CHAPTER 3

RESEARCH METHODOLOGY

3.1 THE RESEARCH DESIGN

A research design deals with specification of methods and procedures for gathering the information needed for research. It is an overall operational plan or framework of the research that stipulates the nature of information to be collected, identification of the sources of information and the method to be employed to collect information. A proper research design will insure that information obtained is relevant and adequate to meet the needs of the research question and that it is collected objectively and economically.

The prime objective of the present research is to carry out an exploratory analysis of the influence of e-business on Supply Chain (SC) in micro, small and medium enterprises (MSMEs). The result of the study is expected to provide greater insights and newer facts. This is an exploratory study to be carried out by an individual researcher with time and resource constraints. Taking into account the objective, the nature of study and the constraints, a descriptive research design was considered as most appropriate. Further, the prime data collection method is through schedules to be filled by respondents with the assistance of persons specifically trained for the purpose. The schedule will be in the form of suitably designed questionnaire.
Initially based on literature review, evidences of the influence of e-business in MSMEs SCM have been collected and the descriptive research design adopted to provide a comprehensive and detailed explanation of the status and influence. This was undertaken to ascertain and to get description of the characteristics of the influence e-business in SCM of MSMEs. These inputs have been taken into account in the design of the questionnaire.

The questionnaire was constructed by combining questions already designed and tested from the studies by Srikantha Dath et al (2008), Rahman (2004) and Lancioni et al (2000). It was designed as a schedule to obtain accurate and complete information about the research problem (Malhotra 1999). Specifically, the questionnaire of this research was a consequence of translation of research objectives into a series of questions to elicit views and data from the respondents. Further, the questionnaire was designed in a comprehensive way so as to motivate respondents to cooperate and provide response accurately to all the questions asked (Frazer and Lawley 2000; Malhotra 1999). The respondents were asked to rate their views about the influence of e-business in SC components and performance of MSMEs. For each question a five-point rating scale was adopted to provide a detailed scale response. Some of the questions used pre-determined answer options, and the respondents have to make choice from them. The next section deals with the various aspects of questionnaire design.

3.2 QUESTIONNAIRE DESIGN

3.2.1 General Structure

The questionnaire contains a preformulated written set of 26 questions for the respondents’ to record their answers. The questionnaire has been designed in line with the objective of the study to deal with the status of MSMEs and to measure the influence of e-business in SC components and
performance. While some questions have options and for many others the respondents have to give their response in a five point rating scale, for the purpose of measuring the level of influence of e-business for each factor. Each question has a number of sub factors to measure the major factor in detail. The questionnaire contains close ended questions. The questionnaire schedule used is given in Appendix. The purpose and major details covered under each question are given below.

3.2.2 Lifespan, Category of MSMEs and Success of SC in MSMEs

The first three questions are meant to get details on lifespan, category of MSMEs and success of SC in them. The first question deals with the life span of MSMEs from which the experience of the firm can be ascertained. Also these questions seek knowledge about SCM, influence of e-business at various levels of SCM, and the support available from Government to implement infrastructure. It is a closed end question with four options.

The second question is closed end one with three options. It provides data on categorization which is essential to identify the proportion of micro, small and medium scale firms surveyed, and comparison with the actual proportion of MSMEs in India. The next question has five options to get an overall opinion of MSMEs about the success of SC. It is aimed to measure the agility, alignment, and adaptability characteristics of MSMEs to accept the e-business in SCM.

3.2.3 E-business System Available to Support SC

This question has been framed to measure the status of usage of e-business systems in MSME to support SCM. Based on studies by Wight (1981); Cox (1998); Forrest (1994); Pedler (1994); Magretta (1998) and
Rahman (2004) the following factors have been identified as important ones of e-business system.

- Material Requirement Planning (MRP)
- Manufacturing Resources Planning (MRPII)
- Enterprise Resources Planning (ERP)
- Warehouse Management System (WMS)
- Customer Relationship Management (CRM)
- Supplier Relationship Management (SRM),
- Advanced Planning System (APS)
- Just in time (JIT),
- Decision Support System (DSS)
- Radio frequency Identification (RFID)
- Electronic data interchange (EDI)

A three point rating scale was used to measure the status of these e-business systems in terms of use of custom made, standard package and none in use. The purpose of measuring the usage of e-business systems is to identify the level of penetration of ICT in each of the components of SC in MSMEs. The usage of at least any one, i.e. either custom mode or standard package has the influence on SC performance and components.

