Development, measurement and validation of supply chain performance measurement (SCPM) scale in Indian retail sector

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Abstract

Purpose – The purpose of this paper is to develop a scale with a high degree of reliability, validity and dimensionality which help to determine appropriate supply chain performance measurement (SCPM).
Design/methodology/approach – The data were compiled and collected from 213 operations and supply chain heads from leading retail stores in India. Confirmatory factor analysis was used to test the validity of the proposed measurement scale.
Findings – The major contribution of the present study is the development of SCPM constructs as well as a rigorously validated measurement instrument. The confirmation process is according to the typical standards of scale development.
Research limitations/implications – This paper strives to contribute to the literature on the SCPM in Indian retail industry. This paper tests the validity of the measurement scales which will enable the managers to determine the appropriate SCPM.
Practical implications – In the long run a good set of identified SCPM and their implementation would inevitability enables in deriving meticulous supply chain strategies.
Social implications – SCM managers in evaluating their current supply chain performance. This can help the managers to identify the strengths and weaknesses of their supply chain.
Originality/value – This study proved that the SCPM can be used from different perspectives, all of which are integrated into one exclusive assessment instrument, applied to the SCPM in this case.

Keywords Performance measurement, Supply chain management
Paper type Research paper

1. Introduction

India is now the major frontier for globalized retail. In the last two decades, since the economic liberalization of 1991, India's middle class has greatly expanded and so has its purchasing power. But over the years, unlike other major emerging economies, India has been slow to open its retail sector to foreign investment. Recent policy changes from the government however clearly suggest that this may be about to change: global supermarket chain stores such as Wal-Mart (USA), Carrefour (France), Marks and Spencer and Tesco (UK) and Shoprite (South Africa) are finally allowed to set up shops in India (Chari and Raghavan, 2012).

Retailing is one of the world's largest private industries. Fierce competition in today's global markets, the introduction of products with shorter life cycles, and heightened expectation of customers have forced business enterprises to invest in, and focus attention on managing their supply chains. This, together with continuing advances in

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retail sector in Indian context have motivated the continuous evolution of the supply chain and of the techniques to manage it effectively. In the past few decades, large retailers have experienced substantial growth around the world. Evidence suggests while the impact of entry by large retail chains on employment and incumbent mom-and-pop stores is mixed, there can be substantial benefits to consumers in the form of lower prices and lowered food price inflation in particular. Similarly, by employing improved distribution and warehousing technologies, large retail chains are in a position to provide better price signals to farmers and to serve as a platform for enhanced exports. At the same time, public outcry over the impact of these chain stores on other retailers and local communities is reported around the world. Small retailers, farmers and even large organized competition have concerns about the entry of large global chain stores. On balance, however, in this paper, it can be opined that opening up foreign direct investment (FDI) in India to multi-brand retailers from abroad may be a catalyst to growth and the development of the retail industry, with positive externalities for the rest of the economy. Liberalizations in FDI, FDI are expected to cause a massive restructuring in retail industry by 2020. The benefits of FDI in retail industry superimpose its cost factors. Opening the retail industry to FDI will bring forth benefits in terms of advance employment, organized retail stores, availability of quality products at a better and cheaper price. It enables a country's product or service to enter into the global market, for which efficient supply chain management (SCM) is key for retail sector success.

Supply chain performance and effective management of supply chain have been increasingly recognized as critical factors in enhancing bottom-line performances. More and more firms are beginning to adopt SCM to improve performances of their organizations (Arawati, 2011). In measuring performance in the supply chain, where control is no longer based on ownership only, but rather on networking across interfaces, the measurement system may reflect a system of measuring the immeasurable. Activities not under the direct control of an individual company (i.e. a manufacturer) have to be measured and controlled (by the manufacturer and its supply chain partners), making the supply chain transparent, to a level not experienced before and leading the way for performance improvements (Hoek, 1998). The growing importance of the management of supply chains has motivated researchers and practitioners to develop and implement measures that can be used to establish supply chain performance. The measurement of supply chain performance requires the creation of an inter-organizational and intra-organization assessment system. Such systems can feasibly be used to identify opportunities for improved supply chain efficiency and competitiveness, to help understand how companies operating in supply chains affect each other's performance, to support the supply chain in satisfying consumer requirements and to assess the result of an implemented initiative (Lyons *et al.*, 2012).

Supply chain performance measurement (SCPM) is framed on the basis of appropriate key performance indicators (KPIs) of the firm. Three SCPMs are evident in SCM literature: cost efficiency, time responsiveness and hybrid of the two which are popularly studied as traditional and relationship or hard and soft parameters. However, there is a deficiency of standard constructs for supply chains in the SCPM literature. Thus, this research work addresses the issue of lack of such standard constructs in frameworks for SCPM in retail sector within Indian context. This objective is achieved by evaluating reliability and validity of the identified constructs from the literature review with the help of structured interview conducted in an exploratory study within the Indian retail industry.

In this paper, an attempt is made to explore the various SCPMs in the Indian retail sector and validate them for the benefit of the retail practitioners.

2. Review of literature

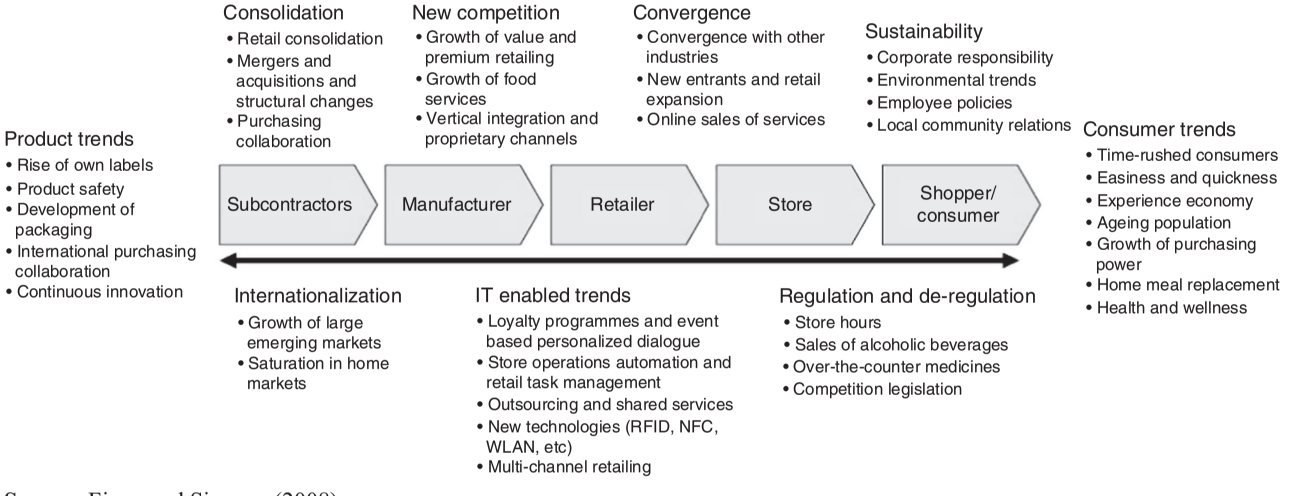
2.1 Retail SCPM

Retailing is a significant part of economic activities of both developed and developing countries' economies, with wholesaling and retailing value-added. The major goal of the retail industry or retail merchandising system is to influence possible consumers to purchase a particular products assortment at a particular retail store (Risch, 1991). Retail activities turnout to be one of the significant themes playing the role in SCM and logistics (Supasansanee and Kasiphongphaisan, 2009). Retail supply chain can be a difficult network, as in the retail world, this network involves getting product from the right vendors to the right customers, while minimizing inventory levels, warehousing and transportation cost.

Customers are ever-more demanding and retailers are competing to please them, and the consumer demand in the market becomes increasingly heterogeneous. The internet has changed the availability of information in the retail value chain; consumers have more knowledge about products and services than ever, and can sometimes even participate in retail processes such as development of products and the choice of products offered (referred to as the assortments). The key challenge for retailers and manufacturers is to identify the most important trends affecting their operations, assess the effects and take actions to respond to them. In retail supply chain integration, the firm integrates its own value chain with the value chains of its business partners for systematic exploitation of the shared resources to provide greatest value to end users by way of better communication and share confidential information resulting into high level of trust and loyalty (Agrawal, 2010; Goyal, 2012). Figure 1 summarizes some key trends affecting the retail value chain and its players.

