3.1 Theoretical Framework preamble

Supply chain can improve efficiency and effectiveness of not only product transfer, but also information sharing between the complex hierarchies of all the tiers. In the present study, we are attempting to view performance measurement on supply chain as an appraisal on the performance including overall operational level, the node enterprises in the supply chain, the cooperative relationship between the node enterprises, etc. Hence it is essentially a business-process-based performance measurement framework. This study also relates the industrial organisation theory of cluster performance enhancement through a firm’s supply network.

In literature the measures have often been categorised into aspects of quality, time, flexibility, and cost. But most often cost is used as the only measure or cost and another measure for customer responsiveness is applied. Other more qualitative measures, like customer satisfaction or concerning risk management, are seldom used due to their restricted applicability in quantitative models[^46].

The review of the literature illustrated in previous chapters has highlighted that existing studies have so far focused on the qualitative as well as quantitative aspects of performance and their measures but not on something that throws up an insight how these are applicable to or adaptable to SMEs with or without a possibility for exports of products, located in a cluster that has considerable dynamics which contributes to growth and vice versa.

The analysis permitted to identify the critical but measurable at SME level, criteria related to supply chain performance and effectiveness and drew attention to

the existence of some elements that more than any others influence mutual behaviour among the partners along the supply chain.

The present framework positions itself within the above ambit wherein an attempt has been made to explore what factors determine or facilitate the improvement of supply chain effectiveness and thus the performance and growth of SMEs in the textile cluster of Tirupur. The research does take into consideration various aspects that are both internal and external the organisation and tries to estimate the degree to which they play a role in measurement.

The research has tried to adopt a combination of models proposed by Michael Porter (1990) and Beamon (1999). While the macro aspects of performance of the industry cluster are dwelt basing Porter’s model, the firm level supply chain network of the SMEs in the cluster are looked into using the Beamon model.

The following pages discuss the fit of these models into current context of the research and the basic framework for this research.

3.2 Competitiveness of Nations model (1990) – Michael Porter

In this section, Michael Porter's Competitiveness of Nations model (1990) is used for assessing competitiveness of Tirupur cluster, on a measurement scale of 5. The methodology has been used widely to understand the competitiveness of the clusters on a macro level.

Porter's diamond model has four determinants of competitive advantage: demand conditions, factor conditions, presence of supporting industries and company strategies. Porter's cluster model is an extension of the diamond model. Clusters refer to geographical concentrations of interconnected companies. Clusters
influence the competitive environment by increasing the productivity of companies in each cluster, encouraging entrepreneurial activity and driving the margin improvement.

**Figure 3.2: Porter’s Cluster Model**

Factor conditions refer to a country's resources, such as labor and natural resources, while demand conditions refer to local/export demand for a company's products and services.

Factor conditions include those factors that can be exploited by the SMEs in a given cluster. Advantageous factors like available workforce in plenty can be built further by skill building initiatives with the buyers whereas disadvantageous factor conditions like shortage of workforce can also contribute to competitiveness because this may force the SMEs to focus on either strengthening welfare measures of workforce or focus on zero defects.
Figure 3.3: Porter’s model
A more demanding home market is a driver of growth, innovation and quality improvements. If the local market is larger than the foreign ones, local small firms put more emphasis on improvements for catering to the segment that has better demand.

The presence of supporting industries in close proximity to manufacturing SME companies can reduce input costs and increase profits. Supporting industries include raw materials suppliers and feeder/sub-product manufacturers. A competitive industry structure is also important because companies that can survive tough competition at home are usually able to withstand even tougher competition in a global business environment.

Government can influence each of the above four determinants of competitiveness - the supply conditions of key production factors, demand conditions in the home market, and competition between firms. Government policy has an impact on all elements of the cluster-specific diamond. It often has responsibilities for large parts of the infrastructure, it sets key rules and regulations affecting competition and demand, and it affects the cluster presence throughout. Government interventions can also occur at local, regional, national or supranational level.

