Indian Small-Scale Manufacturing Firms: Achieving Competitive Advantage

Katrina Savitskie, Sandipan Sen, and Sampath Ranganathan

Abstract Managers today need access to opportunities and insights that enable their firm to achieve a competitive advantage in the marketplace. Supply chain initiatives (e.g., integration and flexibility) are of interest because of their proven benefits. This research examines information sharing, in conjunction with supply chain integration and flexibility, to determine their impact on competitive advantage for small-scale manufacturing firms in India. Our findings indicate that supply chain integration has a significant impact on supply chain flexibility, however not in the direction hypothesized. Unfortunately the other hypothesized relationships (information systems to supply chain flexibility and supply chain flexibility to competitive advantage)

K. Savitskie (✉)
Savannah State University, Savannah, GA, USA

S. Sen
Donald H. Harrison College of Business, Southeast Missouri State University, Cape Girardeau, MO, USA

S. Ranganathan
Austin E. Cofrin School of Business, University of Wisconsin-Green Bay, Green Bay, WI, USA

did not manifest. We will use these results as the impetus for further research in this area.

Keywords Information sharing • Supply chain integration • Supply chain flexibility • Competitive advantage • India • Partial least squares (PLS)

1.1   Introduction

In business today, there is significant concern about the challenges of doing business under environmental uncertainty. Firms tend to emphasize supply chain flexibility more in times of increased uncertainty (Swamidass and Newell 1987), given that supply chain flexibility is a critical driver of supply chain performance (Vickery et al. 1999; Sánchez and Pérez 2005; Aprile et al. 2005; Stevenson and Spring 2009). It is important that critical supply chain management (SCM) issues like SCM flexibility are researched (Vickery et al. 1999), especially as firms strive for coordination and collaboration with channel partners and customers (http://cscmp.org/aboutc-scmp/definitions.asp).

The Indian market is growing, thus the logistics function is expected to do even more to assist the firm to meet market requirements (Wu and Cheng 2008). Indian managers are paying more attention to supply chain initiatives due to the continued growth (approximately 12%) of the manufacturing sector in recent years and the allocation of 12–15% of firm revenues to logistics (Arshinder et al. 2007; Selko 2008). Hence we need to provide managers with suggestions to better utilize resources to succeed. In a dynamic manufacturing environment like India, achieving a competitive advantage is important. The proposed model examined the influence of information sharing and supply chain integration on supply chain flexibility and, ultimately, competitive advantage in the context of South Indian small-scale manufacturing firms.

1.2   Theoretical Framework and Hypothesis Development

The theoretical framework used in our study is based on the resource-based view (RBV) of the firm (Wernerfelt 1984), which recognizes that a bundle of resources (e.g., human, physical, and organizational capital) impact firm performance (Wernerfelt 1984). The concept of RBV has been expanded to include external capabilities by some researchers, given

the realization that firms also utilize some critical *external* resources and that interfirm relationships contribute to the firm's competitive advantage (McEvily and Zaheer 1999; Das and Teng 2000; Araujo et al. 1999). Mathews' (2003) "extended resource-based view of the firm" concept suggests both internal and external assets enable a firm's competitive advantage and a firm's supply chain network is an important external resource. Araujo et al. (1999) concludes that the collaborative relationship between two partnering organizations impacts supply chain flexibility, provided that the firm has easy access to its suppliers' capabilities while making operating decisions. The following sections identify the constructs employed in this study along with the proposed hypotheses.

1.2.1   *Information Sharing*

Information sharing refers to the amount of sensitive information that is willingly shared among partners (Monczka et al. 1998). Sharing information with both upstream and downstream partners is vital for the entire supply chain to function seamlessly (Mason-Jones and Towill 1997; Balsmeier and Voisin 1996). Researchers have found that information sharing can be a source of competitive advantage for the firm (Novack et al. 1995; Jones 1998) because it enables the partners to work as a single unit (Stein and Sweat 1998). While it is clear that improved performance can result from freely sharing information (Tompkins and Ang 1999), many managers see their company's sensitive information as a source of competitive advantage and are reluctant to share it with anyone (Vokurka and Lummus 2000).