### 3.2.4 Usage of SC Enablers

To measure the usage level of the SC enablers this question was included. From a review of studies by Mistry (2006), Frohlich (2002),
Canel et al (2000), Srikantha Dath et al (2008) and Rahman (2004) fourteen SC enablers were identified and included as sub-factors in the questionnaire. They are, close partnership with suppliers and customers, JIT supply, e-procurement, electronic data interchange (EDI), out sourcing, sub contracting, third party logistics (3PL), strategic planning in procurement and distribution, supply chain benchmarking, vertical integration, few suppliers, many suppliers, holding safety stock and use of external consultants.

The SC enablers were measured using a four point rating scale (1 not appropriate, 2 improve, 3 start implementing, 4 satisfied already). The purpose of this question is to measure the level of usage of SC enablers, which are essential to establish the MSMEs capability and knowledge level for decision-making so as to optimize resources.

3.2.5 Benefits of using SC Enablers

In order to measure the benefits gained by the MSMEs based on the usage of the SC enablers mentioned in the previous section, this question was included. Based on the study by Sahay (2003), Singh et al (2004), Koh et al (2007), Gunasekaran et al (2001), Li et al (2006) and Srikantha Dath et al (2008) the following benefits are identified: better quality and quantity of information, flexibility in operation, reduced lead-time in manufacturing, cost saving in manufacturing, improved forecasting and resource planning, better operational efficiency, reduced inventory level, accurate costing, increased coordination between departments and suppliers, customers and increased sales.

A five point scale (1 Not at all, 2 Little, 3 Average, 4 Greatly, 5 A lot) is used to measure the level of benefits gained by the MSMEs in order to improve the performance. The purpose measuring benefits of SC enablers is
for quality information, better planning in all activities of SC and co-ordination between the partners.

### 3.2.6 Supply Chain Performance Measurement Factors

The question included primarily to measure the SC performance measurement factors. Following the study by Tan (2001), Arena (2002), Pan and Yang (2002), Ellram (1991), Rossler (1995), Bhagwat and Sharma (2007), Thomas (1996), Gunasekaran et al (2001), Fuentes-Fuentes et al (2004) and Rahman (2004) several SC performance factors were identified. The SC performance factors include, total supply chain cycle time, buyer-supplier partnership level, supplier lead time, level of supplier's defect free deliveries, purchase order cycle time, supplier assistance in solving technical problems, supplier ability to respond to quality problems, supplier cost saving initiatives, supplier's order entry methods, supplier rejection rate, order lead time, delivery lead time, delivery performance, accuracy of forecasting techniques, product development cycle time, planned process cycle time, effectiveness of master production schedule, operational cost per operation hour, information carrying cost, and capacity utilization.

Moreover it also measures total transportation cost, manufacturing cost, inventory carrying cost, delivery reliability, responsiveness to urgent deliveries, effectiveness of distribution planning schedule, quality of delivery documentation, frequency of delivery, quality of delivered goods, achievement of defect free deliveries, flexibility of service systems to meet particular customer needs, customer perceived level of value of product, rate of return on investment, range of product and services, total cash flow time and customer query time.

A five point scale (1 Not at all, 2 Little, 3 Average, 4 Greatly, 5 A lot) was used to measure level of usage of performance factors. The aim of
this question is to measure the level of influence of SC performance. It is essential for the e-business operation activities associated with optimization of manufacturing and logistics processes.

Most of these factors are meant to measure the level of influence on cycle time aspect from supplier end to customer end. It is important to measure the cost and service aspect of SC performance so as to meet the rapid pace of change in supplier and final customer demands.

3.2.7 Usage of e-business Enablers

The question was included to measure the usage of e-business enablers. Taking inputs from the study by Neef (2001), Rahman (2004), Shore (2001), Briant (2000) and Srikantha Dath et al (2008), the major usage of e-business enabler identified are e-procurement, e-auctions, e-payments, electronic signature, electronic ID, e-order processing, internet and online marketing.

A five point scale (1 Not at all, 2 Little, 3 Average, 4 Greatly, 5 A lot) was used to measure of e-business enablers. Measuring of these enablers results in identification of unnecessary SC activities, improved resource allocations and system-wide standardization.

