EMPIRICALLY INVESTIGATING THE IMPACT OF SUPPLY EFFORT MANAGEMENT, LOGISTICS CAPABILITIES AND SUPPLY CHAIN MANAGEMENT STRATEGIES ON FIRM PERFORMANCE

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Abstract
The primary objective of this research paper is to empirically probe the various aspects and variables that have been already addressed in the previous literature related to supply effort management, logistics capabilities, supply chain management strategies and firm performance. Further, this research aims to develop a measurement framework and pragmatically prove the framework through a measurement model. First, a factor structure for various constructs is made and the initial validity is determined from practicing managers and academicians. This research employs survey method and the data collected from 358 supply chain professionals working in manufacturing firms in India. A measurement model is developed and proved with various tests of reliability and validity. Finally, four major latent constructs were formulated, namely, supply effort management, logistics capabilities, supply chain management strategies and firm performance. The factor scores of these latent variables were used for further analysis. A seven-stage approach was followed in the analysis of data. Firm performance was regressed against supply effort management, logistics capabilities, and supply chain management strategies. The results indicate that the predictive variable has positive and significant effect on firm performance and they do not have any multi-collinearity effects among them.

Key words: *Firm performance, Logistics capabilities, Supply chain management strategy, Supply effort management*

Introduction
The firm's strategy depends upon various aspects like the firm's behavior, performance of the firm against its competitors, scope of business operation and determinants of success factors for the firm (Rumelt et al. 1994). The supply chain management strategies have become a contemporary component of a firm's strategy. The success of a firm depends upon its SCM practices and its related strategy (Hartley & Choi 1996, Degraeve et al. 2000). The globalization of business has had a tremendous impact on the way companies operate and thus it requires the firms to (i) integrate its partner within a supply chain context (Cooper et al. 1997), (ii) integrate the global manufacturing with logistics capabilities (Bowersox & Closs 1996), **(**iii) expand its supply chain management strategy (SCMS) and philosophy from

its traditional internally focused strategies to modern common goal of efficiency, speed and end customer satisfaction (Harwick 1997).

This study pays attention to the basic question of whether the SCM practices and logistics capabilities lead to an improvement in SCM strategies, which, in turn, results in an improvement of the firm's performance. As our objective is to answer this critical question, this research takes cues from the works of Kenneth et al. (2008), Joy Joong-kun Cho et al. (2008), Wisner (2003), and Chin-Shan Lu et al. (2006). This research aims to build a theoretical model for the firm's performance based on context of SCM practices, logistics capabilities, and supply chain strategy. Data collected from a national sample of Indian manufacturers and supply chain professionals are used to assess the model using structural equation methodology. A review of the related literature was undertaken to formulate this research proposition. The methodology employed in this study is presented. A measurement model is developed and proved with various tests of reliability and validity. Finally, four major latent constructs were formulated, namely, supply effort management, logistics capabilities, supply chain management strategies and firm performance. The factor scores of these latent variables were used for further analysis. **A** six-stage approach was followed in the analysis of data. Firm performance was regressed against supply chain management strategies, logistics capabilities, and supply effort management. The results of regression analysis are then presented. The conclusion, limitation, implications for practicing managers and direction for future research were also discussed in this research paper.

Literature Review and Research Proposition

Supply Effort Management

Earlier studies of SCM focused on various dimensions related to several tasks to manage the supply chain. The efforts to manage the supply chain involves various fundamental activities such as managing supplier relationship, supplier involvement in business process, emphasizing quality on supplier selection, leaning the levels of supplier base and augmentation of the information. These tasks are efficiently handled by various organizations and further developed to manage the organization's supply chain in an effective manner. We operationally define these efforts to manage the organization's supply chain as *supply effort management*. Managing the supply chain efforts involves a deeper understanding of the boundary spanning roles performed by the business processing and value creation teams in the organization. The supply effort management involves planning, implementation and regulating the overall functions related to supply chain, which induces the value creation process in the organization as well. The task of supply effort management involves *(i) Supplier's long-term and strategic relationship:* The relationship between the business networks has undergone a paradigm shift in today's business scenario. The business networks are based on the long-term relationship, and such relationships are strategically positioned for over time. The long-term perspective between the buyer and supplier increases the intensity of buyer–supplier coordination (Helper 1991). By developing long-term relationships in the business network, the suppliers will become a part of a well-managed supply chain, which will have an everlasting effect on the competitiveness of the entire supply chain (Choi & Hartley 1996). Moreover, a high degree of trust will be established through long-term relationships between the buyer and the supplier firms (Bensaou & Venkatraman 1995). A close relationship among the supply-chain partners leads to sharing of information, risks and rewards as well. Thus, the firms can fully rely on each other and further maintain a mutually beneficial relationship (Guimaraes et al. 2002; Cooper & Ellram 1993; Landeros & Monczka 1989). Firms are increasingly relying on their suppliers to help them achieve a stronger competitive position, and such a strong position can be achieved only by developing a sustainable competitive advantage created through long-term relationships with their