1.2.2   *Supply Chain Integration*

Supply chain integration is the extent to which the activities within the firm and among supply chain partners are cohesive (Stock et al. 1998; Narasimhan and Jayaram 1998). Supply chain integration encapsulates the following three sub-dimensions:

1. Functional integration: The firm's functional areas (e.g., purchasing, logistics, or marketing) cooperate with the focus often being on cost minimization (Turner 1993; Stevens 1989).
2. Internal integration: The relationships between the critical sub-functions are linked into one transparent unit so each function knows what the other functions are doing to maximize customer satisfac-

tion, while still achieving internal targets (Narasimhan and Jayaram 1998). Once internal functions are integrated, effort turns to the involvement of key suppliers and critical customers to align both groups with the firm's objectives (Narasimhan and Jayaram 1998).

3. External integration: Collaborating rather than competing occurs across the entire supply chain (Vokurka and Lummus 2000) to enable a faster response to customer requirements (Magretta 1998).

1.2.3   *Supply Chain Flexibility*

Supply chain flexibility represents the firm's ability to handle nonstandard orders and to adjust to changes in production levels or product functions and features. Pujawan (2004) determined that highly flexible supply chains improve firm competitiveness. Research has suggested that there are five flexibility dimensions: (1) the ability to handle alterations to customer specifications and non-standard orders, (2) the ability to produce products with many features, (3) the ability to adjust to sudden changes in customer demand, (4) the ability to reach an extensive market consistently, and (5) the ability to handle the final customer demands (Vickery et al. 1999). There is a clear need for greater insight into the factors that influence supply chain flexibility because, to be flexible and to achieve a competitive advantage, a firm needs to have internal functional collaboration along with collaboration with its key suppliers (Vickery et al. 1999).

1.2.4   *Competitive Advantage*

Competitive advantage indicates how well an organization is able to outperform its competitors (Porter 1985; McGinnis and Vallopra 1999). Often the sources of competitive advantage are a result of long-term firm practices (Tracey et al. 1999) based on the strategic objectives of the firm (Giffy et al. 1990). Many researchers have examined competitive advantage; as a result, the following dimensions are used in this study: (1) price/cost, (2) quality, (3) delivery dependability, (4) product innovation, and (5) time to market (Vickery et al. 1997; Tracey et al. 1999; Rondeau et al. 2000).

Competitive pricing is the firm's ability to compete by pricing products and services at the lowest levels (Rondeau et al. 2000), which often leads to a large share of the market. Quality is indicated by the customer's expectation that he or she is getting a good value for money (Rondeau et al. 2000). Dependable delivery is achieved when the product is delivered to the customer when promised without exception (Rondeau et al. 2000). Product

innovation is the organization's ability to introduce products without problems with the desired features to address the changing needs of the marketplace (Rondeau et al. 2000). Time to market is the firm's ability to beat the competition in the race to get new products to the market (Li 2002).

1.3   Hypothesis development

Sánchez and Pérez (2005) have shown that increased communication between suppliers and manufacturers influences the level of flexibility of the firm. Furthermore, in times of uncertainty, relevant information is vital (Duncan 1972), and firms may go so far as to use noncompetitive internal and external networks as information gathering forums (Johnston 2004). These forums enable managers to brainstorm solutions or at least determine the types of information needed to better respond to marketplace challenges. Therefore, the previous research has demonstrated the importance of supply chain flexibility and the critical role information sharing has on the firm's ability to respond to changes in the marketplace; thus, this leads us to the following hypothesis:

H₁ As information sharing level improves, the firm's level of supply chain flexibility also improves.

Supply chain integration is crucial for firm performance, and firms often forge partnerships as a part of their integration efforts within functions and external to the firm with critical partners. As previously mentioned, functional, internal, and external integration are the key dimensions of supply chain integration. The items utilized specifically address cross-functional teams, integrated information systems, and activities shared with supply chain partners. The alignment of supply chain practices makes the firm more agile, responsive, and flexible to react to a dynamic marketplace (Lee 2002). A more integrated supply chain is one of the resources a firm uses to improve overall supply chain flexibility; hence, we hypothesize:

H₂ As supply chain integration improves, the firm's level of supply chain flexibility also improves.

Supply chain flexibility requires internal collaboration along with external collaboration with key suppliers (Vickery et al. 1999). Supplier capabilities must include responsiveness to marketplace changes, which may be achieved through increased information sharing between the collaborating
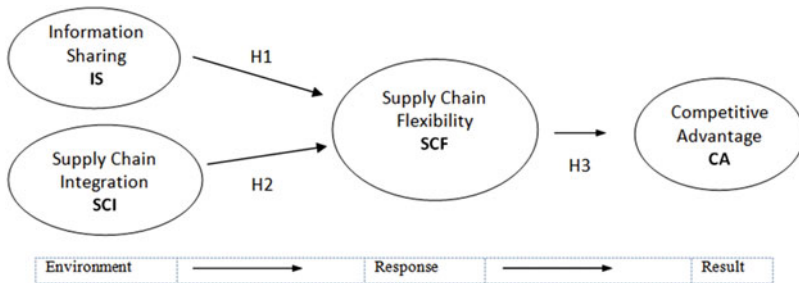
Fig. 1.1 Study model