Organized retail enterprises play a central role in the construction of supply chain, and they need to centralize, integrated supply is a strongly supporting role in purchasing link, logistics link, and consumption link in the whole chain, which improves the comprehensive competitiveness of the whole supply chain (Guangliang, 2011). Supply chain competition becomes the main form of competition among enterprises. Supply chain facilitates not only the benefit for the enterprise, but also brings the challenges faced for performance measurements (PMs) at the same time. The retail enterprises have a large number of material flows. So retail enterprises supply chain may be damaged and there exist potential threats as the external environment of supply chain is uncertain and unexpected as well as the supply chain itself is vulnerable. Hence it is of great important theoretical and practical significance for SCPM (Hou *et al.*, 2011). As global competition increases, retail companies should be more involved in how their suppliers and customers conduct business. They need to focus on SCM programmes that have significant impact on enhancing SCM activities such as where quality materials come from, how products are designed and assembled, how finished products are distributed and what consumers really need (Arawati, 2011). Previous research has concentrated largely on various aspects of supply chain performance as a field which vary with many dimensions of SCPM, e.g. from supplier selection to customer roles from intra and inter organization and latest Triple-A supply chain performance (Cirtita *et al.*, 2012; Whitten *et al.*, 2012). The United States Agency for International Development defines "performance" as the current output and quality

Figure 1.
Key change drivers in the retail value chain



Source: Finne and Sivonen (2008)

of work made. Even though this definition is considerably similar to that used for efficiency, it is crucial to note the key differences. Performance assesses output, while efficiency assesses the method in which output is carried out. PM refers to the process of evaluating action, where measurement is the process of assessment and action leads to performance (Neely *et al.*, 1995). Logistics performance measures are key indicators of the work carried out and the results achieved in an organizational unit (Forbes.com, 2006; Janvier-James, 2012).

The proposed aims of retail PM system or framework are as follows (Rolstadas, 1995; Janvier-James, 2012):

- It must support the decision-making process, by showing where to operate, how to operate and by controlling the impact of implemented action plans.
- The system must control the impact of strategic plans, so that amendments can be made to guarantee the accomplishment of long-term goals.
- PM is necessary for internal objectives and for satisfying requirements from diverse external stakeholders.
- The system must have analytic properties, so that alarm can be given in advance of declining business performance.
- PM is a constituent of a constant improvement process.
- Measurement of improvement has a simulative impact on the labour force of a business and is important to substantiate further effort in any amelioration process.
- The evaluation of performance is important for comparison and for identifying performance apertures.
- Records must be kept of all corporate activities, and then they can be provided on request to suppliers and customers. A record of supplier performance can be used to provide input to their amelioration processes.

Despite several evidences suggesting that performance improvements are related to SCM (Christopher, 1998; Bhasin, 2008), with a few exceptions, performance improvements rarely support their suggestions with statistical evidences. There are relatively few empirical studies exist to measure the extent of performance improvements resulted from SCM especially in the India retail sector context, i.e., the overall efficiency and effectiveness of SCM. The first universal performance measures that were used in SCPM were generated by Pittiglio, Rabin, Todd and McGrath, widely known as PRTM (Wong and Wong, 2008). Interest in PM and management has notably increased in the last 20 years (Taticchi, 2008; Gopal and Thakkar, 2012).

2.1.1 PM: a review. The debate on how best to measure supply chain performance is still active (Chan *et al.*, 2003; Chen and Paulraj, 2004; Shepherd and Gunter, 2006; Flynn *et al.*, 2010b). Some studies used predictor variables that can help explain why some supply chains perform better than others. Gunasekaran *et al.* (2001) presented a list of key supply chain performance metrics, classified at strategic, tactical and operational levels. Zelbst *et al.* (2009) recognize supply chain performance as the ability to satisfy the ultimate customer in terms of quality and cost. Chan and Qi (2003a, b) proposed a process-based approach to mapping and analysing supply chains and suggest a model for SCPM (Ibrahim and Ogunyemi, 2012).

To respond to the current requirements for SCPM, a set of new measures have been suggested and are used in the literature. For example, Stevens (1990) suggested that an organization measures the performance of supply chain in terms of inventory level, service level, throughput efficiency, supplier performance and cost. A consortium of organizations and academic institutions developed a set of agreed-upon supply chain metrics that can be used as standards. These measures fall into one of four categories: customer satisfaction/quality, time, cost and assets (Pittiglio *et al.*, 1994). Narasimhan and Jayaram (1998) used the customer responsiveness and manufacturing performance as the measures for SCM performance. Spekman *et al.* (1998) used cost reduction and customer satisfaction as the SCM measures. Hewitt (1999) recommended customer satisfaction, return on trading assets and flexibility as the measurements for a supply chain performance. Beamon (1998) identified several qualitative SCM performance measures such as customer satisfaction, flexibility, information and material flow integration, effective risk management and supplier performance. It can be seen that each of above researchers, more or less, have addressed some dimensions of SCM performance measures, but not all. Among all measures, customer responsiveness/satisfaction received the most recognition.

PM can only help to identify the problems existing in the current supply chain. The most popular framework, not specifically designed for the measurement of performance but for the general description of supply chain processes, is the supply chain operations reference (SCOR) model proposed by the Supply-Chain Council. This model suggests to measure performance based on five key supply chain processes that are plan, source, make, deliver and return. In fact, performance metrics can be developed over these five processes for the individual companies in the supply chain as well as for the entire network. Though widely used in practice, the SCOR model never gained real attention from academia. Other frameworks were also proposed by academics (Chan and Qi, 2003a, b; Chan *et al.*, 2003; Gunasekaran *et al.*, 2004; Beamon, 1999a, b; Berrah and Clivillé, 2007) but found little implementation in practice (Taticchi *et al.*, 2013).

In the 1990s, the role of various business-related perspectives and the associated financial and non-financial performance indicators became an important topic for professionals and researchers. In this manner, the balance score Card (BSC) provided relevant information about the performance of the organization, particularly in relation to the key strategic objectives. At that time, the new management tool enabled the description and communication of strategies to all employees and a link to budget of the organization (León-Soriano *et al.*, 2010; Janeš and Faganel, 2013). The biggest advantage of the BSC, as compared to other approaches or models, is its ability to integrate the capabilities of the various perspectives of the company: financial and non-financial, as well as internal and external. From the business practice, it is also known that 80-90 per cent of organizations are not successful in the execution of their chosen strategy. The reason, according to the experts and authors of the BSC, relies in the fact that such organizations do not know how to properly describe, measure and manage their strategies (Barnabe and Busco, 2012; Norton and Russell, 2011). Although it is much, of the written above, acclaimed, there seems to be some confusion, both in practice and among academics, with respect to how this cause-effect principle should be interpreted and implemented (Bukh and Malmi, 2005; Nørreklit, 2000). Implementation of the BSC has triggered many debates and academic-professional publications that were looking for solutions to the lack of clarity regarding the

definition of BSC causal relations and the selection and classification of KPIs (Bititci *et al.*, 2006).

The Performance Prism is a second generation measurement framework designed to assist PM selection the vital process of picking the right measures. It is a comprehensive measurement framework that addresses the key business issues to which a wide variety of organizations, profit and not-for-profit, will be able to relate. It explicitly asks critical questions and encourages managers to think through the links between measures in a way that other frameworks do not intuitively suggest (Neely *et al.*, 2001).

The performance prism has a much more comprehensive view of different stakeholders (e.g. investors, customers, employees, regulators and suppliers) than other frameworks. Neely *et al.* (2001) argue that the common belief that performance measures should be strictly derived from strategy is incorrect. It is the wants and needs of stakeholders that must be considered first. Then, the strategies can be formulated (Neely *et al.*, 2001). Thus, it is not possible to form a proper strategy before the stakeholders and their needs have been clearly identified.

However, although the performance prism extends beyond "traditional" PM, it offers little about how the performance measures are going to be realised. Neely and co-workers have previously published many useful tools in this area and should, if possible, create a better link between such tools and the performance prism (Tangen, 2004).

Many authors such as Cavinato (1992), Ellram and Feitzinger (1997) and Hergert and Morris (1989) have studied measurement in supply chain context in various disciplines. Table I highlights contributions and the approaches used in brief.

Nine major dimensions of Supply Chain Performance are proposed based on the studies presented in Table I, which encompass three types of PMs as suggested by Beamon (1999a, b): relationship measures (supplier performance (output measure), partnership quality) and traditional measures (efficiency, quality, supply chain flexibility (flexibility measure), supply chain integration (resource measure), product innovation, customer responsiveness (output measure), supplier responsiveness, market performance and supply chain integration).