suppliers (Ganesan 1994). The close long-term working relationships based on trust form the basis of collaborative advantage (Kanter 1994, Dyer 2000), which then leads a firm to manage the relationship strategically. Moreover, the firms that foster close, cooperative relationships with their suppliers have reported substantial revenue gains and cost savings (Landeros & Monczka 1989, Cooper & Ellram 1993). Zeller and Gillis (1995) demonstrate that businesses can improve their competitiveness and meet their customer's needs by implementing a cooperative, long-term relationship with suppliers. Long-term cooperative relationships have been found to have a positive impact on a firm's competitiveness, especially when the level of uncertainty is relatively high in business situations (Noordewier et al. 1990). The present-day competitiveness has brought a pattern of market-based evolution in SCM. Market orientation of SCM practices has resulted in superior performance in terms of cost, quality, and customer responsiveness (De Toni et al. 1994). Thus, managing for long-term relationship is a major task for supply effort management. (ii) *Supplier involvement*: Supplier involvement is one of the critical aspects of supply effort management. Supplier involvement is important for fundamental design of the product and its development process (Levy 1997, Troyer 1997). Tracey (1998) found that the supplier involvement enhances communication and provides avenues for coordinating activities between the suppliers. Effective supplier involvement improves the utility of technology, reduces supply chain costs, and shortens the order cycle (Morgan 1997). A higher level supplier involvement establishes a pattern of cooperation in continuous improvement efforts (Burt & Soukup 1985, Cooper & Ellram 1993, Epatko 1994, Monczka & Trent 1991, Towler 1996). (iii) *Selection of quality suppliers*: The major focus of the literature on supplier selection is on the different aspects of quality as performance criteria for the selection of a supplier. Dickson (1966) states the important factors to be considered for supplier selection are meeting the requirements of quality standards, delivery time, and performance history. Supplier quality is a critical determinant of the overall product quality and costs, the overall quality performance, which helps supply chain managers to select right sources of supplies with due consideration of time, delivery, and price (Manoochehri, 1984, Treleven, 1987, Baxter et al. 1989). (iv) *Keeping the levels of supplier base lean:* Reduced (lean) supplier base is a unique characteristic of contemporary buyer–supplier relationship (Kekre et al. 1995). With the limited number of suppliers, the firms can forge a close relationship contracting with a smaller number of dedicated suppliers (Kekre et al. 1995, Bozarth et al. 1998, Shin et al. 2000). Supply base reduction policies are positively related to the buyer supplier product design relationship (De Toni & Nassimbeni, 1999). Dyer and Singh (1998) and Kale et al. (2000) argue that strategic purchasing contributes to the development of a supply effort management capability in which close working relationships are established with a limited number of suppliers. Stanley and Wisner (2001) observed that when limited number of suppliers are properly and selectively used, then the firms achieve better customer responsiveness and Carr and Pearson (1999) found that this practice enhanced the firm's financial performance. The study conducted by Guimaraes et al. (2002) proves that various companies have achieved substantial cost savings by reducing the number of suppliers in their supplier base and deepening the relationships with existing suppliers. Moreover, companies are found to gain significant benefits when they place a larger volume of business with a limited number of suppliers using long-term contracts (Helper & Sako 1995, Krause and Ellram 1997, Guimaraes et al. 2002). Companies are streamlining the number of suppliers to obtain competitive advantage (Vijayaraghavan & Raju 2008). Lyons et al. (1990) found that the reduced supplier base builds the closer and longer-term relationships, resulting in a relationship with a few suppliers who then play a critical role contributing to a new product design in some instances. Leaning the supplier base significantly reduces costs and constantly improves quality (Monczka et al. 1993). (v) *Communication:* A study conducted

by Newman and Rhee (1990) found that many problems related to products provided by suppliers were due to poor communication. Another study conducted by Galt and Dale (1991) also states that poor communication is often a fundamental weakness in the interface between a buying firm and its supplier that undermines the buying firm's efforts to achieve higher levels of supplier performance. In managing the supply relationship and its efforts, direct communication with suppliers is inevitable to solve problems (Levy 1997). Integrated interorganizational communication facilitates a closer relationship among the supply chain members in sharing information, risks and returns; moreover, it indirectly makes an amicable level of compactness among the networks, which promote a comforting level of long-term relationship (Guimaraes et al. 2002, Cooper & Ellram, 1993, Landeros & Monczka, 1989). The different modes of communication platforms such as open source to informal channel pave the way for developing and leveraging the tacit knowledge among the channel partners, which enables the whole network to gain strategic advantage (Nonaka & Tekeuchi, 1995). By frequent communication, the firm and its suppliers can enhance their knowledge capabilities and their understating to solve the complex competitive issues by the way of developing innovative solutions. It is evident that the members in the supply chain form strategic alliances for sharing their business time and critical and sensitive information are more successful than others (Mohr & Spekman 1994). Frequent exchange of information on strategic and operational matters builds greater confidence and reduces dysfunctional conflict between partners (Dwyer et al. 1987, Anderson & Weitz 1992). If the firm and its suppliers share information and aim to go beyond the business boundaries like design, engineering, quality, materials procurement, and other defined functions between the buyer and the supplier firms, the performance of the supplier becomes superior (Carter & Miller 1989). Above all, effective communication improves the buying firm's performance (D'Amours et al. 1999, Walton & Marucheck 1997). Communication is an important factor for the development of supply management capabilities (Zollo et al. 2002), supply chain relationships and strategy (Mohr & Sohi 1995). It is obvious that effective communication contributes to the development and maintenance of interorganizational routines that enhance a firm's capability for effectively managing strategic alliance (Zollo et al. 2002).

