customers' supply chains, compared to its own supply chain, this study addressed the issues of a firm's intra SCS, competitive priorities and performance, rather than its extended SCS, which also includes the firm's suppliers' and customers' SCSs. It is true that the overall alignment across a firm's extended supply chain would be very desirable and help researchers and practitioners understand the full picture. This extension will pose significant difficulties for statistical analysis but case study could be a possible method.

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Appendix

The testing results for all measurement models in model-to-data fit, unidimensionality, reliability, and construct validity (Tables AI-AV).

Table AI. Goodness-of-fit indices

	Normed Chi-square	RMSEA	GFI	NFI	NNFI	CFI
High performers sub-sample						
Diversity	1.25	0.06	0.98	0.99	1.00	1.00
Complexity	1.53	0.07	0.95	0.98	0.97	0.99
Dynamism	1.73	0.07	0.94	0.98	0.97	0.99
Hostility	1.33	0.04	0.95	0.99	0.98	0.99
Low cost	1.89	0.05	0.92	0.96	0.97	0.98
Quality	1.95	0.08	0.91	0.95	0.94	0.95
Delivery performance	1.66	0.06	0.93	0.97	0.96	0.99
Flexibility	1.15	0.03	0.96	0.99	0.98	1.0
Supply chain structure	1.69	0.07	0.91	0.93	0.92	0.96
Low performers sub-sample						
Diversity	1.80	0.08	0.95	0.96	0.97	0.98
Complexity	1.72	0.07	0.96	0.96	0.97	0.98
Dynamism	1.21	0.05	0.96	0.99	1.00	1.00
Hostility	1.09	0.02	0.98	1.00	1.00	1.00
Low cost	1.38	0.04	0.95	0.97	0.96	0.99
Quality	1.25	0.06	0.93	0.95	0.94	0.96
Delivery performance	1.72	0.07	0.92	0.96	0.94	0.98
Flexibility	1.67	0.06	0.93	0.96	0.95	0.97
Supply chain structure	1.44	0.05	0.93	0.95	0.94	0.97
Recommended values	≤ 2	≤ 0.08	≥ 0.90	≥ 0.90	≥ 0.90	≥ 0.90

	Variables	SLs in individual construct (H)	SLs in structural model (H)	SLs in individual construct (L)	SLs in structural model (L)
Diversity	V1	0.68	0.68	0.70	0.70
	V2	0.58	0.58	0.60	0.60
	V3	0.84	0.84	0.89	0.89
Complexity	V4	0.82	0.81	0.81	0.82
	V5	0.68	0.69	0.90	0.89
	V6	0.79	0.80	0.79	0.80
Dynamism	V7	0.74	0.74	0.86	0.86
	V8	0.75	0.75	0.89	0.89
	V9	0.88	0.88	0.88	0.88
Hostility	V10	0.83	0.80	0.69	0.65
	V11	0.63	0.63	0.57	0.56
	V12	0.55	0.56	0.59	0.57
Low cost	V13	0.60	0.61	0.53	0.53
	V14	0.87	0.87	0.85	0.84
	V15	0.82	0.81	0.66	0.66
Quality	V16	0.57	0.58	0.64	0.64
	V17	0.80	0.81	0.75	0.76
	V18	0.80	0.80	0.79	0.79
Delivery performance	V19	0.85	0.83	0.92	0.92
	V20	0.65	0.68	0.84	0.84
	V21	0.70	0.70	0.64	0.65
Flexibility	V22	0.81	0.81	0.70	0.70
	V23	0.85	0.83	0.58	0.58
	V24	0.77	0.78	0.85	0.85
	V25	0.62	0.63	0.76	0.76
	V26	0.78	0.79	0.82	0.82
Supply chain structure	V27	0.69	0.69	0.81	0.81
	V28	0.77	0.77	0.91	0.91
	V29	0.75	0.75	0.75	0.75
	V30	0.87	0.87	0.73	0.73
	V31	0.78	0.78	0.68	0.68

Notes: SLs = mean standardized loadings; Variables: measurement variables; H = high performers sub-sample; L = low performers sub-sample