Chance events are those that are outside the control of a firm, are equally important because they create discontinuities in which some gain competitive positions and some lose.
A company's competitive environment can also affect profitability. The bargaining power of buyers and suppliers affect a small company's ability to increase prices and manage costs, respectively.

Industry rivalry is likely to be higher when several companies are vying for the same customers, and intense rivalry leads to lower prices and profits.

The macro analysis discussed in the present research study dwells in detail on the overall performance of the textile industry cluster in the country and especially in Tirupur. By using Porter’s diamond, SMEs can analyse which competitive factors can be exploited to gain competitive advantages qualitative front and improve upon their supply chain performance.

However, the competitiveness indices of the cluster under different conditions are prepared with the support of opinion makers and leaders in the cluster, to make it as realistic as possible.

The following diagram resembles the Porter’s model as adapted to Tirupur.
Figure 3.4: Tirupur cluster’s Competitive Position as adapted to this study

**Quality initiatives:**
- Product/service level quality
- Relationships with customers

**Proactive management:**
- Top management commitment, initiatives
- Legislative effects
- External pressures
- Focus on core competency

**Employee orientation:**
- OSHAS
- Diverse workforce
- Customer focus-knowing the requirements

**Competition:**
- Margins
- Differentiation, strategy to tackle competition
- Flexible production schedules
- Information sharing

**Buyer relationship:**
- Buyer site visits
- Buyers’ quality demands
- Buyer pressures
The study looks at clusters of industries, where the competitiveness of one company is related to the performance of other companies and other factors tied together in the value-added chain, in customer-client relation, or in terms of local or regional or international contexts. The Porter analysis was used to examine, to clarify the dynamic process by which competitive advantage is created. The phenomena that are analysed are classified into five broad factors incorporated into the Porter diamond as indicated above, which has become a key tool for the analysis of competitiveness.

3.3 Beamon’s Model (1999)

Measures of performance are generally thought to be effective if the following aspects are fulfilled:

- inclusiveness (measurement of all pertinent aspects)
- universality (allow for comparison under various operating conditions)
- measurability (data required are measurable) and
- consistency (measures consistent with organization goals)

It is also important not only to focus on the measures used, but also to reflect on the performance measurement system as a whole. If only one performance measure is used, it should adequately describe the performance of the system in focus and align performance measures with the strategic goals.

Individual performance measures are usually non-inclusive so the goal for a performance management system should be to include more aspects. Beamon suggests focusing on measures for resources (R), output (O) and flexibility (F).
Resource management implies uses of physical assets, human resources optimally to improve profitability and thus the margin. Output implies the quality of the product which is critical for attracting and retaining the buyers. Flexibility is the dimension that enables one to respond on time to changes in the demand in the environment.

The present study looks also tries to look at the supply chain performance of SMEs in the industry cluster based on the Beamon’s model. The initiatives taken by a firm, for example, on use of resources can be on:- 1. utilising optimally the fixed assets – use of machinery or space either for direct sales/supplies or work on subcontracts. This in turn depends on how well the ‘relationship’ with the other stakes, especially the buyers becomes important. 2. Improvements in asset utilisation can also contribute to technological upgradation consequent to demands on quality front. Improvements and focus on quality can complement customer focus, buyer retention and stable demand for products. 3. Abundant and diverse workforce adds to flexibility in scheduling ‘production’ on one hand but can also be constraint when one talks about stringent quality standards. This is where the top management’s commitment to strive for implementing standard working condition, improving work environment etc motivates skilled workforce to remain loyal to the firm and thus reducing the uncertainties.

Thus, even looking at from Beamon’s model, the initiatives on quality, customer relationship and management support can be studied to measure the supply chain performance of the cluster under study.
Case Study Approach

A case study methodology is ideal when the research is trying to answer questions of ‘how’ and when the enquiry is empirical in nature. Moreover the methodology is best suited to be used in situations where complex social/business phenomena are studied and the phenomena involve many variables of interest and multiple sources of evidence\textsuperscript{47}. Analytic generalisation is possible even from a case study and prior expert knowledge can be brought to the study.