Thus, all fundamental activities related to managing suppliers' relationship, supplier involvement in business processes, placing emphasis on quality during supplier selection, leaning the levels of supplier base and augmentation of the information are collectively called as supply effort management. Such management leads to the enhancement of SCM strategies and overall performance of the firm as well. Based on the above mentioned relationship, the following hypothesis is derived.

H1: Supply effort management activities are positively influencing supply chain management strategies.

H2: Supply effort management activities are positively influencing the firm's performance.

Logistics Capabilities

Logistics literature is replete with examples of the effect of logistics capabilities and strategy. It has been found that logistics capability can make major contributions towards the achievement of superior performance and sustained competitive advantage. Olavarrieta and Ellinger (1997) cited that logistics capabilities established by superior firms are difficult to duplicate. Hayes and Pisano (1994) stated that a firm's logistics capability is perceived as one of the important parameters to exceed customer expectations and enhance market and financial performance. Hayes et al. (1988) identified five logistics capabilities as drivers to deliver superior value to the customers: cost, quality, flexibility, delivery and innovation. Morash et al. (1996) divided logistics capability into demand-oriented and supply-oriented capabilities. Fawcett et al. (1995) states the following capabilities are essential to achieve

optimal operational performance at a global level: delivery speed, quality service, flexibility, cost and innovation. Zhao et al. (2001) examined the effect of logistics capabilities on the firm's performance. They classified logistics capabilities as customer-focused capabilities and information-focused capabilities. The study indicated that customer-focused capabilities and information-focused capabilities respectively affect a firm performance directly and indirectly. Shang and Marlow (2005) examined the relationship existing among logistics capabilities, logistics performance and financial performance. The Michigan State University study (GLRT at Michigan State University 1995) especially revealed how firms used logistics capability to achieve competitive superiority by consistently meeting customer expectations. This body of the research provides the framework for the current study by relating logistics capability to the firm's performance. This gives rise to our next hypothesis.

H3: Logistics capabilities of the firm are positively associated with supply chain management strategy.

H4: Logistics capabilities of the firm are positively associated with firm performance.

SCM strategies and firm's performance

Porter (1985) stressed in his early theories by presenting discussion of the value system (more commonly referred to as the supply chain at present) and its impact on competitive advantage. The early literature on supply chain contains studies related to SCM and firm's performance. Armistead and Mapes (1993) found that an increasing level of supply chain integration corresponded with increased manufacturing performance. SCM activities were primarily focused on the key process integration throughout the supply chain, which should ultimately lead to a balance between customer requirements and supply chain capabilities (Lummus & Alber 1997). Tyndall (1988) stated that the focus on opportunities for competitive advantage began shifting from inside the manufacturing plant to relationship with suppliers, and then to closer relationship with customers. Morgan (1997) identified that the firms in mid-1990s had embraced SCM philosophies and practices to achieve cost and time efficiency, taking the purchase and logistics function to a new level. Whereas firms now use the advanced operational techniques and tools like EOQ, MRP, MRP II, JIT, TQM, ERP systems as their SCM operational philosophy, which in turn translates into gaining competitive advantage. SCM is now so firmly entrenched in the increasingly global business environment that any competition is fast becoming a competition among supply chains as opposed to the competition between companies (Schuetz et al. 1999). The current studies have explored the relationship between supply chain management strategies and a firm's performance. Brewer and Speh (2000) examined how balance scorecard could be used to leverage a firm's supply chain into a source of competitive advantage. Bowersox et al. (2000) and Oliver and Delbridge (2002) have empirically proved the positive impact of supply chain management strategies on supply chain performance. A study conducted by Tan (2002) that involved senior supply chain and materials managers concluded that SCM practices positively impact a firm's performance. Wisner (2003) hypothesized SCM strategies as a positive predictor of the firm's performance. Wisner (2003) developed a 12-item scale that measures SCM strategies. The scale was utilized for further scale confirmation of this study. Green et al. (2006) found that there are positive links between SCM strategies and both marketing and financial performance of an organization. SCM is described as a "strategic level concept" (Stank et al. 2005). Kenneth et al. (2006) describes SCM is now a strategic tool to improve competitive position and a major concern for top-level management.

The firm's performance has been stated in a variety of ways. Chow et al. (1994) have opined that the definition and measurement of performance is a challenging task for researchers because various organizations have several and frequently conflicting goals. They classified

the measurement of firm performance into hard (objective) measures and soft (perceptual) measures. Venkatraman and Ramanujam (1986) have classified performance into financial performance and non-financial performance. Kaplan and Norton (1992) also suggested a 'balance scorecard' framework, which uses both financial and non-financial metrics to measure performance. Many studies have utilized different types of measures for arriving at a firm's performance in the context of SCM. In this study, the firm's performance is represented by five separate measures: financial performance, market performance, perceived product value, customer loyalty and overall competitive capabilities. Based on the theoretical justification and supporting empirical evidences, the next hypothesis is proposed.