organizations (Squire et al. 2009). Sanchez and Perez (2005) collected data from 126 Spanish automotive suppliers and found a positive relation between superior performance in flexibility-related capabilities and firm performance, especially in times of uncertainty. Supply chain flexibility is an essential ingredient for developing strategic SCM since it plays an important part in helping the firm to excel in the multiple dimensions of "competitive advantage" (e.g., speed, quality, and cost) (Ketchen and Hult 2007). Hence, we hypothesize (Fig. 1.1):

H_3 As supply chain flexibility improves, the firm's competitive advantage also improves.

1.4   METHODOLOGY

The Indian small-scale manufacturing sector in Coimbatore (a district in the state of Tamil Nadu in southern India) is the objective of this exploratory research. The backdrop of the manufacturing industry was used to increase internal validity. Based on information from the Census of India (2001), Coimbatore has a growing manufacturing sector and is known for its small-scale industries (e.g., wet grinder and pump manufacturers). India has over 12.34 million small-scale firms employing more than 30 million people. It accounts for 34% of exports and contributes 6% of India's gross domestic product; thus, it plays an important role in the Indian economy (Venkataramanaiah and Parshar 2007). From a list of 792 small-scale manufacturing firms provided by the Coimbatore District Small Scale Industries Association (CODISSIA), a random sample of 80 firm owners was taken, and they were then contacted to participate in the survey research project. Each firm owner was solicited by graduate

Table 1.1 Profile of study respondents (*n*=75)

Description	Mean
Number of products manufactured by firms	1.86
Number of years in business	6.48
Number of customers	9.41
Number of suppliers	6.23

students to participate in the study, which resulted in 75 completed questionnaires (a 94% response rate). Given that graduate students personally contacted each owner, the total number contacted was limited to 80 firms. Table 1.1 provides respondent details. Validated measures from existing studies (e.g., Li 2002) were used to develop the questionnaire with Likert-type items, with scales ranging from 1 – *strongly disagree* to 5 – *strongly agree* (see Table 1.2 for the scale items).

1.4.1   *Analysis and Results*

In this study, we used the SMARTPLS 2.0 software of Ringle et al. (2005) to evaluate our data. The reliability for each construct indicated its level of internal consistency, and all scales had a Cronbach alpha above 0.7, which indicated that the scales are reliable (Nunnally 1978). Harman's single-factor test was conducted to test the presence of common method bias. All items in the four study variables were entered into an exploratory factor analysis. If a substantial amount of common method variance is present, one general factor will account for the majority of the covariance among the variables (more than 50% of variance). However, exploratory factor analysis indicated the presence of four distinct factors, and the first factor explained only 28% of variance. Hence we conclude that study variables do not suffer from common method bias.

SMARTPLS 2.0 software (Ringle et al. 2005) was also used to test convergent and discriminant validity of the constructs. We found that the construct validity of the study constructs was poor. The average variance extracted (AVE) of supply chain integration and information sharing was above the 0.50 threshold, but the AVE of supply chain flexibility and competitive advantage was below the 0.50 level. Further, the *t*-values of factor loading for most items in information sharing, supply chain flexibility, and competitive advantage were below the 2.0 level, indicating that convergent validity of the study constructs could not be established (Fornell and Larcker 1981). Removing items with poor loading, regard-

Table 1.2   Factor loadings

Item	Factor loading	t-value
Information sharing (AVE = .68, α = .89)		
Our trading partners are informed in advance of our changing needs	0.31	0.80
Our trading partners share proprietary information with us	0.67	1.34
Our trading partners share business knowledge of core business processes with us	0.10	0.23
Supply chain integration (AVE = .81,, α = .88)		
Cross-functional teams are frequently used for process design and improvement in our firm	0.38	29.44
There is a high level of integration of information systems in our firm	0.28	10.21
There is a great amount of crossover of the activities of our firm and our trading partners	0.43	15.25
Supply chain flexibility (AVE = .41, α = .89)		
Our supply chain is able to		
Rapidly adjust capacity so as to accelerate or decelerate production in response to changes in customer demand	0.95	115.86
Rapidly introduce large numbers of product improvements and variation	0.84	58.62
Handle rapid introduction of new products	0.92	20.13
Competitive advantage (AVE = .18, α = .86)		
We provide customized products	−0.20	0.90
We alter our product offerings to meet client needs	−0.24	0.92
We provide dependable delivery	0.65	1.48
We are able to compete based on quality	−0.33	1.19
We offer products that are highly reliable	0.49	1.49
We offer high-quality products to our customers	−0.46	1.51

less of the combination of items, generated the same results. To continue with this research initiative, we elected to retain even the low weighted items. The measurement properties of the scales and their descriptive statistics are presented in Tables 1.2 and 1.3.