The flexibility of case study design is that the researcher can select cases different from those initially identified, if required, without changing the purpose or objectives of the study to suit the cases\textsuperscript{48}. However it is to be noted that the purpose is to generalize the theoretical propositions and time limits & writing formula depend on the choices of investigators.

3.4.1 Tirupur textile cluster as the model

- This is an empirical enquiry that investigates a contemporary phenomenon within its real life context is possible given the fact that the boundaries between the phenomenon and the context are not clearly evident

In this case, what is attempted is to find out to what extent the initiatives of the SMEs in the supply chain context help them improve their supply chain performances.

\textsuperscript{47} Robert K Yin, 1994, Case study -Design and Methods- 2\textsuperscript{nd} edition
\textsuperscript{48} ibid
It is an empirical study on the lines social sciences research and the action of the human beings are being studied and interpreted by another researcher.

The real life situation is being studied and it is dynamic. We will not be able to draw up an exact ‘cause-effect’ relationship since it is statistically impossible to draw up such a relationship for a dynamic system like the Tirupur textile cluster.

- Does not involve explicit control or manipulation of variables

There is not attempt on the part of the study or the researcher to alter the influence of the independent variables on the dependent variable. Though the actual attempt is to find out the influence each of the independent variables, in actual, it is only possible to infer the collective influence of the independent variables in a naturally occurring phenomenon.

- Possible to describe SC performance phenomenon, develop a theory and test it

Supply chain is a concept that can be applied to all businesses, we are limiting the scope of this study to SMEs in the Tirupur industry cluster, to SMEs that are by the very nature of volume transacted, to SMEs that naturally have capital constraints but SMEs that have abundant entrepreneurial fire to get propelled to perform. It is this dimension where in this study is made to look at how ‘initiative centric’ actions, either self driven or under some sort of compulsion to excel, on the part of the entrepreneurs of the SMEs help in accomplishing an effective supply chain – develop a theory that will focus on a measurement system aligned with strategic goals, organisation culture and seek to improve continually.
A combination of positivist and interpretivist approach is possible

Predictions can be made on the basis of the previously observed and explained realities and their inter-relationships. Positivism has a long and rich historical tradition. It is so embedded in our society that knowledge claims not grounded in positivist thought are simply dismissed as ascientific and therefore invalid. Most empirical studies in the literature were positivist in approach. Positivism has also had a particularly successful association with the physical and natural sciences. There has, however, been much debate on the issue of whether or not this positivist paradigm is entirely suitable for the social sciences.

Positivist postulate believes that reality is stable and can be observed and described from an objective viewpoint, without interfering with the phenomena being studied. It contends that phenomena should be isolated and that observations should be repeatable. This often involves manipulation of reality with variations in only a single independent variable so as to identify regularities in, and to form relationships between, some of the constituent elements of the social world. Through the subjective interpretation of intervention in reality, the reality can be fully understood.

The study of phenomena in their natural environment is important to the interpretivist philosophy, together with the acknowledgement that researchers cannot avoid affecting those phenomena that they study. The study admits that there may be

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many interpretations of reality, but maintain that these interpretations are in themselves a part of the scientific knowledge that is pursued.

While we shall not elaborate on this debate further, it is germane to our study since it also deals as it does with the interaction of people and is considered to be of the social sciences rather than the physical sciences.

Having set the context of the theoretical framework, background and justification of the research methodology to further probe on the supply chain performance in an industrial cluster, the researcher gets into setting the actual theoretical framework for the study as follows.