H5: Supply chain management strategies are positively associated with a firm's performance.

An integrated and comprehensive approach keeping all factors (supply effort management, logistics capabilities, supply chain management strategy and firm performance) as a single combined measure is rarely found in the literature. A logical integration of all such factors leads to formulation of the conceptual model and hypothesis. The conceptual model is shown in Figure 1. The details of the model are provided in Table 2. The design of research method is as follows.

Research Dign and Discussion of Rsult

Qualitative Inquiry and Item generation

A set of measurement items was initially developed based on the data available in the literature in relation to supply chain practices and effort involved in managing the supply chain, logistics capability, supply chain strategies and firm performance. Initially 12 items for supply effort management constructs were adopted from Choi & Hartley (1996), Burt & Soukup (1985), Cooper & Ellram (1993) and Guimaraes et al. (2002). Eleven items for logistics capability constructs were adopted from Morash et al. (1996) and Joy Joong-Kun Cho et al. (2008). Twelve items for supply chain strategy construct were adopted from Wisner (2003) and 10 survey items for the firm performance construct were adopted from Fynes & Voss (2002), Zhang Fu-jiang, Titan Ye-zhuang, SUN Xiao-lin (2006), Bryne & Markham (1991), Heskett et al. (1994), LaLonde et al. (1988), McKee et al. (1989), and Slater (1995).

An in-depth interview was used to uncover the various aspects involved in supply chain practices and efforts, logistics capability, supply chain strategies and firm performance. The respondents were recruited on a referral basis. Seven supply chain management faculty members and 22 managers from various cross-functional areas related to supply chain, logistics , procurement , commercial, trade, quality of various manufacturing organizations participated in the in-depth interview. Interviewers were provided with a brief description of the goal of the in-depth interview and respondents were first asked to think about the effects of supply chain effort, logistics capabilities, supply chain strategy on firm performance based on the developed measurement items. The SCM faculty members and the professional managers were also involved to evaluate the items for content and face validity. The practicing managers and the faculty members were given the conceptual definition of supply effort management, logistics capability, supply chain management strategies and firm performance along with illustrative quotes and were instructed to retain items based on their representation of SCM domain and clarity of words. The items that were not clear, not representative of domain, or those were possibly open to misrepresentation or convey similar meaning. Moreover, a substantial number of redundant items were also eliminated from the scale. The authors then reviewed the list of items after elimination and inconsistencies were resolved by discussion among subject matter experts. The resulting items pool contained 33 items, including 9 items for supply effort management, 8 items for logistics capabilities, 10

items for SCM strategies and 6 items for firm performance. Later, the item pool was submitted to a multisample scale purification and validation process.

Scale purification and item analysis

The breath of theoretical content coverage by an item (subjectivity) and empirical considerations were also employed throughout the scale purification process. Scale purification is concerned with detailed item analysis, confirmatory factor analysis, unidimensionality and convergent and discriminant validity. A questionnaire was constructed incorporating the 33 items related to supply effort management (9 items), logistics capability (8 items), supply chain management strategy (10 items) and firm performance (6 items). The sample frame was constructed mainly to target managers at higher levels in the organization such as operations managers, supply chain professionals, logistics managers and quality managers from manufacturing companies. Respondents were contacted face-to-face, by telephone and e-mails. A total of 358 questionnaires were returned from all sources. Hair et al. (2006) states that supply effort management models containing five or fewer constructs, each with more than three items (observed variables), and with high item communalities (0.6 or higher), can be adequately estimated with a sample as small as 100–150. The measurement model for this research has four constructs, each with three or more observed items. The sample size of 358 is, therefore, considered adequate to support the structural equation analysis necessary to assess this causal model.

First, the corrected item-total subscale correlation was examined for each set of items representing various dimensions (supply effort management, logistics capability, supply chain management strategy, firm performance). Items not having a corrected item-total correlation above 0.50 were the candidates for deletion. After careful inspection of item content for domain representation, 10 items having corrected item-total correlation of 0.50 and below were subsequently deleted (2 items representing supply effort management, 3 items representing logistics capability, 4 items representing supply chain management strategy and 1 item representing firm performance). Second, the correlations for items with their hypothesized dimensions were later compared with the remaining dimensions. Items that did not have statistically higher correlation with the dimensions to which they were hypothesized to belong in comparison to other dimensions were subsequently deleted. This procedure resulted in deletion of 2 items from supply effort management, 1 item from logistics capabilities and 2 items from supply chain management strategies, leaving a remaining items pool of 18 items for further analysis. The Cronbach coefficient α values greater than or equal to 0.70 indicates sufficient scale or factor reliability (Graver and Mentzer, 1999). The Cronbach α values for each of the scales exceeding the recommended values indicate sufficient reliability (Table 1). The variance extracted for three factors are above 0.50 and for one factor is 0.41. As a whole, the factors are validated in the hypothesized model (Table 2).