2.1.1.1 Traditional measures. PM typically relies on functionally focused financial measures. For the most part, financial accounting measures tend to be historically oriented and do not provide a forward-looking perspective. They also typically do not relate to important strategic non-financial performance measures, like customer service, loyalty and product quality, and do not tie directly to operational effectiveness and efficiency. Within such traditional frameworks, each functional area measures its performance on its own terms, with individuals being evaluated based on their ability to meet objectives consistent with department (or at best, process) measures. When each functional area establishes its performance in isolation, it often leads to silos and conflicting organizational goals. Similarly, organizations that establish functional and process PM systems in isolation from the other.

2.1.1.2 Supply chain flexibility. Lummus *et al.* (2005) view flexibility as a subset of agility, and in a study of expert opinions define "supply chain flexibility" as the ability of a company to adapt its operations and influence their suppliers to accommodate for demand variability and changes needed for new products in a timely manner. Beamon (1999a, b) suggested a framework with three types of performance measures flexibility, resource and output. Ibrahim and Ogunyemi (2012) view, "flexibility" measures the "effectiveness" of a supply chain in responding to changes in terms of product design, delivery times, volume and mix.

Author	Year	Title	Focus	Contribution/approach
Kanji and Wong	(1999)	Business excellence model for supply chain management	Supply and business excellence	Develops an excellence model similar to EQQM. Verifies the model with a survey. Emphasis is on the concept of extended total quality management and the need for excellence in all processes
Perea *et al.*	(2000)	Dynamic modelling and classical control theory for supply chain management (SCM)	Supply chain modelling with dynamic modelling	Development of a dynamic model involving laws and state transitions
Stock *et al.*	(2000)	Enterprise logistics and supply chain structure: role of fit	Logistics and supply chain structure elements. Concept of fit	Review section comprehensive and develops a framework of fit between logistics integration and supply chain structure. Defines fit variables and analyses with a survey
Gunasekaran *et al.*	(2004)	A framework for supply chain performance measurement	Performance measurement	Measurement and metrics classification. Involves survey. Assessing importance for each performance measure
Lockamy and McCormack	(2004)	Linking SCOR planning practices to supply chain performance	SCOR planning practice and supply chain performance relationships	Survey-based study to investigate relationship of SCOR planning practices and performance
McCormack and Lockamy	(2004)	The development of a supply chain management process maturity model using concepts of business process orientation	Maturity model and performance relationship	Develops a maturity model having a business process view. Defines 5 levels of maturity and performs a survey to investigate the relationship of maturity and performance
Meixell and Gargeya	(2005)	Global supply chain design	Emerging issues in global supply chain	Comprehensive review and classification. Critiques emerging trends in historical perspective. Emphasizes outsourcing, vendor managed inventory (VMI), integration across tiers, internal and external integration, and performance measurement criteria

Table I.
Chronological summary of studies in supply chain management field

(*continued*)

Author	Year	Title	Focus	Contribution/approach
Robinson and Malhotra	(2005)	Defining the supply chain quality management and its relevance to academic and industrial practice	Supply chain quality focus-extended quality	Defines supply chain quality management merges quality and supply domain. Provides a very comprehensive taxonomy. Idea of supply chain excellence is emphasized. Provides clear support for overall performance measurement. Includes a survey-based study
Gunasekaran and Ngai	(2009)	Performance measurement and costing system in new enterprise	Performance-based costing system for the new enterprise	Comprehensive discussion of pressures and approaches for the new organization. Direct justification for the need of a new performance measurement and costing system. Development of a framework.
Yao and Liu	(2006)	An integrated approach for measuring supply chain performance	Economic value added (EVC), Balance score card (BSC) and ABC in supply chain	Combines EVA, BSC, ABC. Suggests use of various KPIs and a framework
Vonderembse *et al.*	(2006)	Designing supply chains: towards theory development	Product life cycle supply chain types matching, including agility and lean classifications	Detailed descriptions of lean and agile supply chain, tries to match product life cycles and product types with different supply chain types. Supports with three cases
Geiger *et al.*	(2006)	Strategy/structure fit and firm performance	Relationship between fit and performance	Emphasizes the mediating effect of industry concentration between fit and performance. Contains manufacturing-based survey. Develops a relation to measure return on assets
Gunasekaran and Kobu	(2007)	Performance measures and metrics: a review of recent literature	Supply chain performance measurement	Comprehensive review and classification. Justification for the need of new metrics to support new organizations. Need and purpose of performance measurement, criteria for

(*continued*)

Table I.

Author	Year	Title	Focus	Contribution/approach
				successful metrics well discussed. Classification of different measurement perspectives
Ho	(2007)	Measuring system performance of an enterprise resource planning (ERP)-based supply chain	ERP-based supply chain performance	Proposes an integrated method, total related cost measurement, to evaluate supply chain performance of a 3-echelon, ERP-based supply chain system. Uses simulation-based validation experiments
Bhagwat and Sharma	(2007a)	Performance measurement of supply chain management using the hierarchical process	Prioritization and choice of metrics and measures	Proposes 5 classes of metrics and proposes an Analytical Hierarchy Process (AHP) approach. Supports with a survey. Comprehensive review of BSC and AHP
Swafford *et al.*	(2008)	Achieving supply chain agility through information technology (IT) integration and flexibility	Relationship among IT integration, supply chain flexibility, supply chain agility and business performance	Tests the relationships of IT integration, supply chain flexibility, supply chain agility and competitive business performance
Puigjaner and Lainez	(2008)	Capturing dynamics in integrated supply chain management (SCM)	Dynamic behaviour modelling	Multi-stage, multi-period, stochastic mixed integer linear model combined with control theory. Develops a strategic-level model, uses forecasting, optimization and simulation in tandem, analyses results using sample scenarios. The model involves demand and price uncertainty, financials (assets, liabilities, credit policies, capacity expansion and shareholder value)
Bernardes and Zsidisin	(2008)	An examination of strategic supply management benefits and performance implications	Relation of strategic supply chain management with the concepts of network embeddedness and network scanning	Survey-based study focusing on network embeddedness and scanning. Rigorous statistical treatment

Table I. (*continued*)

Author	Year	Title	Focus	Contribution/approach
McCormack *et al.*	(2008)	Supply chain maturity and performance in Brazil	Innovative performance measurement and maturity model	Takes the SCOR model and business process orientation maturity model as base. Develops a Brazilian survey. Provides clear support for new performance measurement and maturity model. Includes clear support for the development of new performance measurement methodologies and clearly emphasizes the need and importance of survey-based studies
Cai *et al.*	(2008)	Improving supply chain performance management: a systemic approach to analysing iterative KPI accomplishment	Dependence and priority modelling of KPIs	Challenges, intricacy dependency and conflicts of performance measurement system. Iterative, analytical approach based on eigenvalues. Tries to model dependency on KPIs. Checks the cost of improving KPIs at each iteration
Butterman *et al.*	(2008)	Contingency theory "fit" as gestalt: an application to supply chain management	Fit of strategy, structure and IT	Survey-based clustering analysis for fit of strategy, structure and IT variables. Ends up with 6 levels of maturity. Clustering levels can be a base for our study. A critical application of theory of "fit" to supply chain
Hwang *et al.*	(2008)	The performance evaluation of SCOR sourcing process	SCOR-based Taiwanian case study to evaluate sourcing	SCOR overview, Taiwanian LCD sector questionnaire, stepwise regression analysis to analyse dependency of measures and a rigorous statistical test and justification
Martin and Patterson	(2009)	On measuring company performance within a supply chain	Identification of different performance measures	Defines three main classes of performance measures: inventory, cycle time and financials.

(*continued*)

Table I.

Author	Year	Title	Focus	Contribution/approach
				Uses a survey to investigate the effects of supply relations organizational structure, partnering, supplier agreements and process improvements
Wouters	(2009)	A developmental approach to performance measures: results from a longitudinal case study	Concept of enabling performance management	Challenges of performance measurement, a company-based study, need of developmental approach in performance measurement, importance of delegating the performance measurement at every level of hierarchy. Emphasizes the idea of "metrics for people"

Table I.