3.4.2 Defining characteristics of clusters as proposed in the literature:

A. Directly observable characteristics

1. Relative spatial proximity (or nearness) of the enterprises
2. A high density of economic activities generally
3. Presence of numerous firms involved in same, similar, and subsidiary activities

B. Foundational and universal characteristics

4. Inter-firm linkages between enterprises as a result of (vertical) subcontracting
5. Inter-firm linkages between enterprises in specific forms of (horizontal) co-operation
6. Some degree of specialization
C. **Theoretically constructed characteristics**

7. Mutual and collective learning processes

8. Social networks that are not embedded in transactions among producers or traders

9. External economies resulting from linkages and networks

10. A role for local and traditional institutions

11. A role for municipal and regional governments

12. Favourable and supportive institutional environment

13. Circumstances favourable to the generation of trust between business partners

14. Generalized atmosphere of trust and absence of or limits to opportunism

15. Similar levels of technical sophistication

16. Common labour pool

17. Shared technical competence pool

The first three are directly observable and can be established by simply visiting the presumed cluster. The next three characteristics can be identified through a small number of company visits and preliminary discussions with their proprietors and managers, and these features, moreover, can be seen as defining whether we are dealing with a cluster or not. The other characteristics listed above are theory-dependent to a larger extent and more demanding in terms of empirical research\(^51\).

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\(^{51}\) Meine Pieter Van Dijk and Arni Sverrisson, Enterprise clusters in developing countries: mechanisms of transition and stagnation – Entrepreneurship and Regional Development, 15, July-Sep 2003, 183-206
The literature consists of a large number of case studies and a few review papers, it does not provide sufficient basis for systematic empirical comparison and conclusions about such interrelationships.

The cluster concept has been defined in multiple ways by researchers and therefore they also tend to come up with a different selection of characteristics, according to the premise that you find what you are looking for. The formulation of a coherent theory concerning the importance of clustering for the competitiveness and development of small enterprises in developing countries therefore requires us to consider the interrelationship of these criteria.

Indeed, it is possible that the relevance of theoretical models is a variable itself, i.e. that for example ‘customer focus’ may be important in some cases but irrelevant in others, and that ‘buyer relationship’ is sometimes central, sometimes peripheral in comparison with, for example in local and global markets as well.

3.5 Theoretical Construct for the study

Based on the above, the attempted theoretical construct looks as follows and the researcher is studying a number of factors in a cluster which could explain supply chain performance. The following diagram depicts the construct:
Figure 3.5: Theoretical Construct

INDEPENDENT VARIABLE  DEPENDENT VARIABLE

- Quality Initiatives
- Customer/ Buyer Relationship
- Customer focus
- Employee orientation
- Support from Top Management
- Export orientation

Supply Chain Performance
Quality initiatives can decisively swing during intense competition in favour of the SMEs assiduously practicing it in a continuous manner. Buyer’s site visits do often strengthen the production scheduling and also the checks on quality during the process. Such visits ensure ‘on time’ delivery from the SMEs apart from reducing rejects owing to quality defects in the final product.

Quality is mandatory. It has quite a lot of inherent advantages like

1. customer retention
2. customer loyalty
3. flexible but committed customer relationship
4. competitive marketing edge
5. reduced wastages
6. motivated employees
7. newer customers
8. increased market share, resulting in possible ‘increased profits’… etc.

SMEs may have limitations on achieving quality because they may not be able to retain skilled workforce or may not be able to upgrade their technology/skills and hence cannot upgrade their product lines and more importantly may severely be affected by rather a constant resource crunch just because of the fact they are ‘small and medium’. This is where their efforts to draw the support of the buyer and building a long term relationship will result in mutual benefit, increased quality due to initiatives supported by the buyer and these result in an improved performance of the respective supply chain network.
Buyer orientation on the part of the SMEs enhances the trust and commitment of the buyers in building collaborative and long term partnerships. It is observed from various researches that such partnerships improve upon the supply chain performance in the cluster and the ‘pressures’ from the buyer perspective, on ‘delivery, quality and conformance to norms’ can raise the quality of supply chain performance on a continuous basis.

Quality oriented initiatives, whether applied proactively or under the pressures from the buyer improves the final quality of the end product and this gives a cutting edge when SMEs face fierce competition with in the cluster as well as from similar producer groups outside. A transparent and open exchange of communication and ideas with in the cluster opens up trust and increases collective wisdom. This is a way of capacity building enroute to an improved performance.