Measurement Model and Validity

Unidimensionality of the supply effort management, logistics capabilities, supply chain management strategies and firm performance scales were assessed by using confirmatory factor analysis as recommended by Gerbing and Anderson (1988). All the four latent construct scales yielded the goodness-of-fit index value is 0.89, which is close to 0.90. The value ≥0.90 (GFI) (Ahire et. al. 1996) is a reasonably good fit. Non-normed-fit index (NNFI) and comparative-fit-index values ≥ 0.90 (Graver & Mentzer 1999), and the root mean square error of approximation (RMSEA) value between 0.05 and 0.08 (Graver & Mentzer 1999) indicates sufficient unidimensionality. Convergent validity for all the four latent constructs scales was assessed using the normed-fit index coefficient as recommended by Ahire et al.

(1996), with values ≥0.9 indicating strong validity (Table 4). Further evidence for convergent validity is shown by *t*-values for factor loads in the model, which are greater than 1.96 and are significant at $p \leq 0.05$ (Table 2). Discriminant validity was tested by modifying this model such that the correlations between the factors were set to 1. Chi-square value for this modified model was $\chi^2_{[84]} = 369.48$. Chi-square difference test showed the original model in which the correlations between factors were independent and which had a significant lower chi-square value $(\Delta \chi^2)_{(4)} = 86.52$. This indicates that the scales have discriminant validity (Fornell & Larcker, 1981).

Investigation of relationship and discussion of results

As our objective is to find the cause and effect relationship, regression analysis was used to explore the impact of supply effort management, logistics capability and supply chain management strategies on the firm performance. A six-stage approach was followed in the analysis of data. Accordingly, supply chain management strategies was first regressed with supply effort management (Table 4) and secondly, the firm performance was regressed against supply effort management (Table 5) and thirdly the supply chain management strategies was regressed against logistics capabilities (Table 6) and fourthly the firm performance was regressed against logistics capabilities (Table 7) and then firm performance was regressed against supply chain management strategies (Table 8).

As the factors of supply effort management, logistics capabilities and supply chain management strategies were assumed to influence each other in determining the firm performance, two more causal models were developed using hierarchical regression that follows a stepwise method. In the first model, the causal effect was tested with the assumption that supply chain management strategies as basic predictor (forced entry) and supply effort management as exploratory predictor with an aim that the factor supply effort management should not predict firm performance if firm performance is indeed distinct from supply effort management (Table 9). In the next model (see Table 10), the causal effect was tested with the assumption that supply chain management strategies as basic predictor (forced entry in step one) and supply effort management as exploratory predictor (in step two) and supply effort management and logistics capabilities as exploratory predictor (in step three) with an aim that the factor supply effort management (as in step two), and the factors of supply effort management and logistics capabilities (as in step three) should not predict firm performance if firm performance is indeed distinct from supply effort management (as in step two), and supply effort management and logistics capabilities (as in step three) respectively.

Supply effort management and Supply chain management strategies

The results of regression analysis performed based on the entire method show that supply effort management has a significant and positive impact (b=.714; p<0.05) on firm performance (Table 4). The R^2 and the adjusted R^2 values indicate the model is fit at 51 % and 50.9 %, respectively. The ANOVA (based on the α value, which is ≤ 0.05) indicated that there is presence of a linear relationship. The factors related to communication, long term relationship, supplier involvement, leaning the supplier base, quality on supplier selection are taken into consideration for supply effort management. If the following issues were considered in supply effort management it will positively influence the firm's supply chain management strategies. Moreover, a clear demonstrable relationship can be shown to exist between investments in supply effort management and formulating supply chain management strategies.

Supply effort management and firm performance

The second regression analysis provided insights into the relationship between the constituent factor of supply effort management and firm performance (see Table 5). Specific supply effort managerial tasks were found to impact the firm performance. They are communication, long-term relationship, supplier involvement, leaning the supplier base and quality on supplier selection. The results suggest that the firm performance should be developed by the efficient practices of various tasks involved in supply chain management. The results of regression analysis shows that supply effort management has a significant and positive effect on firm performance (b=.806; p<0.05). The R^2 and the adjusted R^2 value indicate the model is moderately fit at 64.9 % and 64.8%, respectively. The ANOVA (based on the α value, which is ≤ 0.05) indicated that there is presence of linear relationship.

Logistics capabilities and Supply chain management strategies

The third regression analysis provided insights into the relationship between the constituent factor of logistics capabilities and supply chain management strategies (see Table 6). Specific logistics capabilities were found to impact the supply chain management strategies. They are managing pre and post sales services, covering the distribution by both widespread and selective way, ascertain prompt delivery speed and reliability, efforts to bring low total cost distribution. The results of regression analysis shows that logistics capabilities has a significant and positive effect on supply chain management strategies (b=.678; p<0.05). The R^2 and the adjusted R^2 value indicate the model is moderately fit at 46 % and 45.9 %, respectively. The ANOVA (based on the α value, which is ≤ 0.05) indicated that there is presence of linear relationship.

Logistics capabilities and firm performance

The fourth regression results exhibits the logistics capabilities were found to impact the firm performance (see Table 7). They are managing pre and post sales services, covering the distribution by both widespread and selective way, ascertain prompt delivery speed and reliability, efforts to bring low total cost distribution. The results of regression analysis shows that logistics capabilities has a significant and positive effect on firm performance (b=.760; p<0.05). The R^2 and the adjusted R^2 value indicate the model is moderately fit at 57.7 % and 57.6 %, respectively. The ANOVA (based on the α value, which is ≤ 0.05) indicated that there is presence of linear relationship.