2.1.1.3 Supply chain integration. Supply chain integration is defined as the extent to which all activities within an organization and the activities of its suppliers, customers and other supply chain members are integrated together (Stock *et al.*, 1998; Narasimhan and Jayaram, 1998; Wood, 1997). Flynn *et al.* (2010a) argued that supply chain integration is a multi-dimensional concept and "that the diverse dimensions of supply chain integration can ultimately be collapsed into three dimensions: customer, supplier and internal" (Gimenez *et al.*, 2012).

2.1.1.4 Responsiveness to customer. Responsiveness to customer is defined as the speed of an organization's response to the customer requests (Narasimhan and Jayaram, 1998; Beamon, 1998). The performance of SCM must ultimately be measured by its responsiveness to customers (Lee and Billington, 1992).Customer responsiveness has also been recognized as an important dimension of supply chain management performance (SCMP) (Christy and Grout, 1994; Deshpande, 2012). Customer responsiveness has been recognized as one of the principal aims of SCM practice (Stevens, 1990; Kiefer and Novack, 1999; Spekman *et al.*, 1998).

Figure 2 indicates the customer responsiveness requirements on the horizontal axis represent how short the lead time needs to be to meet customer expectation.

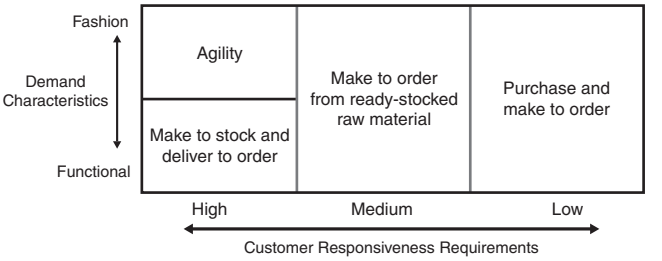


Figure 2.
Matching demand and supply for the global food company of the sample case

Source: Ahn *et al.* (2011)

The demand characteristics on the vertical axis have been divided into functional vs fashionable. For products with low lead time requirements, there is enough time for the company to purchase, make and deliver to specific orders, even if the product is fashionable. If the customer responsiveness requirements are reduced to a medium level, the supply chain only has time to make and deliver from previously purchased raw materials. When customer lead times are short, for the functional products, the company can produce products to forecast as efficiently as possible and deliver to the market on request (Ahn *et al.*, 2011).

2.1.1.5 Efficiency. Efficiency refers to the extent to which a firm's collaboration process with supply chain partners is cost competitive among primary competitors (Bagchi and Skjoett-Larsen, 2005). The process could be information sharing process, joint logistics process, joint product development process or joint decision-making process. Efficiency is a measure of success and a determinant factor of the ability of the firm to profit (e.g. inventory turnover and operating cost). Supply chain collaboration facilitates the cooperation of participating members along the supply chain to improve performance (Bowersox, 1990). The benefits of collaboration include cost reductions and revenue enhancements (Lee *et al.*, 1997; Cao and Zhang, 2011).

2.1.1.6 Quality. Quality refers to the extent to which a firm with supply chain partners offers quality product that creates higher value for customers (Gray and Harvey, 1992; Li and Lin, 2006). It is expected that firms those can respond fast to customer needs with high-quality product and innovative design, and excellent after-sales service allegedly build customer loyalty, increase market share and ultimately gain high profits. Garvin (1988) proposes eight dimensions of quality: performance, features, reliability, conformance, durability, serviceability, aesthetics and perceived quality, which are comprehensive but measures for each are difficult to establish (Cao and Zhang, 2011). Neely *et al.* (1995) listed quality as important measure of operational performance (Flynn *et al.*, 2010a). In several studies, quality has been considered as the most important part of the value in a supply chain (Johansson *et al.*, 1993; Naylor *et al.*, 1999; Manrodt *et al.*, 2005). From the literature it was seen that quality is one of the main components of performance that it measured supply chain performance in connection with the sub-processes (Behrouzi and Wong, 2011).

2.1.1.7 Product innovation. Product innovation is the introduction of a new product in the market that uses different technology and has a higher utility for the consumer than the existing products (Chitakornkijsil, 2012). A firm's performance is dependent on product innovation that increases its market power as well as its capacity to cope with market conditions. Product innovation enhances a firm's leverage in a highly competitive market. It increases consumer loyalty and satisfies a wide range of consumer needs since they are presented with a variety of products to choose from. Innovative products earn a firm super profit in the short-run that declines over time as follower firms imitate the new product. Firms have to maintain innovativeness especially for complementary products that generate inter-dependence in the market. Product innovation also increases the capacity of a firm to adapt to a constantly changing environment and hence is significant for a firm's survival (Tung, 2012).

2.1.1.8 Market performance. Market performance, defined in terms of sales growth, market and product development. Organizations implementing SCM have achieved improved performance. Cost savings, increased revenues and the reduction of defects in products are some of the chief advantages of introducing SCM (Shin *et al.*, 2000). It has been demonstrated that business profitability is closely associated with market

and business shares (Buzzel *et al.*, 1975). Based on the long-term and short-term goals of the SCM, the organizational performance measures identified were and financial and market performance and customer satisfaction. In context of SCM, the financial and market performance are operationalized in terms of market share, return of total assets, annuals sales growth (Tan *et al.*, 1999; Venkatraman and Ramanujan, 1987; Deshpande, 2012).

2.1.1.9 Relationship measures. Relationship measures are basically termed as the non-financial measures or soft measures which are generally non-quantifiable in nature but off late these non-quantifiable measures which are qualitative in format are raising awareness of the performance potential of chains. A considerable number of authors including Neely *et al.* (1994, 1995), Beamon (1998, 1999a, b), Christopher (1998), Li and O'Brien (1999), Gunasekaran *et al.* (2001), Lambert and Pohlen (2001), Van Der Vorst (2006) endorse to the need of such relationship key issues to be addressed in SCPM. This clearly suggests that relationship measures should be included in chain PM instrument as possible performance determinants. Still, relationship measures are not extensively included into chain PM (Molnar *et al.*, 2007). Besides this, chains belonging to different sectors may have different characteristics such as varied chain length, variation in the closeness of chain relationships, types of process links (Lambert and Cooper, 2000). These may influence their performance within the integrated supply chains; hence it is pertinent to measure the intangible yet important relationships among the supply chain partners. One of the critical aspects of the SCM is supplier relations at the upstream and customer relations at the downstream. The relationship measures also include the binding relations including communications, type of relations and trust among the supply chain partners.

2.1.1.10 Partnership quality. Partnership quality is defined as how well the outcome of a partnership matches the participants' expectation (Lee and Kim, 1999; Wilson and Vlosky, 1998). A good partnership quality between the buyer and its supplier is based on mutual trust, joint problem solving and fulfilment of pre-specified promises and which help in avoiding complex and lengthy contracts, that are costly to write and difficult to monitor and enforce (Fynes *et al.*, 2004, 2005; Zaheer and Venkatraman, 1995). Firms that rely on high-quality partnerships with suppliers are better equipped to adapt to unforeseen changes, identify and produce well-crafted solutions to organizational problems, and reduce monitoring costs, all of which help improve the economic outcomes (Ryu *et al.*, 2007; Srinivasan *et al.*, 2011). A good partnership quality is a crucial precursor for any stable exchange relationship which ensures the relationship continuity (Jap and Anderson, 2003).

2.1.1.11 Supplier performance. Suppliers' consistency lies in delivering materials, components or products to focal firm on time and in good condition. Supplier performance is often viewed as one of the leading contributors to enhance an organizations competitive advantage (Lemke *et al.*, 2003; Marksberry, 2012). Previous measures of supplier performance indicate that buyers have a variety of intentions for their relationships with suppliers (Johnston *et al.*, 2004a, b), including service quality or speed of service delivery. To maintain effective relationships "the buyer must continuously monitor supplier performance across multiple dimensions" (Cousins *et al.*, 2008; Stouthuysen *et al.*, 2012).

The objective of this research is to develop and validate a parsimonious measurement instrument for SCPM. Interest in PM and management has notably increased in the

last 20 years (Taticchi, 2008; Gopal and Thakkar, 2012). Traditional and relationship (financial and non-financial) measures for the constructs are developed from extensive literature review and tested empirically, using data collected from respondents through a survey. It is expected that offering a validated instrument to measure SCPM will provide useful guidance for SCPM and provide a springboard for further research in the area. The research is of paramount importance to academicians and practitioners as the proposed scale for SCPM is expected to uncover many neglected relationships that are of interest to managers. In addition, specific patterns of SCPM would also be revealed which would further encourage managers to implement this technique and possibly improve both SCM and organization performance.