3.2.8 Importance of e-SCM Attributes

To ascertain the importance of e-SCM attributes this question was introduced. Based on the study by Yasin et al (1997), Kannan and Tan (2002), Cetinkaya and Lee (2000), Kaipia et al (2002) and Cox (2001), the SCM attributes to be measured are identified as information sharing with the supplier, vendor managed inventory, subcontracting, e-procurement, supply
chain benchmarking, team work, electronic data interchange (EDI), third party logistics, response time, reduced inventory level and strategic sourcing

Again a five point scale (1 Not at all, 2 Little, 3 Average, 4 Greatly, 5 A lot) adopted to measure the level of usage that require firms to deploy right technologies in support of strategically engineered fulfilment processes.

3.2.9 Emphasis on e-SCM Infrastructure

To measure the emphasis on e-SCM infrastructure, this question was added. Relying on the study Cullen and Webster (2007), Smeltzer (2002), Van, (2001) and Srikantha Dath et al (2008) the e-SCM infrastructure factors were identified. They include trading partner accessibility to information through secure extranet sites, linking of all departments electronically, integration of all functions and activities in the supply chain by IT, updation of information systems and periodic review of the information systems.

A five point scale (1 Not at all, 2 Little, 3 Average, 4 Greatly, 5 A lot) was used to measure the emphasis on e-SCM infrastructure. The purpose is to identify the MSMEs physical capabilities, knowledge competencies, and technology connectivity of their supply chain networks. It facilitates merging of real-time interaction for synchronized passage and convergence of network information so as to improve the performance.

3.2.10 SCM Components

The SCM components identified from literature and included in the questionnaire are given below. They are discussed in detail in the subsequent sections.
Purchase decision

Inventory management decision

Transportation management decision

Order processing management decision

Customer service management decision

Production scheduling decision and

Vendor relation decision.

3.2.11 Level of e-procurement in SC

Inclusion of this question was mainly to measure the influence of e-business in purchase / procurement decisions of SCM. From the study of Emiliani and Stec (2001), Lancioni et al (2000), Lamming, (2000), Subramaniam et al (2004) and Srikantha Dath et al (2008), the factors identified are online purchase from vendor catalogues, EDI program with vendors, communication with vendors, negotiation with vendors, checking price quotation of vendors, arranging for returned /damaged products to vendors, dealing with warranty issue of vendors, electronic document management, e-payments, order processing, follow-up via e-mail.

A five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) was used to measure the influence of e-business in procurement decisions in each and every activities of the purchasing, starting from component sourcing, negotiation, purchase order generation and status monitoring, and ending with materials receipt the level.
3.2.12 Level of e-inventory Management in SC

This question addresses the influence of e-business in inventory management decision related factors. As per the study of Lancioni et al (2000), Srikantha Dath et al (2008) and Rahman (2004) the following factors were identified for measuring the level of influence of e-business in inventory management viz., EDI programs with vendors for inventory, coordination of JIT delivery programs, communication with customer and vendors about the inventory levels, notification of delays in order ship dates to customers.

As in the previous case a five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) was used to measure the level of influence of e-business in inventory management. Of course the main purpose is to measure the inventory planning and scheduling, and the seamless integration of necessary core competencies from all points in the supply channel.

3.2.13 Level of e-transportation Management in SC

To measure the level of e-business influence in transportation management this question was included. The influence of e-business in the transportation management decision measured with the help of the factors identified from studies by Christopher (1998), Lancioni et al (2000) and Yung-yu (2005). They are transportation cost, scheduling pickups at regional distribution centres, scheduling drop-offs at regional distribution centres, monitoring on time arrivals of carriers and mode of transportation.

The rating scale used to measure the level of influence of e-business in transportation management is five point (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) one. It is for the purpose seeking a variety of shipping solutions that automate and optimize provider selection, multi-carrier options,
rate quotation, routing, manifesting, tracking, cost analysis, and post-shipment analysis processes.

### 3.2.14 Level of e-order Processing Management in SC

The question was meant to measure the influence of e-business in order processing management decision. From the study of by Lancioni et al (2000), Srikantha Dath et al (2008) and Rahman (2004), the following factors identified for measuring the level of influence of e-business in order processing management; order processing time, communication with customers and vendors about order status and credit status, providing total order-cycle performance for customers, providing credit processing status to customers, obtaining price quotes from vendors and providing price quotes to customers

A five point scale (1 Not at all, 2 Little, 3 Average, 4 Greatly, 5 A lot) was used to measure the level of influence e-business in order processing management. It is used for the purpose of measuring the customer’s requirement in order picking and fulfilment of smaller and more frequently delivered lot sizes. This fulfilment require the MSMEs’ equipped with the e-business system to accesses the logistics communities to make delivery of any order size at anytime a reality.