Supply chain management strategies and firm performance

The fifth regression results exhibits that the factors of supply chain management strategies (new ways to integrate supply chain management activities, share customers' future needs, creating trust in supply chain, beyond supply chain of suppliers) has a significant and positive impact (b=.665; p<0.05) on factors of firm performance (Table 8). They are marketing performance, financial performance, perceived product value, customer satisfaction, overall Competitive position. The R^2 and the adjusted R^2 values indicate the model is fit at 44.2 % and 44.0 %, respectively. The ANOVA (based on the α value, which is ≤ 0.05) indicated that there is presence of a linear relationship.

Supply chain management strategies and Supply effort management on firm performance

The results of regression analysis performed based on stepwise method show that supply effort management and supply chain management strategies have a significant and positive impact (b=..676 (supply effort management) b = .182 (supply chain management strategies); p<0.05) on the firm performance (Table 9). If the concerns related to supply effort

management and supply chain management strategies are considered, the firm performance can improve. The R^2 and the adjusted R^2 values indicate the step 2 model is fit at 66.5 % and 66.3 %, respectively.

Supply chain management strategies, Supply effort management and Logistics capabilities on firm performance

The results of regression analysis performed based on stepwise hierarchical method show that supply chain management strategies, supply effort management strategies and logistics capabilities have a significant and positive impact (b=.130 (supply chain management strategies); b = .493 (supply effort management); b = .269 (logistics capabilities); p<0.05) on firm performance (see Table 10). The R^2 and the adjusted R^2 values indicate the step 3 model is fit at 68.8 % and 68.5 %, respectively.

Multicollinearity and interaction effect between the dependent variables on firm performance

It is usual that, when correlation is excessive, standard error of the b and β coefficient become larger, making it difficult or impossible to assess the relative importance of the predictor variables. In such a situation, interaction effect and multicollinearity are a serious problem when the research purpose includes causal modeling like this research. The indicators for identifying the multicollinearity problem in the causal model are based on the value of tolerance and the value of variance-inflation factor (VIF). The results of hierarchical regression (see Table 9) show that the value of tolerance is 0.490 ≥ 0.20, which indicates that there is no problem with multicollinearity and further to substantiate, the value of VIF is 2.042, which is ≤ 4.0, indicating no multicollinearity problem. Thus, it shows that both the predictor variables (supply chain management strategies, supply effort management) do not influence each other in determining the level of firm performance. Likewise the results of hierarchical regression (see Table 10) show that the value of tolerance for supply chain management strategies, supply effort management and logistics capabilities are 0.463, 0.285 and 0.314 respectively, which all are ≥ 0.20, which indicates that there is no problem with multicollinearity and further to substantiate, the value of VIF for supply chain management strategies, supply effort management and logistics capabilities are 2.161, 3.508 and 3.181 respectively, which all are ≤ 4.0, indicating no multicollinearity problem. Thus, it shows that both the predictor variables (supply chain management strategies, supply effort management and logistics capabilities) do not influence each other in determining the level of business performance.

Implication and conclusion

There are few interesting observations that need to be given attention based on this empirical investigation. Primarily, the variables that are related for developing the construct of supplier effort management, logistics capabilities, supply chain management strategies and firm performance are consistent constructs, and have been found to be empirically important in the domain of SCM research. All the observed variables used for survey instrument were also found to have high level of reliability and validity. The estimate loadings of these variables that exhibited high values proves the variables selected for developing the construct holds good. So, the developed instrument is a valid and reliable measurement instrument. Academicians as well as practitioners can use this measurement tool to measure and weigh the firm's supplier effort management, logistics capabilities, supply chain management strategies and firm performance. This research offers a few important advantages to the practicing managers. The knowledge of managing the critical tasks in supply chain activities will be useful for managing various activities in the supply chain.

For example, the criteria like establishing supplier long term relationship, creating avenues to involve supplier in firm's business process, selection of good quality suppliers, leaning the level of supplier base, maintaining frequent communication with suppliers /customers have to be considered for managing the critical activities in supply chain. The scientific way of managing the supply effort will enhance the function of the overall supply chain. In addition, logistics managers have to ponder the decisive factors like managing pre and post sales services, covering the distribution by both widespread and selective way, ascertain prompt delivery speed and reliability, efforts to bring low total cost distribution will synergize the overall function of supply chain. Further, managers have to think on the various tasks involved in supply chain management strategies. The tasks like searching for new ways to integrate supply chain management activities, establishing communication platform to share customers' future needs, creating a greater level of trust in whole supply chain, extending supply chain beyond the firm's suppliers / customers will also enhance the overall function in managing the supply chain. Moreover, the indicators related to financial performance, market performance and competiveness of the firm will provide a guiding principle for measuring the performance of the firm.