The nine dimensions identified from the literature are used in this study as the testing model (see Figure 3).There are few studies validating the SCPM (Agus *et al.*, 2012; Chavez *et al.*, 2012) in the manufacturing industries. However, validating these scales for retail supply chains has not received much attention. Moreover, there are no studies which have provided a validated scale for measuring the retail SCPM in Indian context. Further it is observed that the validity of the dimensions making up the scale, have not been universally proven and are not as generic and needs to be validated in different situations. It is with this objective that the present study has been undertaken.

The rationale underlying this theoretical research framework is straightforward. There are limited number of works done, those which deal with performance measures and metrics in a supply chain environment (Gunasekaran and Kobu, 2007). According to Cuthbertson and Piotrowicz (2008), the majority of supply chain measures are economic and quantitative (cost, customer, responsiveness and productivity) rather than qualitative. From the analysis of Chow *et al.* (1994), practitioners have assigned less benefits and measures at strategic level compared to operations and individual processes. From the above highlighted points, it can be concluded that many empirical studies reflect the lack of a theoretical framework for anchoring the results of their studies. The lack of a comprehensive view of SCPM and the consequent lack of reliable operational measures of the concept have constrained the earlier studies from offering broad-based and generalizable implications for guiding both the SCPM and further research on the topic. PM systems are historically developed as a means of monitoring and maintaining

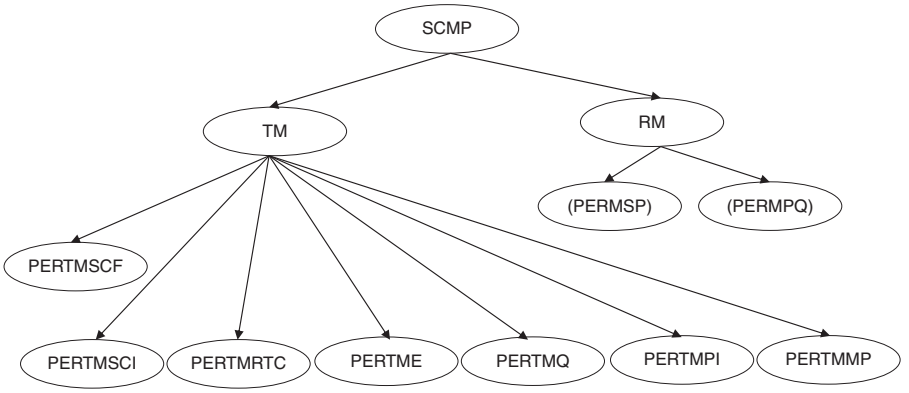


Figure 3.
Proposed conceptual framework

organizational control, which is the process of ensuring that an organization pursues strategies that lead to the achievement of overall goals and objectives (Amaratunga *et al.*, 2001). Also PM is a means of monitoring and controlling organizational activities to ensure they achieve predefined objectives (Dey *et al.*, 2006). Many research articles discuss the financial measures as the only PM, the results show that firms continue to use financial performance measures despite the recommendations from experts and academics to incorporate non-financial measures (Gorane *et al.*, 2012). This research paper identifies and addresses the gap from literature by developing and validating scale for SCPMs.

3. Research methodology

3.1 Sample size and characteristics

The field study was carried on a sample of 213 operations and supply chain practitioners working with organized retail stores in India. More than 500 operations managers from various retail stores were requested for their participation in the study and share their views on the subject under consideration. However, 213 managers showed their interest to be part of the study. The researcher then fixed appointments with these executives and conducted the survey. As all of them who showed their willingness to participate in the study filled the survey forms, the response rate can be taken as 100 per cent. However, if we take into consideration the percentage of respondents who shown their interest to be part of the study, the response rate can be taken as 43 per cent (213/500).

This study followed a two stages research methodology. The first stage involved exploring the variables from previous studies followed by extensive structured interviews and the second stage focus was to test these variables for their validity and reliability within Indian retail sector. The two stages used for the study are discussed in more detail in the following paragraphs.

Stage 1: to develop the scale for survey instrument, an extensive literature review was first conducted so as to identify scales used in previous studies and those having strong validity and reliability. The critical variables of SCPM identified from the literature had content validity because an extensive review of the literature was conducted in selecting these items followed by discussion with the industry practitioners on applicability of these variables in Indian retail supply chain context. The sample composition for study included the operational/supply chain heads and academicians of leading retail organizations in India. Structured interviews were conducted with total 20 experts that included ten operational heads and ten academicians from top business schools from Mumbai in India. In the exploratory study, structured interviews were conducted among the experts from the leading retail house and academicians. The format of structured questionnaire was prepared covering the details, prospects, complexities growth, hindering factor, building block, etc., of retail sector and the list of SCPM prepared from the literature review for content validity. Content validity represents the sufficiency with which a specific domain of content (construct) was sampled (Nunnally, 1978; Ahire *et al.*, 1996). Content validity is subjective and judgemental but is often based on two standards as put forward by Nunnally: does the instrument contain a representative set of measures, and were sensible methods of scale construction used (Flynn *et al.*, 1990).

Stage 2: the second stage consisted of using the previously collected data to analyse the various SCPM of the assessment scales. This procedure aimed to identify the most suitable scales for SCPMs in Indian organized retail context. The scale was finally made

up of nine dimensions of SCPM. To be precise, the dimensions for SCPM constructs broadly classified into traditional measures (PERTM) and relationship measures (PERRM), namely, supply chain flexibility (PERTMSCF), supply chain integration (PERTMSCI), responsiveness to customers (PERTMRTC), efficiency (PERTME), quality (PERTMQ), product innovation (PERTMPI), market performance (PERTMMP), supplier performance (PERRMSP) and partnership quality (PERRMPQ), The instrument used in this study was a structured survey questionnaire. The questionnaire comprised several constructs and sub items analysing the nine dimensions of the selected SCPM to enable respondents to indicate their answers. Seven-point Likert interval scale was used for the SCPMs dimensions.

Validity and reliability tests were conducted to select and assess the final items of the independent constructs that would be used for statistical testing. The field study was performed on a sample of 213 operations and supply chain practitioners working with organized retail stores in India.

4. Analysis and validation of the scales

This study used the analysed data in three stages. The first was based on an exploratory study which consisted of maintaining exclusively those items which enabled the analysis of other dimensions or factors with a suitable degree of reliability or unidimensionality. The second stage was an exploratory factor analysis and the third is the confirmatory study which discarded those items which did not enable suitable dimensionality for the entire constructs of SCPM. In the above analysis, the measurement properties of the nine dimensions of SCPM constructs were evaluated by assessing key components of construct validity. As per the guidelines of Bagozzi (1980), and Bagozzi and Fornell (1982), the following measurement properties are considered important for assessing the measures developed in this paper: content validity; internal consistency of operationalization (unidimensionality and reliability; convergent validity; and discriminant validity.

4.1 Findings of the exploratory analysis

Content validity depends on how well the researchers create measurement items to cover the domain of the variables being measured (Nunnally, 1978). The evaluation of content validity is a rational judgemental process not open to numerical evaluation. Usual method of ensuring content validity is an extensive review of literature for the choice of the items and getting inputs from the practitioners and academic researchers on the appropriateness, completeness, etc.

An instrument has content validity if there is a general agreement among the subjects and researchers that the instrument has measurement items that cover all important aspects of the variable being measured. Unidimensionality indicates that all of the items are measuring a single theoretical construct. Reliability values indicate the degree to which operational measures are free from random error and measure the construct in a consistent manner. Convergent validity is about the extent to which there is consistency in measurements across multiple operationalizations (Campbell and Fiske, 1959). Discriminant validity refers to the independence of the dimensions (Bagozzi and Phillips, 1991), i.e., the extent to which measures of the nine constructs are distinctly different from each other.

The sample composition for exploratory study included the operational/supply chain heads and academicians of leading retail organizations in India. Structured interviews were carried out with total 20 experts who included ten operational heads

and ten academicians from top business schools from Mumbai in India. In the exploratory study, structured interviews were conducted among the experts from the leading retail houses and academicians. The format of structured questions was prepared covering with the details, prospects, complexities growth, hindering factors, and building blocks, etc., of retail sector and the list of SCM practices prepared from the literature review. All experts uniformly agreed and added the importance and role of SCPM in retail sector. The experts firmly believe that various aspects of SCPM suggest a multi dimensionality of SCM that covers set of activities and processes, which considered as the one of the important perquisites of strong supply chain and but they strongly argue that the various aspects of SCPM from literature may be applicable to sectors specifically to manufacturing, hence all the SCPM may not be pertinent to the retail sector. Therefore from the list of SCPMs prepared from the extensive literature review, were further reduced by conducting structured interviews and the items were dropped which the experts opined are inappropriate with respect to Indian retail sector.