Top management support to quality initiatives, workers’ welfare and safety add value to the SME in a competitive environment, thus attracting the buyers. Strategic retention of existing buyers then becomes a part of long term management strategy which is mutually rewarding and providing a growth. Focussing on core competency as a strategy enhances productivity and thus the margin ultimately.

External pressures from non buying stakes like government regulates the production and marketing disciplines in the cluster and this compliments the supply chain performance overall.

Environmental concerns have found their way from strategy and board room meetings to operations and to supply chain management (SCM). A growing number
of companies have realised the importance of making their SCM environmentally friendly. They try to ensure that their manufacturing facility is friendly to the environment and does not generate harmful waste products into the environment. Buyers have also started insisting on certain environmental initiatives. Working with suppliers and/or buyers on environmental issues not only generates significant environmental benefits, but also opportunities for cost containment, improved risk management and enhanced quality, brand image and hence improved performance. This will also help companies streamline their buyer/supplier base in a focused manner and develop a more co-operative, long-term relationship with key buyers/suppliers, a practice that has fostered greater opportunities to work together on environmental issues. Companies must carefully justify all environmental changes through either cost reduction or customer satisfaction issues.

Theory and intuition suggest that the actual level of health and safety measures is related to employee performance. Employees are a key element in quality management and quality improvement. At the SME level, despite commitment to quality, there are other challenges like working capital constraints, size of employee workforce and its abundancy but migrant nature etc really require a strong conviction from the management to pursue the safety and health measures against odds.

This study attempts to look at this angle of change in focus as a competitive tool and ‘environmental efficiency and quality’ are viewed as positive catalysts for change to improve SC performance through employees’ capacity building on
environmental concerns and improving employee health and safety standards in the workplace. With the continuous development of theories for supply chain management and advancement of practice, this research attempts to develop a more effective index system available for performance measurement.

The current study focuses on the key points and a thorough analysis on these performance indices has been undertaken. We have ensured that the

- performance rating indices that reflect the real business process have been adopted.

- these performance rating indices are capable of reflecting the operation status of the overall supply chain, instead of just reflecting on the operation status of single node enterprises of a supply chain.

Regression equation for the performance score of an SME firm can be argued to be based on the premise that the performance should improve if each of the independent variables ‘buyer relationship, quality oriented initiatives, top management commitment, customer focus and employee orientation’ consciously improved upon. Capability to remain committed to quality products, use assets effectively, engage buyers in a beneficial manner, use competition to improve margins in a focussed manner and focus on quality result in improved performance in a continuous manner. Below in the table, each attribute for the respective driver variable is listed on the basis of the framework presented above.
Table 3.3: Attributes of the driver variables

<table>
<thead>
<tr>
<th>Item No</th>
<th>Item/Attribute Name</th>
<th>Independent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Site visits by buyer</td>
<td>Buyer Relationship</td>
</tr>
<tr>
<td>2</td>
<td>Buyer oriented adjustments</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Buyer pressures</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Competitive Market Climate</td>
<td>Quality Oriented Initiatives</td>
</tr>
<tr>
<td>5</td>
<td>High Quality products</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Information Exchange</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Quality Control by Buyer</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Clear Policy towards Environmental Protection</td>
<td>Top Management Commitment</td>
</tr>
<tr>
<td>9</td>
<td>Occupational Safety &amp; Health Standards</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Top Management Support for SCM</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>External Pressures</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Customer Focus</td>
<td>Customer Orientation</td>
</tr>
<tr>
<td>13</td>
<td>Government Regulations</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Self Orientation towards Quality</td>
<td></td>
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<tr>
<td>15</td>
<td>Focus on Core Competency</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Environmental &amp; Social Programmes</td>
<td>Employee Orientation</td>
</tr>
<tr>
<td>17</td>
<td>Workforce Diversity</td>
<td></td>
</tr>
</tbody>
</table>

Given the dynamic environment prevalent in the cluster, the following inter-linkage is highly plausible as well.

```
Quality Initiatives
  +
  Asset Utilisation
     ↓
  Responsiveness
     ↓
Margin Improvements
```

```
[Supply Chain Performance]
```

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Basing on the arguments listed in the pages above and the theoretical framework for consideration, possible hypothesis taken up for in depth analysis are:

1. There is a positive association between supply chain performance and customer (any buyer of output from the firm) relationship. This means that customer behaviour by collaborating with the firm can improve supply chain performance.