The seven causal models that were tested confirm that the predictor variables (supply effort management, logistics capabilities, and supply chain management strategies) are positively influencing the firm performance. Among the three predictor variables, supply effort management has the most significant effect on firm performance than others. Later, it was found that there is no multicollinearity problem among the predictor variables. The results of various causal models were discussed with subject matter experts. The discussion reveals that the managers of manufacturing firm have to invest more effort in managing the supply chain tasks. It is recommended that the supply effort management, logistics, supply chain strategies functions have to be managed separately because of the nature of task. Though these three functions have to be managed separately, special integrating tasks should be identified and further appreciation of such tasks to be made to make proper coordination among them.

Rsearch Litation and Frther direction

This research is not without limitation. The scale is validated based on convergent and discriminant validity. The scale can also be validated by taking further process of performing replicate confirmatory factor analysis and thereby nomological and predictive validity can be measured. In future, this process can be undertaken to strengthen the validity of the measurement tool. In terms of research construct, new dimensions of construct related to professional way of managing supply chain like supplier certification and supplier integration can be included in supply effort management criteria. The concerns related to strategic issues like system dynamics, business process, organizational culture and dynamics can also be incorporated in the construct of business performance. This research has concentrated on first-tier supplier and hence the future research can address the secondary level of suppliers and further the issues related to the interaction effects of both primary and secondary level of suppliers can also be addressed. This research measures the causal relation based on simple and multiple regression analyses only. The advanced statistical analytical tool like partial least square regression, ordinal least square regression and structural equation model can be used for understanding the causal relationship.

Table 1. Measurement scales

Supply Effort Management	**(Cronbach alpha 0.924, 5 items)**
Please indicate the importance of each of the following issues/concerns to your organization's supply chain management efforts (1 = low importance, 7 = high importance)	
SEM 1: Establishing supplier long term relationship *	
SEM 2: Creating avenues to involve supplier in firm's business process	
SEM 3: Selection of good quality suppliers	
SEM 4: Leaning the level of supplier base	
SEM 5: Maintaining frequent communication with suppliers /customers	
Logistics Capabilities	**(Cronbach alpha 0.90, 4 items)**
Please indicate the importance of each of the following issues/concerns to your organization's logistics capabilities (1 = low importance, 7 = high importance)	
LC 1: Managing pre and post sales services *	
LC 2: Covering the distribution by both widespread and selective way *	
LC 3: Ascertain prompt delivery speed and reliability *	
LC 4: Efforts to bring low total cost distribution *	
Supply Chain Management Strategies	**(Cronbach alpha 0.801, 4 items)**
Please indicate the importance of each of the following issues/concerns to your organization's supply chain management strategies (1 = low importance, 7 = high importance)	
SCMS 1: Searching for new ways to integrate supply chain management activities *	
SCMS 2: Establishing communication platform to share customers' future needs *	
SCMS 3: Creating a greater level of trust in whole supply chain*	
SCMS 4: Extending supply chain beyond the firm's suppliers / customers	
Firm Performance	**(Cronbach alpha 0.769, 5 items)**
Please indicate the importance of each of the following issues/concerns to your firm performance (1 = low importance, 7 = high importance)	
FP 1: Performance related to marketing aspects such as market share, sales volume. *	
FP 2: Performance related to financial aspects like ROI, ROA, ROS and Valuation of the firm.*	
FP 3: Customer perception on product value *	
FP 4: Ability to create customer satisfaction	
FP 5: Withstanding in the overall competition position by the firm *	

* Scale modified based on suggestion by Subject Matter Experts

Table 2. Results of measurement model

Indicator Variables and their underlying factor	**Factor Estimate**	***t*-Value**	**Error term**	R^2	**Variance extracted**
Supply effort management (ξ_1)					0.7167
SEM 1: Supplier long term relationship (x_{11})	1.30	18.56	0.84	0.67	
SEM 2: Supplier Involvement (x_{12})	1.38	21.20	0.52	0.78	
SEM 3: Selection of quality suppliers (x_{13})	1.41	21.93	0.44	0.82	
SEM 4: Leaning supplier base (x_{14})	1.30	19.78	0.64	0.72	
SEM 5: Communication (x_{15})	1.16	16.68	0.99	0.57	
Logistics Capabilities (ξ_2)					0.7061
LC 1: Managing pre and post sales services (x_{21})	1.21	16.82	1.02	0.58	
LC 2: Coverage of distribution network (x_{22})	1.34	21.13	0.47	0.79	
LC 3: Delivery speed and reliability (x_{23})	1.36	21.36	0.45	0.80	
LC 4: Low total cost distribution (x_{24})	1.28	17.80	0.93	0.63	
Supply Chain Management Strategies (η_1)					0.5473
SCMS 1: New ways to integrate SCM activities (y_{31})	0.74	8.60	2.09	0.20	
SCMS 2: Share customers' future needs (y_{32})	1.20	15.51	1.21	0.54	
SCMS 3: Creating trust in supply chain (y_{33})	1.37	19.72	0.59	0.76	
SCMS 4: Beyond SC of suppliers (y_{34})	1.27	18.07	0.78	0.66	
Firm Performance(η_2)					0.4177
FP 1: Marketing Performance (y_{41})	0.82	10.33	1.64	0.28	
FP 2: Financial Performance (y_{42})	0.71	9.05	1.68	0.22	
FP 3: Perceived product value (y_{43})	0.85	11.16	1.47	0.32	
FP 4: Customer satisfaction (y_{44})	1.21	17.96	0.68	0.68	
FP 5: Overall Competitive position (y_{45})	1.14	15.53	1.04	0.54	