Table AII.
Unidimensionality assessment

	Cronbach's coefficient alpha (H)	Construct reliability (H)	Cronbach's coefficient alpha (L)	Construct reliability (L)
Diversity	0.727	0.746	0.747	0.780
Complexity	0.806	0.810	0.869	0.875
Dynamism	0.823	0.834	0.909	0.909
Hostility	0.676	0.708	0.838	0.758
Low cost	0.789	0.813	0.702	0.723
Quality	0.754	0.775	0.756	0.774
Delivery performance	0.769	0.782	0.832	0.849
Flexibility	0.893	0.879	0.876	0.863
Supply chain structure	0.896	0.881	0.896	0.885

Notes: H = high performers sub-sample; L = low performers sub-sample

Table AIII.
Reliability assessment

	AVE (H)	AVE (L)
Diversity	0.501	0.549
Complexity	0.588	0.700
Dynamism	0.627	0.770
Hostility	0.500	0.512
Low cost	0.596	0.507
Quality	0.540	0.535
Delivery performance	0.547	0.657
Flexibility	0.594	0.565
Supply chain structure	0.599	0.608

Notes: H = high performers sub-sample; L = low performers sub-sample

Table AIV.
Convergent validity assessment

	Confidence interval (H)	Confidence interval (L)
Diversity – Complexity	(0.31, 0.71)	(0.38, 0.74)
Diversity – Dynamism	(0.42, 0.78)	(0.19, 0.59)
Diversity – Hostility	(−0.09, 0.43)	(0.06, 0.56)
Diversity – Low cost	(−0.61, −0.13)	(0.19, 0.63)
Diversity – Quality	(−0.06, 0.42)	(0.00, 0.48)
Diversity – Delivery performance	(0.04, 0.52)	(0.05,0.49)
Diversity – Flexibility	(0.06, 0.50)	(0.03, 0.47)
Complexity – Dynamism	(0.27, 0.67)	(0.24, 0.60)
Complexity – Hostility	(0.10, 0.58)	(0.42, 0.78)
Complexity – Low cost	(−0.27, 0.21)	(−0.09, 0.39)
Complexity – Quality	(0.25, 0.65)	(0.20, 0.60)
Complexity–Delivery complexity	(0.21, 0.65)	(−0.02, 0.42)
Complexity – Flexibility	(0.05, 0.53)	(0.14, 0.54)
Dynamism – Hostility	(−0.14, 0.34)	(−0.30, 0.18)
Dynamism – Low cost	(−0.31, 0.17)	(0.07, 0.41)
Dynamism – Quality	(0.06, 0.50)	(0.02, 0.46)
Dynamism–Delivery performance	(−0.13, 0.35)	(−0.26, 0.16)
Dynamism – Flexibility	(0.18, 0.58)	(0.48, 0.76)
Hostility – Low cost	(−0.49, −0.01)	(−0.14, 0.38)
Hostility – Quality	(0.58, 0.90)	(0.36, 0.76)
Hostility –Delivery performance	(0.31, 0.71)	(0.31, 0.71)
Hostility – Flexibility	(0.03, 0.51)	(−0.22, 0.26)
Low cost – Quality	(−0.27, 0.21)	(0.13, 0.61)
Low cost – Delivery performance	(0.12, 0.60)	(0.24, 0.64)
Low cost – Flexibility	(−0.62, −0.18)	(0.19, 0.63)
Quality – Delivery performance	(0.24, 0.68)	(0.39, 0.75)
Quality – Flexibility	(0.18, 0.62)	(0.25, 0.65)
Delivery performance– Flexibility	(0.15, 0.59)	(0.03, 0.47)
Diversity – SCS	(0.23, 0.63)	(−0.28, 0.16)
Complexity – SCS	(0.02, 0.46)	(−0.12, 0.12)
Dynamism – SCS	(0.33, 0.69)	(−0.09, 0.31)
Hostility – SCS	(0.03, 0.45)	(−0.43, 0.05)
Low cost – SCS	(−0.73, −0.37)	(0.06, 0.50)
Quality – SCS	(0.04, 0.48)	(−0.28, 0.20)
Delivery performance – SCS	(0.04, 0.48)	(−0.11, 0.33)
Flexibility – SCS	(0.52, 0.80)	(0.02, 0.36)

Table AV. Discriminant validity assessment

Notes: H = high performers sub-sample; L = low performers sub-sample. Alignment between business environment characteristics, competitive priorities, supply chain structures, and firm business performance: conceptual model and empirical investigation

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