SCPM construct was represented by nine dimensions and 53 items. Based on the exploratory content validity 43 items were selected for the final survey. The details of the initial 43 items selected for the study are given in the Appendix.

4.1.1 Reliability analysis. The reliability of the measurement scale in the survey was tested using Cronbach's α. Hair *et al.* (1998) suggested that a value of 0.60 and higher is often considered the criterion for internally consistent established factors. Scales reliability is presented in Table II .The Cronbach's α coefficients indicating the internal consistency reliability of the measures for the nine constructs of SCPM were all above the suggested value of 0.60 (Hair *et al.*, 1998) (Table III).

The reliability values for all constructs were all greater than 0.60, which are considered acceptable (Nunnally, 1978). Whereas, all other selected variables showed high reliability of greater than 0.9 in the study. Table IV presents the statistical descriptive measures like mean, standard deviation and range of item correlations for the constructs selected in the study.

From the Table IV, from the ranges of item to item correlation (R) it was interpreted that the items show high positive correlation with the each other, with a significant level of 0.05. The factors which have scored high value of correlation have shown considerable positive range of correlation amongst themselves. However one construct, namely, PERRMPQ shows negative range of item to item correlation. This may be because of the fact that few items from this construct may be not reliable and needs further investigation. It was therefore thought important to use confirmatory factor analysis (CFA), so that the convergence validity for these item to be established more specifically. The following section discusses the results of CFA.

4.1.2 CFA. The findings of the Reliability tests were further supported by CFA carried for all the constructs separately. CFA was used to assess the fit of the measuring items for describing the behaviour of the unobserved latent variables mentioned above. CFA or a measurement model using AMOS 20 was employed for examining construct validity of each scale by assessing how well the individual item measured the construct (Ahire *et al.*, 1996). Specifically, CFA was used to detect the unidimensionality of each construct. In this stage, a more exhaustive analysis of the SCPM dimensions' assessment scales were performed by means of a confirmatory factorial analysis.

The measurement model for each construct was treated as a single factor congeneric model with error variances and estimated regression weights. Motwani *et al.* (1997)

Coding	Constructs	No. of items (identified from literature)	Experts opinion	Total of items used for final survey
PERTM	*Traditional measures*			
PERTMSCF	Supply chain flexibility	5	Experts view supply chain flexibility as an integrated concept and in retail sector the lack of research treating supply chain flexibility as an entire system may is considered due to weak conceptual foundations detailing what exactly should be included in the systems view of supply chain flexibility and how it should be measured. Thus for this research work supply chain flexibility all items were considered	5
PERTMSCI	Supply chain integration	5	In retail sector supply chain integration (SCI) is one of the most important aspects of supply chain management. Experts define SCI as the degree to which a firm can strategically collaborate with its Supply Chain partners and cooperatively manage intra- and inter-organizational processes to achieve effective and efficient flows of products, services, information, money, and decisions to provide the maximum value to the final customer with low costs and high speed. Thus for this research work supply Chain Integration all items were considered	5
PERTMRTC	Responsiveness to customers	3	Customer responsiveness is one of the traditional performance measure irrespective of sector, as Customer responsiveness minimize the amount of time required from the time an order is placed until the time the order is received by the customer, in Indian retail context customer responsiveness is considered as perquisite measure for performance measurement, from literature it reinstate that there are various aspects and dimensions for measuring the customer responsiveness, but experts suggested the mentioned items under customer responsiveness constructs captures the dimensions hence all items are applicable	3
PERTME	Efficiency	5	The items listed under the efficiency constructs covers the stocking ability, transaction capacity, POS, employee ratio and operating expenses which are considered to be an required set of item for performance measurement for retail, hence all items are applicable	5
PERTMQ	Quality	4	Quality is a multidimensional measure as it's appears to be the most consistent driver of business performance. The dimensions of quality vary as per the need and types of the organization, hence from the literature only those item were selected which are considered to be appropriate for retail sector in term of reliability and durability and hence experts considered all the items important	4
PERTMPI	Product innovation	2	Product innovation felicitates the flexibility in product customization as per the requirement, and determining the supply chain performance on the mentioned item was appreciated by the experts with suggested modification	2

(*continued*)

Table II.
Results of exploratory study

Coding	Constructs	No. of items (identified from literature)	Experts opinion	Total of items used for final survey
PERTMMP	Market performance	3	Market Performance popularly used as the performance measurements variable, as it provide the factual view of the firm in market. These items provide information about market share, sales thus was suggested by experts as applicable with modification	3
PERRM	*Relationship measures*			
PERRMSPP	Supplier performance	6	Experts point out that Supplier Performance deals with the ability to respond to and accommodate periods of poor delivery performance, All the six items was dropped during content validity because it was found that similar set of items were captured in other constructs more precisely	–
PERRMPQ	Partnership quality	20	Partners make the supply chain complete but how to measure and on what parameters its efficiency and quality can be measured it's difficult to determine being qualitative measure in nature, experts and available literature reinforced on the importance of relationship measures. Based on expert's suggestion from the list of items covering soft parameters like trust, dependency, satisfaction, reputation, etc., parameters were clubbed under one construct named as Partnership Quality. Four items, namely, PERRMPQ1, PERRMPQ10, PERRMPQ11, PERRMPQ12 were dropped	16
Total variables		53	Total variables for pilot survey	43

Table II.

Note: $n = 20$

Factors	Cronbach's α
Supply chain flexibility (PERTMSCF)	0.864
Supply chain integration (PERTMSCI)	0.806
Responsiveness to customers (PERTMRTC)	0.668
Efficiency (PERTME)	0.848
Quality (PERTMQ)	0.867
Product innovation (PERTMPI)	0.796
Market performance (PERTMMP)	0.880
Partnership quality (PERRMPQ)	0.925

Table III.
Reliability of the measurement instrument used for the study

have proposed the following guideline in order to establish the construct validity of the measure:

(1) CFA loading cut off value was fixed at 0.5, those items scoring less than 0.5 were dropped.

(2) The extent to which the measure correlates with other measures designed to measure the same thing and whether the measure behaves as expected. The goodness of fit index (GFI) and comparative fit index (CFI) of the three constructs calculated from CFA exceeded the 0.90 criterion suggested by Hair *et al.* (1998),

Factors	No. of items	Mean[a]	SD[a]	Range of item to item correlations (*R*)
Supply chain flexibility (PERTMSCF)	5	5.52	0.828	0.501-0.700**
Supply chain integration (PERTMSCI)	5	5.62	0.904	0.268-0.540**
Responsiveness to customers (PERTMRTC)	3	5.68	0.726	0.299-0.554**
Efficiency (PERTME)	5	5.80	0.815	0.392-0.677**
Quality (PERTMQ)	4	5.80	0.847	0.570-0.688**
Product innovation (PERTMPI)	2	5.81	0.822	0.664-0.664**
Market performance (PERTMMP)	3	5.52	1.134	0.592-0.859**
Partnership quality (PERRMPQ)	16	5.46	1.009	−0.030-0.705**

Notes: [a]Average of means and standard deviation. *,**Correlation is significant at the 0.05 and 0.01 levels (two-tailed), respectively

Table IV. Reliability test findings

hence establishing the construct validity. CFA showed all the items were loaded highly on their corresponding constructs, which supported the independence of the constructs and provided strong empirical evidence of their validity. (The overall fits of all confirmatory factor analyses were judged to be satisfactory (χ^2 probability > 0.10; GFI, CFI > 0.9, RMSR < 0.05) (Byrne, 1994; Hair *et al.*, 1998).

(3) Considering the latent variables which represent SCPM, an improvement process was performed using a model development strategy (Hair *et al.*, 1998), which consists of eliminating the indicators (or variables) which are less suitable for achieving proper adjustment. This variable elimination process generates successive models until it reaches the model which provides the best adjustment measures, dimensionality and a suitable number of variables for each subscale (Ding *et al.*, 1995).