Table 3. Fit Index of SEM model

Fit Index	Acceptable Threshold Levels and Description	Fit Indices of SEM Model.
1. Absolute Fit Indices		
χ^2	Low χ^2 relative to degree of freedom with an insignificant *p* value	χ^2 for the independent model with 153 *df* is 13207.21. χ^2 value is high due to large sample size.
Root Mean square error of approximation (RMSEA)	Has a known distribution, favors parsimony. Value $\leq$ 0.03 represents excellent fit, Value $\leq$ 0.05 represents good fit, and Value $\leq$ 0.08 represents adequate fit.	RMSEA is equal to 0.077 represents moderate fit.
GFI	Scaled between 0 and 1, with higher value indicates better model fit.	GFI is equal to 0.89 represents good fit.
AGFI	Adjusts the GFI based on the number of parameters in the model. Value $\geq$ 0.90 represents good fit.	AGFI is equal to 0.85 represents moderate fit.
RMR	Good model have small RMR.	RMR is equal to 0.12 represents good fit.
SRMR	Standardized version of RMR. SRMR $\leq$ 0.08 is good fit	SRMS is equal to 0.049
2. Incremental Fit Indices		
NFI	Assessing fit relative to a baseline model which assumes no covariance between the observed variable Value $\geq$ 0.95 indicates strong fit.	NFI is equal to 0.97 indicates strong fit.
NNFI	Non-normed, values can fall outside the 0-1 range. Favours parsimony. Value $\geq$ 0.95 indicates strong fit	NNFI is equal to 0.97 indicates strong fit.
CFI	Normed, 0-1 range. Value $\geq$0.95 indicates strong fit	CFI is equal to 0.98 indicates strong fit
3. Fit Index Combination		
NNFI and SRMR	NNFI of 0.96 or higher and an SRMR OF 0.09 or lower	NNFI is 0.97 and SRMR is 0.049 indicates excellent combination fit index
CFI and SRMR	CFI of 0.96 or higher and a SRMR of 0.09 or lower	CFI is 0.98 and SRMR is 0.049 indicates excellent combination fit index

Table 4. Regression results of supply chain management strategies against supply effort management

Variables	***b***	***SE b***	***β***
Constant	-2.787	.037	
Supply effort management	.714	.037	.714*

R^2 = .510, P ≤ 0.05, n=358*

Table 5. Regression results firm performance against supply effort management

Variables	***b***	***SE b***	***β***
Constant	-1.039	.031	
Supply effort management	.806	.031	.806*

R^2 = .649, P ≤ 0.05, n=358*

Table 6. Regression results supply chain management strategies against logistics capabilities

Variables	***b***	***SE b***	***β***
Constant	-1.674	.039	
Logistics capabilities	.678	.039	.678*

R^2 =.460, P ≤ 0.05, n=358*

Table 7. Regression results firm performance against logistics capabilities

Variables	***b***	***SE b***	***β***
Constant	-1.143	.034	
Logistics capabilities	.760	.034	.760*

R^2 =.577, P ≤ 0.05, n=358*

Table 8. Regression results firm performance against supply chain management strategies

Variables	***b***	***SE b***	***β***
Constant	-1.117	.040	
Logistics capabilities	.665	.040	.665*

R^2 = .442, P ≤ 0.05, n=358*

Table 9. Regression results firm performance against supply chain management strategies and supply effort management

Variables		*b*	*SE b*	*β*	*Tolerance*	*VIF*
Step 1	*Constant*	-1.117	.040			
	Supply chain management strategies	.665	.040	.665*	1.00	1.00
Step 2	*Constant*	-9.883	.031			
	Supply chain management strategies	.182	.044	.182*	.490	2.042
	Supply effort management	.676	.044	.676*	.490	2.042

R^2 = .442 for Step 1: *∆ R^2 =.0.224 for Step 2, P ≤ 0.05*, n = 358.*
Durbin-Watson measure = 1.823(independent error is tenable)

Table 10. Regression results firm performance against supply chain management strategies and supply effort management

Variables		*b*	*SE b*	*β*	*Tolerance*	*VIF*
Step 1	*Constant*	-1.117	.040			
	Supply chain management strategies	.665	.040	.665*	1.00	1.00
Step 2	*Constant*	-9.883	.031			
	Supply chain management strategies	.182	.044	.182*	.490	2.042
	Supply effort management	.676	.044	.676*	.490	2.042
Step 3	*Constant*	-1.672	.030			
	Supply chain management strategies	.130	.044	.130*	.436	2.161
	Supply effort management	.493	.056	.493*	.285	3.508
	Logistics capabilities	.269	.053	.269	.314	3.181

R^2 = .442 for Step 1: *∆ R^2 =.0.224 for Step 2, ∆ R^2 =.0. for Step 3, P ≤ 0.05*, n = 358.*
Durbin-Watson measure = 1.823(independent error is tenable)

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