### 3.2.15 Level of e-customer Service Management in SC

As influence of e-business in customer service management decision is an important aspect, this question was included. As per the study of Lancioni (2000), Srikantha Dath et al (2008) and Rahman (2004), the following factors identified for measuring the level of influence of e-business in customer service management: customer promising time and order status, helping customers to purchase items online through catalogues and lists,
receipt of customer complaints, providing technical service, notifying customers of emergencies in the supply chain strikes, fires, etc, and managing the outsourcing of customer service functions.

To measure the level of influence e-business in customer service management, a five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) adopted. It is an important aspect as MSMEs view customer service as a necessary investment to reinforce customer loyalties and assuring maximum customer value.

3.2.16 Level of e-production Scheduling in SC

The question was included to measure the influence of e-business in production scheduling. Based on the literature review, the following factors considered for measuring the level of influence of e-business in production scheduling (Lancioni et al 2000; Srikantha Dath et al 2008; Rahman 2004): coordination of production schedules with vendors, coordination of production schedules with field depots, coordination of production schedules with warehouse, coordination production schedules of multiple manufacturing sites.

A five point scale (1 Not at all, 2 Little, 3 Average, 4 Greatly, 5 A lot) adopted to measure the level of influence e-business in production scheduling. It is for the purpose of detailed scheduling and sequencing. For generating feasible and optimal manufacturing schedules, the constraints include shop floor capacities, workload balancing, material availability and available resources.

3.2.17 Level of e-vendor Relation in SC

Measurement of the influence of e-business in vendor relation decision is yet another aspect. For this purpose a question was designed. From the study of Lancioni et al (2000), Srikantha Dath et al (2008) and
Rahman (2004) the factors recognized to measure vendor relation are: coordination of deliveries of vendors to warehouses and field depots, communication with vendors regarding raw material stock levels at their plant sites and receipt of information queries from vendors

A five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) used to measure the level of influence e-business in vendor relation. The purpose is to access the ability of a MSMEs to rate the performance of its vendors on the basis of the elements agreed in their negotiated contracts.

### 3.2.18 Emphasis on Firms Strategy on SC

The question was framed to measure the level of influence strategy of firms on SC. On the basis of the study by Mollenkopf (2005), Koh et al (2007) and Srikantha Dath et al (2008) several factors were identified to measure the firms’ strategy. They include ensuring the product’s ready availability on the shelf in the market, reducing the lead time in the supply chain, offering returns management solutions, producing innovative and technologically superior products and offering products with the best quality and with a minimum price.

A five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) was used to measure the firm’s strategy. The aim is to measure the influence of e-business on strategy of firms, which could lead to lower product price, better quality of product, faster response and eventually higher market share.

### 3.2.19 Emphasis on Top Management Support

In order to measure the level of influence of e-business on top management this question was designed. The factors identified to measure the influence of e-business on top management based on the study by Vereecke (2006); Mollenkopf (2005); Koh et al (2007); Srikantha Dath et al
(2008): include commitment of adequate resources for effective SCM, clear customer and shareholders focus, ensuring of good internal communication and dialogue process, supporting acquisition and implementation of appropriate information system across departments and across the supply chain, and ensuring of performance measures aligned with the SCM strategy.

A five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) was used to measure the level of emphasis of top management support. This is to assess the owners support in e-business education, sponsoring of e-SCM effort, development of SCM strategy, development of human resources, investment in supply chain improvement and effectiveness of e-SCM.

3.2.20 Emphasis on Long Tem Relationship with Trading Partner

The inclusion of this question was primarily to measure the level of influence e-business on long term relationships with suppliers. Premkumar (2000), Srikantha Dath et al (2008) and Lau (2003) considered the following factors to measure the influence of long term relationship with trading partner: trading partners’ participation in the organisation’s various project teams and involvement during planning, design and development stages of new products and services, mutual exchange of sensitive, proprietary and critical information with key trading partners in a timely manner, regular meeting and interactions with the related departments of trading partners, effort to maintain a long-term relationship with trading partners, the organisation viewing trading partners as a virtual part of the extended organization, comprehensive dispute resolution management system formed with trading partners to address contingencies and organisation sharing risks and rewards with the trading partners in a transparent manner.