(4) The process was carried out considering the three criteria proposed by Jöreskog and Sörbom (1993). The first criteria of weak convergence would eliminate indicators those did not have a significant factorial regression coefficient *t*-student > 2.58 ($p = 0.01$).

(5) The second criteria of strong convergence would eliminate those indicators those were not substantial, i.e., those who's standardised coefficient (λ) was less than 0.5.

The results of CFA for the various constructs used in the study are presented in two sections:

(1) initial values without the modification; and

(2) final values with the modification.

4.1.2.1 Initial values – CFA. Table V, shows the results of the initial values CFA analysis. The CFI, GFI, NFI and RMR values for various constructs selected in the study are shown in Table V.

4.1.3 Modifications stages. Based on the modification indices as suggested by the software and the conceptual understanding of the constructs, modification of the constructs was carried. The results of the CFA along with the modification stages are presented in the following section for the SCPM constructs.

4.1.3.1 PM constructs. Stage 1: the structural equation method was used for this analysis (Bentler, 1992). According to the first criterion, items scoring less than the cut off value of CFA = 0.5 were deleted.

Measurement models	Variables	Standardized regression weights	Range of standard loadings	CFI	GFI	NFI	RMR	χ^2 (df)
Supply chain flexibility (PERTMSCF)	PERTMSCF1	0.790	0.707-0.790	0.781	0.627	0.660	0.092	1837.82 2 (852)
	PERTMSCF2	0.767		The initial model fit values for the performance measurement constructs are loading less as compared to the cut off range. Though Initial CFI > 0.781 (considerable acceptable value), GFI > 0.627 and NFI > 0.660) which is not substantial for a good model fit, Thus further modification is required to achieve the good model fit				
	PERTMSCF3	0.765						
	PERTMSCF4	0.707						
	PERTMSCF5	0.728						
Supply chain integration (PERTMSCI)	PERTMSCI1	0.654	0.556-0.768					
	PERTMSCI2	0.726						
	PERTMSCI3	0.768						
	PERTMSCI4	0.697						
	PERTMSCI5	0.556						
Responsiveness to customers (PERRTC)	PERTMRTC1	0.735	0.502-0.735	From the results of CFA analysis, standard loadings range for the selected constructs shows that all items of the performance measurement constructs are loading with relatively high values with variation in the loading values ranging between 0.467 and 0.974. Confirmatory factor analysis also helped to detect the unidimensionality of each and all items of performance measurement constructs which was loading above the cut off value of 0.5				
	PERTMRTC2	0.709						
	PERTMRTC3	0.502						
Efficiency (PERTME)	PERTME1	0.621	0.621-0.836					
	PERTME2	0.690						
	PERTME3	0.836						
	PERTME4	0.717						
	PERTME5	0.780						
Quality (PERTMQ)	PERTMQ1	0.814	0.773-0.814					
	PERTMQ2	0.782						
	PERTMQ3	0.797						
	PERTMQ4	0.773						
Product innovation (PERTMPI)	PERTMPI1	0.770	0.770-0.861	The convergent validity was found high among the 43 selected items that measure a performance measurement construct as they agree (converge) with each other with slight variation in the Standardized Regression Weights				
	PERTMPI2	0.861						
Market performance (PERTMMP)	PERTMMP1	0.712	0.712-0.974					
	PERTMMP2	0.880						
	PERTMMP3	0.974						
Partnership quality (PERRMPQ)	PERRMPQ2	0.544	0.467-0.799	The CFI, NFI and RMR values as observed were found below satisfactory (> 0.9 for CFI, NFI and < 0.10 for RMR). Thus further modification is required to achieve the good model fit				
	PERRMPQ3	0.697						
	PERRMPQ4	0.754						
	PERRMPQ5	0.763						
	PERRMPQ6	0.694						
	PERRMPQ7	0.680						
	PERRMPQ8	0.770						
	PERRMPQ9	0.672						
	PERRMPQ13	0.467						
	PERRMPQ14	0.745						
	PERRMPQ15	0.636						
	PERRMPQ16	0.725						
	PERRMPQ17	0.695						
	PERRMPQ18	0.799						
	PERRMPQ19	0.758						
	PERRMPQ20	0.769						

Table V.
Results from confirmatory factor analysis

Stage 2: covariance's was drawn among the error term on same factor to improve the fit measures as suggested by the modification index resulting in higher modification values.

Stage 3: standardized residual covariance is in the symmetric matrix displayed each residual covariance has been divided by an estimate of its standard error (Jöreskog and Sörbom, 1971, 1993). In sufficiently large samples, these standardized residual

covariances have a standard normal distribution if the model is correct. So, if the model is correct, most of them should be less than two in absolute value. Items having significantly higher values were considered for dropping from the model.

Table VI presents the details of the model fit output and stages highlights the step by step procedure to get the optimality in model fit. It can be observed from the initial output that Cmin 1837.822, df 852, Cmin/df 2.157, RMR 0.092, GFI 0.627, CFI 0.781, RMSE 0.085, PCLOSE 0.000) to final model output (C_{min} 1084.077, df 456, C_{min}/df 2.377, RMR 0.061, GFI 0.754, CFI 0.815, RMSEA 0.081, PCLOSE 0.000.

Figure 4 presents the final validated model. The GFI value was modified to 0.754 from 0.627 and CFI value to 0.815 from 0.781 which is nearer to the suggested value of > 0.9 (Joreskog and Sorbom, 1989). Further the other fit indices, namely, C_{min}/df, RMR, RMSEA and GFI were also found to be satisfactory. As it was seen that the further deletion of any item will not affect the output values and thus the nearby optimum value was achieved.

5. Conclusions, managerial implications and future research lines

This paper strives to contribute to the literature on the SCPM in Indian retail industry. This paper tests the validity of the measurement scales which will enable the managers to determine the appropriate SCPM. The major contribution of the represent study is the development of a set of SCPM constructs as well as a rigorously validated measurement instrument for collecting data in further studies. The confirmation process is according to the typical standards of scale development (Raghunathan *et al.*, 1999; Sethi and King, 1994; Anderson and Gerbing, 1988). The instrument developed in this paper is parsimonious and will be of use to researchers for further studies of SCPM and their relationships with other organizational processes and outcomes like competitive advantage, SCM practices, and organizational performance.

The scale emerging from this study shows a good degree of reliability, validity and unidimensionality in each of its dimensions. The set of dimensions included in the scale proposed is completed, namely, supply chain flexibility (PERTMSCF), supply chain integration (PERTMSCI), responsiveness to customers (PERTMRTC), efficiency (PERTME), quality (PERTMQ), product innovation (PERTMPI), market performance (PERTMMP) and supplier performance (PERRMSP). Therefore, the scale which was finally selected was made up of eight subscales which are clearly related and integrated in one exclusive construct, demonstrating the latent and multidimensional nature of the SCPM context. In fact, this study proved that the SCPM can be used from different perspectives, all of which are integrated into one exclusive assessment instrument, applied to the SCPM in this case.

Many organizations still tend to consider SCM as being the same as integrated logistics management or as a synonym for supplier management though they are not. Although some organizations have realized the importance of SCM, they lack an understanding of what constitutes a comprehensive set of SCPM. The measures of SCPM provided in this paper can be useful to SCM managers in evaluating their current supply chain performance. This can help the managers to identify the strengths and weaknesses of their supply chains. SCPM felicitated to identity bottleneck in terms of service delivery and quality assurance for a better SCM as it also help the managers to monitor inventory stock at various levels within the supply chain. This is possible as better envisaged information transfer is possible in real time in a seamless supply chain. The input derived out of such quality information exchange would further

Table VI.
Results of confirmatory factorial analysis for performance measurement constructs

Adjustment fit measures	Initial values	Stage 1 modification (λ)	Revised values after stage 1	Stage II modification (covariance added between)	Revised values after stage II	Stage III modification (λ)	Revised values after stage III	Stage IV modification (λ)	Final model
Cmin	1,837.822	PERRMPQ18	1,391.408	e 90↔e 91	1,284.195	PERRMPQ14	1,108.948	PERRMPQ3	1,084.077
DF	852	PERRMPQ19	657	e 81↔e 87	650	PERRMPQ15	548	PERRMPQ5	456
Cmin/DF	2.157	PERRMPQ20	2.118	e 74↔e 75	1.976	PERSCF5	2.024	PERRMPQ16	2.377
RMR	0.092	PERSCI2	0.082	e 73↔e 76	0.079		0.078		0.061
GFI	0.627	PERSCI3	0.670	e 73↔e 75	0.691		0.711		0.754
CFI	0.781		0.802	e 73↔e 74	0.829		0.832		0.815
RMSEA	0.085		0.083	e 41↔e 42	0.078		0.080		0.081
PCLOSE	0.000		0.000		0.000		0.000		0.000