2. There is a positive association between supply chain performance and quality initiatives of the firm.

3. There is a positive association between supply chain performance and the management commitment towards safety, health and environmental factors.

4. There is a positive association between supply chain performance and business focus namely focused customer group.

5. There is no significant difference between export oriented units and units that serve domestic market in terms of supply chain performance.

3.6 Regression Equation for the study

Given the dynamic nature of environment and the fact that the factors influencing the supply chain performance are dynamic as well, the regression equations could well look like as follows:

\[ Y_p = \alpha_c c + \varepsilon + \alpha_4 \]

\[ Y_p = \alpha_r r + \varepsilon + \alpha_2 \]

\[ Y_p = \alpha_o o + \varepsilon + \alpha_3 \]
\[ Y_p = \alpha_4 \, a + \varepsilon + \alpha_4 \]
\[ Y_p = \alpha_w \, w + \varepsilon + \alpha_5 \]
\[ Y_p = \alpha_e \, e + \varepsilon + \alpha_6 \]

Where,

- \( Y_p \) = Performance score for the cluster
- \( c \) = Capability score for SME firm – management support
- \( r \) = Buyer relationship score for the SME firm
- \( o \) = Score for the SME firm for using opportunities to improve quality
- \( a \) = Score for utilising assets optimally
- \( w \) = Score for application of safety, health and diverse workforce
- \( e \) = Score for export orientation
- \( \varepsilon \) = Measurement error for the SME firm
- \( \alpha_{1,2,3,4,5,6} \) = A Constant
- \( \alpha_c \) = Coefficient of Capability score for the SME firm
- \( \alpha_r \) = Coefficient of buyer relationship score for the SME firm
- \( \alpha_o \) = Coefficient of the firm for using opportunities of the SME firm
- \( \alpha_a \) = Coefficient for asset utilisation score of the SME firm
- \( \alpha_w \) = Coefficient for OSHAS and diversity of workforce of the SME firm
- \( \alpha_e \) = Coefficient for export orientation of the SME firm

The regression equation for the above hypothesis is:

\[ Y_p = \alpha + \alpha_c \, c + \alpha_r \, r + \alpha_o \, o + \alpha_a \, a + \alpha_w \, w + \alpha_e \, e + \varepsilon \]
Where,

\( Y_p \) = Performance score for cluster

\( c \) = Capability score for SME firms – management support

\( r \) = Buyer relationship score for the SME firms

\( o \) = Score for the SME firms for using opportunities to improve quality

\( a \) = Score for utilising assets optimally

\( w \) = Score for application of safety, health and diverse workforce

\( e \) = Score for export orientation

\( \varepsilon \) = Measurement error for the SME firms

\( \alpha \) = A Constant

\( \alpha_c \) = Coefficient of Capability score for the SME firms

\( \alpha_r \) = Coefficient of buyer relationship score for the SME firms

\( \alpha_o \) = Coefficient of the firm for using opportunities of the SME firms

\( \alpha_a \) = Coefficient for asset utilisation score of the SME firms

\( \alpha_w \) = Coefficient for OSHAS and diversity of workforce of the SME firms

\( \alpha_e \) = Coefficient for export orientation of the SME firms

The scores for each driver in the theoretical model are arrived by summing up individual item scores that constitute each driver variable. The following chapters discuss in detail the results of macro analysis of performance, study data analysis and the conclusions and recommendations.