A five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) provided to measure the level of influence of e-business in long term
relationship. It is meant for the purpose of identifying improvement in opportunities and tailored solutions to meet mutual needs of the supplier and buyer beyond physical product and service delivery. Moreover, the relationship is tightly coupled with quality, innovation and information sharing. Thus, it is possible to share risks and rewards with the trading partners in a transparent manner.

3.2.21  **Emphasis on SCM Benchmarking**

To measure the level of influence of e-business on emphasis on the bench marking of SCM activities, this question was framed. From the study by Mehrjerdi (2009) and Srikantha Dath et al (2008) the factors recognized to influence of e-business in SCM bench marking are: customer focus, supply chain design, performance metrics, managing information, trading partner management, inventory management, manufacturing, returns management and employee training and management.

For this question also, a five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) adopted to measure the level of influence of e-business in SCM benchmarking. It is measured for assessing of the MSMEs’ capabilities of competing suppliers and ensuring that costs, delivery, and collaborative targets are attained.

3.2.22  **Emphasis on Measure of Performance**

For evaluating the level of influence e-business on the measures of performance on MSMEs, this question was included. The following factors identified based on the study by Mentzer (2001); Lee (2004), to measure the performance: increase in profitability, increase in return on investment, increase in market share has and decrease in cash to cash cycle time. Most of the Indian MSMEs are still using monetary performance and productivity based performance measure to measure the SC performance. The monetary
performance is measured by the company’s relative cost and profit-related performance.

A five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) was provided to indicate the level of influence of e-business in performance measurement. The influence of e-business in performance measurement is in the form of identification of financial performance of MSMEs in terms of return on investment, return on sales, revenue growth and market share.

3.2.23 Emphasis on Trading Partner Performance

This question was provided for measuring the level of influence e-business on the emphasis on trading partner performance. On the basis of the study by Tummala et al (2006); Srikantha Dath et al (2008); the following factors identified: increase in on time delivery by trading partners, increase in the number of products conforming to specification, improvement in cost effectives of products/services offered by trading partners and increase in the number of orders delivered in full.

A five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) used to measure the level of influence of trading partner performance. This metric is used to assess whether the MSMEs are participate in e-markets and utilising internet tools to improve interoperability, dependence on long-established trading relationships.

3.2.24 Emphasis on Business Performance

To measure the level of influence e-business on the emphasis on Business performance this question was framed. From the study of Bozarth et al (1997), Lancioni (2000), Srikantha Dath et al (2008) and Rahman (2004) the factors identified include decrease in new product development time,
reduction in production lead time decrease inorder fulfilment lead time and decrease in inventory days of supply have. decreased.

A five point scale (1-Not at all, 2-Little, 3-Average, 4-Greatly, 5-A lot) used to measure the level of influence of e-business on business performance. It is mainly for the purpose of evaluating the various cycle time like order processing time, production lead time, and delivery reliability.

3.3 RELIABILITY AND VALIDITY

3.3.1 Pilot Study

Using the preliminary questionnaire schedule, a pilot study was conducted with a sample of 30 respondents randomly picked up in and around Chennai. The profile of the respondents are the Manufacturing, assembling, processing, engineering and maintenance MSMEs in an around Chennai. The result of the pilot study was used to identify the weakness in the survey instrument and scope for improvement. In addition, the reliability of the instrument and the adequacy of sample size were established. The questionnaire schedule was also discussed with a few industrial experts to seek their opinion for improvement and validation.

3.3.2 Reliability Analysis

Reliability and validity are two important issues which decide the amount of rigor of the overall research design and eventually the effectiveness of the study. Validity include construct validity, internal validity and external validity (Yin 2003; Voss et al 2002).

The reliability of the survey questions for each construct was assessed using the measure, Cronbach’s alpha. Reliability explores whether a set of survey questions is consistent in measurement of a construct (Hair
et al 1992). The reliability is higher as the Cronbach’s alpha approaches the value of 1.0. Table 3.1 shows that the Cronbach’s coefficient (α) calculated to test the reliability and internal consistency of the responses. The value of ‘α’ in this study was found to be 0.850439. Cronbach’s alpha values of all the constructs well exceeded the recommended minimum value of 0.7 for exploratory research (Nunnally 1978).