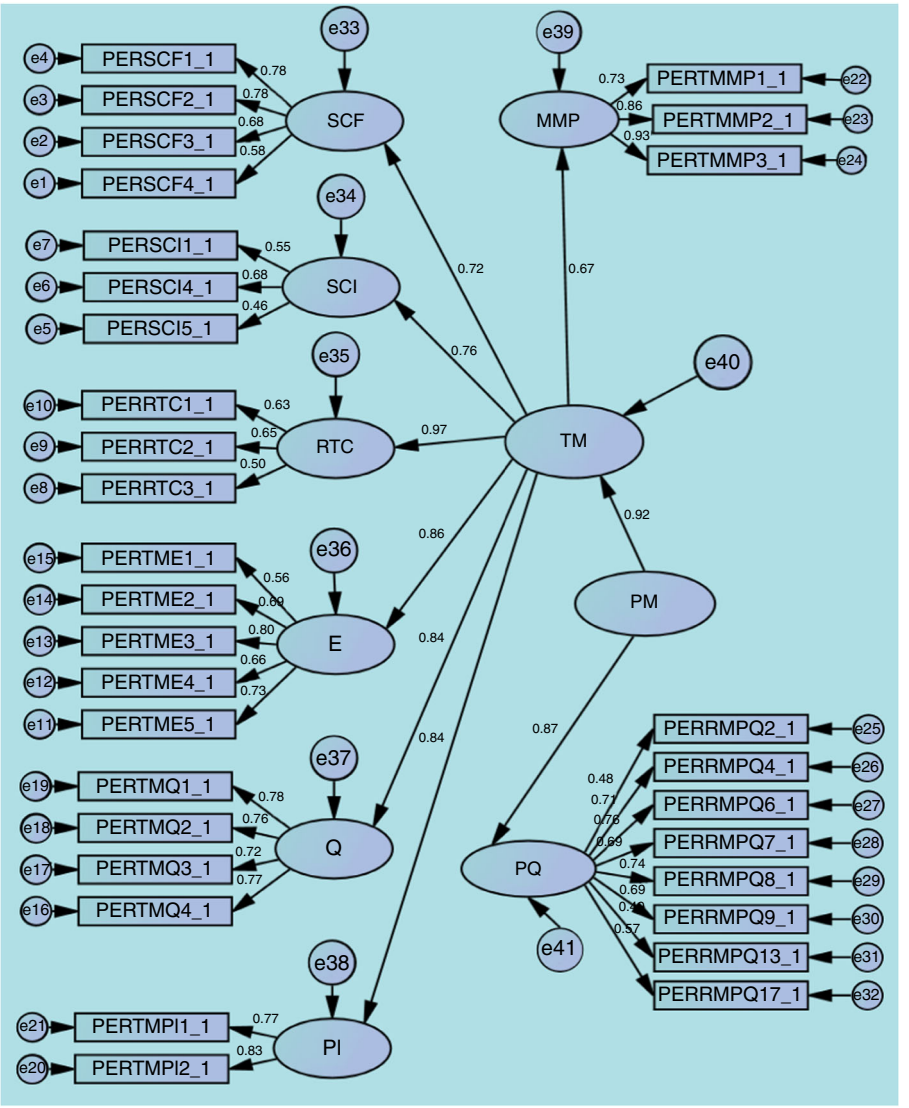


Figure 4.
Optimum CFA model performance measurement

enhanced manager understanding customer and client requirement and provide better meaning into customer relationship.

In the long run a good set of identified SCPMs and their implementation would inevitability enable in deriving meticulous supply chain strategies. The further extensions to this research work are to check the direct and indirect implications of the SCPMs, which can be determined with respect to SCM practises, competitive advantage, supply chain profitability, an integrated approach can be further determined as future scope of the current research work with Indian retail sector. Likewise, it would be interesting to repeat the study in other geographic locations in order to test more reliably the possibilities of scale extrapolation developed in this study.

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Appendix

PERSCF1	Our supply chain is able to handle difficult non-standard orders including numerous features options, sizes and colours
PERSCF2	Our supply chain is able to rapidly adjust capacity so as to accelerate or decelerate production in response to changes in customer demand
PERSCF3	Our supply chain is able to rapidly introduce large numbers of product improvements/ variation
PERSCF4	Our supply chain is able to handle rapid introduction of new products
PERSCF5	Our supply chain is able to respond to the needs and wants of the firm's target market(s)
PERSCI	**SUPPLY CHAIN INTEGRATION**
PERSCI1	There is a high level of communication and coordination between all functions in our firm
PERSCI2	Cross-functional teams are frequently used for process design and improvement in our firm
PERSCI3	There is a high level of integration of information systems in our firm
PERSCI4	There is a great amount of cross-over of the activities of our firm and our suppliers
PERSCI5	Our supply chain is characterized by full system visibility from suppliers' suppliers to customers' customers
PERRTC	**RESPONSIVENESS TO CUSTOMERS**
PERRTC1	Our firm fills customer orders on time
PERRTC2	Our firm has short order-to-delivery cycle time
PERRTC3	Our firm has fast customer response time
PERRM	**RELATIONSHIP MEASURES**
PERRMSP	SUPPLIER PERFORMANCE
PERRMSP1	Our suppliers deliver material/components/products to us on time
PERRMSP2	Our suppliers provide dependable delivery to us
PERRMSP3	Our suppliers provide materials/components/products that are highly reliable
PERRMSP4	Our suppliers provide high-quality materials/component/products to us
PERRMSP5	Our suppliers provide materials/component/products to us at low cost
PERRMSP6	Our supplier base has reduced over the past three years
PERRMPQ	PARTNERSHIP QUALITY
PERRMPQ1	We do not wish to terminate current partnerships with suppliers and establish new ones
PERRMPQ2	We believe our relationship with our suppliers is mutually profitable
PERRMPQ3	We and our suppliers share any risk that can occur in the supply chain
PERRMPQ4	We and our suppliers share benefits obtained from SCM
PERRMPQ5	Our relationship with suppliers is marked by a high degree of harmony
PERRMPQ6	Our overall relationship with suppliers is satisfactory
PERRMPQ7	Our suppliers have been open and honest in dealing with us
PERRMPQ8	Our suppliers are reliable
PERRMPQ9	Our suppliers respect the confidentiality of the information they receive from us
PERRMPQ10	Our transactions with suppliers do not have to be closely supervised
PERRMPQ11	Our suppliers have made sacrifices for us in the past
PERRMPQ12	Our suppliers are willing to provide assistance to us without exception
PERRMPQ13	We expect to increase business with our suppliers in the future
PERRMPQ14	We have invested a lot of effort in our relationship with suppliers
PERRMPQ15	Our suppliers abide by agreements very well
PERRMPQ16	We and our suppliers always try to keep each other's promises
PERRMPQ17	We and our suppliers understand each other's' business policies and rules very well

(*continued*)

Table AI.
List of items

PERRMPQ18	We and our suppliers have a similar understanding about the aims and objectives of the supply chain
PERRMPQ19	We and our suppliers have a similar understanding about the importance of collaboration across the supply chain
PERRMPQ20	We and our suppliers have a similar understanding about the importance of improvements that benefit the supply chain as a whole
PERTM	**TRADITIONAL MEASURES**
PERTME	EFFICIENCY
PERTME1	Our store has more items per sale
PERTME2	Our store has higher value of business per each transaction
PERTME3	Our store have more point of sales (POS) per square meter than others
PERTME4	Our store has more full time employees per square foot of area of store.
PERTME5	Our operating expenses per square foot area are less than others
PERTMQ	QUALITY
PERTMQ1	We are able to compete based on quality
PERTMQ2	We offer products that are highly reliable
PERTMQ3	We offer products that are highly durable
PERTMQ4	We offer high-quality products to our customers
PERTMPI	PRODUCT INNOVATION
PERTMPI1	We provide customized products
PERTMPI2	We alter our product offerings to meet client needs
PERTMMP	MARKET PERFORMANCE
PERTMMP1	Market Share
PERTMMP2	The growth of market share
PERTMMP3	The growth of sales

Table AI.

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