The research hypotheses were also tested with the SMARTPLS 2.0 software (Ringle et al. 2005). Partial least squares (PLS) path modeling was used because it does not require the same rigid adherence to rules about the distribution of the data or the sample size needed for model validation and testing and is more appropriate for our sample size of 75. Test results indicate that no hypotheses were supported in the direction intended. However, we did have a significant negative relationship between supply

Table 1.3 Mean and correlation table

	IS	SCI	SCF	CA
IS	1.00			
SCI	0.12	1.00		
SCF	−0.13	−0.93	1.00	
CA	−0.39	−0.24	0.23	1.00
Mean	3.82	3.24	2.73	3.65
SD	0.39	0.52	0.48	0.56

Note: All correlations are significant

IS information sharing, *SCI* supply chain integration, *SCF* supply chain flexibility, *CA* competitive advantage

Table 1.4 Heuristics of the path model

Hypotheses		Path coefficient	t-value	R^2
H₁:	information sharing → supply chain flexibility	−0.02	0.47	
H₂:	supply chain integration → supply chain flexibility	−0.93	41.86*	0.87
H₃:	supply chain flexibility → competitive advantage	0.23	0.88	0.05

*Significant at $p > .01$

chain integration and supply chain flexibility, but it was not as hypothesized. Given our poor construct validity, this is not surprising. The model explains 87% of the variance in supply chain flexibility and 5% of the variance in competitive advantage (Table 1.4).

1.5   DISCUSSION AND IMPLICATIONS

This exploratory study employed items and constructs that were previously tested by other researchers (e.g., Li et al. 2006). The hypothesized relationships among the constructs were developed based on the tenets of RBV theory and extant literature. In a dynamic manufacturing environment like India, achieving a competitive advantage continues to be an objective, and thus managers need a clear understanding of options available to facilitate this goal. The proposed model examined the influence of information sharing and supply chain integration on supply chain

flexibility and ultimately on competitive advantage in small-scale manufacturing firms.

In our effort to add to the supply chain literature, we undertook this research; however, the findings of the study were not as expected. The first issue is that factor loadings for our constructs were lower than the preferred cutoff. We elected to retain the items because the multi-item scales were operationalized successfully in other research. Handfield (2011) suggested that when models don't work, researchers need to look at the measures. Upon review, we do think the items reflect the concepts intended, but perhaps the emerging market environment played an unexpected role in how the participants responded to the items. Clearly the effort to administer the survey to the owners of small-scale manufacturing should have included a pretest in that environment. Had this step been performed, we might have found that these items do not work in that environment, either due to the lack of advanced understanding of the concepts or because the existing strong relationships and informal communication networks may mean structured, formal procedures are not needed.

The ultimate outcome is that, due to the poorly loaded items, the weak constructs did not work as hypothesized in our model. The only significant finding in this study is that supply chain integration has a negative relationship with supply chain flexibility—which counters our hypothesis. This counterintuitive finding may be due to the nature of small organizations where employees have to perform many roles which, when combined with a culture that values relationships, may translate into respondents who don't see the difference in the two concepts. Based on the poor outcome of our study, we recognize the need for future research. Holweg (2011) stated, "After all, a relevant problem or real-world phenomenon will not go away just because the results did not confirm the predictions derived from existing theory!" (p. 20).

1.6   Directions for Future Research

There are a number of options for future research. Primarily, we need to undertake better scale development to ensure that items selected best represent the overall construct concept. As research progresses, examining the impact of mediating factors such as the age of the company, the level of sophistication of supply chain partners, and the extent of management training can be considered. The mediating and moderating

effects may play an important role in manufacturing in emerging markets like India. Other researchers have successfully used small samples (Auramo et al. 2005; Stank et al. 1999), but the small sample size of this study is a limitation, and researchers should strive for a greater representation of the Indian manufacturing community. Finally, future studies may consider expanding the research into large-scale manufacturing to see how their responses compare to those of the small-scale manufacturing sector.

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