**Table 3.1 Reliability analysis of the questionnaire**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Item</th>
<th>Cronbach's Alpha</th>
<th>No of Item</th>
<th>No of Samples</th>
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<td>1.</td>
<td>Supply Chain Enablers</td>
<td>0.8658</td>
<td>15</td>
<td>30</td>
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<tr>
<td>2.</td>
<td>Benefits of supply chain components</td>
<td>0.9211</td>
<td>14</td>
<td>30</td>
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<td>3.</td>
<td>factors influencing the Supply Chain performance</td>
<td>0.9623</td>
<td>36</td>
<td>30</td>
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<td>4.</td>
<td>Importance of e-business related aspects</td>
<td>0.7955</td>
<td>13</td>
<td>30</td>
</tr>
<tr>
<td>5.</td>
<td>Attributes of Supply Chain Management is important for the organisation with respect to e-business</td>
<td>0.8652</td>
<td>13</td>
<td>30</td>
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<td>6.</td>
<td>E-business traits, the extend to which it lays emphasis on Supply chain Management of the organization</td>
<td>0.8611</td>
<td>5</td>
<td>30</td>
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<td>7.</td>
<td>Purchase decisions related aspects of Supply Chain Management with respect to e-business</td>
<td>0.9229</td>
<td>11</td>
<td>30</td>
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<td>8.</td>
<td>Inventory management decision related aspects of Supply Chain Management with respect to e-business</td>
<td>0.9134</td>
<td>9</td>
<td>30</td>
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<td>9.</td>
<td>Transportation management decision related aspects of Supply Chain Management with respect to e-business</td>
<td>0.8128</td>
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<tr>
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<td>10</td>
<td>Order processing management decision related aspects of Supply Chain Management with respect to e-business</td>
<td>0.8995</td>
<td>11</td>
<td>30</td>
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<td>11</td>
<td>Customer service management decision related aspects of Supply Chain Management with respect to e-business</td>
<td>0.8888</td>
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<td>30</td>
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<tr>
<td>12</td>
<td>Production scheduling decision related aspects of Supply Chain Management with respect to e-business</td>
<td>0.8120</td>
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<td>30</td>
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<td>13</td>
<td>Vendor relation decision related aspects of Supply Chain Management with respect to e-business</td>
<td>0.7922</td>
<td>4</td>
<td>30</td>
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<td>14</td>
<td>Company’s strategy the extent to which it lays emphasis in Supply Chain Management of the organisation</td>
<td>0.8180</td>
<td>5</td>
<td>30</td>
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<tr>
<td>15</td>
<td>Top management the extent to which it lays emphasis in Supply chain Management of the organisation</td>
<td>0.7825</td>
<td>5</td>
<td>30</td>
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<td>16</td>
<td>Long term relationships with suppliers, the extent to which it lays emphasis on Supply chain Management of your organization</td>
<td>0.8753</td>
<td>8</td>
<td>30</td>
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### Table 3.1 (Continued)

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<th>No of Item</th>
<th>No of Samples</th>
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<td>17.</td>
<td>Bench marking of SCM activities with that best in class of organization</td>
<td>0.8896</td>
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<td>18.</td>
<td>Measures of performance lays emphasis on your organization’s SCM</td>
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<td>Trading partner performance lays emphasis on your organization’s SCM</td>
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<td>20.</td>
<td>Business performance given below lays emphasis on your organization’s SCM</td>
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<td>21.</td>
<td>Customer related performance lays emphasis to on your organization SCM</td>
<td>0.7839</td>
<td>4</td>
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<td>22.</td>
<td>which e-business tools support the SCM Performance in your organization</td>
<td>0.9158</td>
<td>10</td>
<td>30</td>
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<td>23.</td>
<td>Company’s effort in Supply Chain Management and e-business in the future</td>
<td>0.8866</td>
<td>8</td>
<td>30</td>
</tr>
</tbody>
</table>

**Overall Cronbach Alpha** | 0.854039

#### 3.3.3 Sample Size

In this research, the population comprises micro, small and medium scale enterprises in and around Chennai. The MSME Development Institute and MSME testing centre are located in close proximity to many of the MSMEs in Chennai.

In India 21.438 million MSMEs are available, while in Tamil Nadu alone 2.055 million MSMEs are located. (MSME report 2011-12). A list of
manufacturing and engineering firms from MSME-DI Chennai was collected and they were selected randomly and approached through contacts to meet the key person of each MSME. As high as 400 firms were approached through contacts to collect data, but, however only 131 firms responded and the response rate constitute nearly 32%.

Review of literature reveal that some of the earlier studies made involving SMEs, the number of respondents was 98 (Croom 2005) and 120 (Sambasivan et al 2009). In the light of these, the response from 131 firms is considered as is adequate enough to arrive at meaningful conclusions and possible generalization. However, it is understood that the extent of generalization should be restricted to Indian context and specific to SME units in manufacturing sector. The samples were selected from the MSME maximum concentration area of Chennai and the surrounding industrial area. Since the data collection instrument is a questionnaire in a schedule form, it was necessary to go to the firm directly for data collection.

3.4 DATA COLLECTION AND STATISTICAL TESTS

3.4.1 Data Collection

The purpose of data collection is to obtain information to keep on record, to make decisions about important issues and to pass on information to others. As the data collected has to provide information regarding specific issues, it has to be secured from primary sources depending on the nature of research. In this study, the primary data refers to the information obtained firsthand by the researcher on the variables of interest for the purpose of measuring the influence of e-business in the SCM of MSMEs.

The primary data for this research was collected by questionnaire survey method in the form of schedule. As already stated, it consists of
pre-formulated written set of questions the response for which to be filled by the respondent with the assistance of trained interviewer in a face to face manner. The questionnaire was administered by the researcher and through the trained person to collect complete data. Really it was a challenging task to meet the key person of the MSME at his/her convenience to get the information about 26 questions. In fact, gathering of data itself took nearly nine months.

The interference of the interviewer to the study situation is very minimal. The interviewer cannot interfere with the normal activities of the firm and hence forced to collect the primary data from the key person of the firm at his / her convenience.

The data obtained though the questionnaire were checked, collated and analyzed to arrive at findings. As stated in the scope of the study, statistical test like Chi-square test and Friedman test were used to test the hypotheses formulated in the study besides use of techniques like multivariate analysis and factor analysis. To assist better understanding of e-business influencing factors in supply chain of MSMEs and their linkages, an Interpretive Structural Modeling (ISM) was developed.

3.4.2 Friedman Test

The Friedman test is applied to data with repeated-measures designs or matched-subjects designs. With repeated-measures designs, each participant is a case in the data file and has scores on K variables. From the score obtained on each of the K occasions or conditions, the researcher is interested in determining if subjects changed significantly across occasions (or conditions). For Friedman test, the observations come in sets of K observations. From the Friedman test results, the mean rank values and the
standard deviation values of the factors alone taken into consideration for the purpose of inference in this research.

### 3.4.3 Chi-Square Test

Chi-Square test normally used to examine differences with categorical variables. It is used in two similar but distinct circumstances: for estimating how closely an observed distribution matches an expected distribution, referred as the goodness-of-fit and also for estimating whether two random variables are independent.

### 3.4.4 Multiple Regression Analysis

The stepwise multiple regression analysis is used in establishment of relationship. It is a sophisticated statistical method when the numbers of independent variables are more. Each variable is introduced in sequence and its value assessed. If adding the variable contributes to the model then it is retained, but all other variables in the model are then re-tested to see if they are still contributing to the success of the model. If they no longer contribute significantly they are removed. Thus, this method ensures that the smallest possible sets of predictor variables that mostly contribute are included in the model.

Multicollinearity occurs when prediction variables are highly correlated with each other and it is difficult to arrive at reliable estimates of their individual regression coefficient using beta weight (Garson, 2008). In order to avoid the occurrence of multicollinearity, tolerance indicator suggested is, that it should be more than 0.1, and the variation inflation factors (VIF) be greater than 10 (Ooi et al 2007). The threshold value of condition index is between 15-30, with 30 is most commonly used value.
3.4.5 Factors Analysis

Factor analysis is a technique that can be used to simplify data, by reducing the number of items to demonstrate the presence or otherwise of underlying constructs. This technique can therefore be used to uncover any interdependencies between items of interest (Weber and Kantamneni 2002) and this was used to find out the underlying common factors influencing the supply chain performance.

Principle component analysis is applied to determine how and to what extent the items are linked to their underlying factors (Zhang et al 2000). According to Hair et al (2005), factor loadings greater than 0.30 are considered as significant; loadings of 0.40 are considered as more important, while loadings that are greater than 0.50 are recognized very significant. Therefore, a factor loading of 0.50 was used as the cut off point (Hair et al 2005). Latent root criterion was applied to determine if the items are loading into one factor. Factors, whose eigen values are more than 1 considered significant, while those that have eigen values of less than 1 are considered insignificant.