1.1 Introduction

Industrial clusters have been patronised over the decades as they contribute to economic performance of the region. In other words these are geographical agglomeration of firms that contribute to the immediate society by way of employment generation, development of infrastructure and so on, and other stakeholders like government through export earnings. Many a time industrial clusters could be primarily formed due to factor input advantage or demand conditions or simply by a chance factor because of an early initiative.

Supply chain management strategies are firm specific across a network of organizations to achieve competitive advantage. Incidentally, firm’s supply chain network could be able to achieve benefits of a cluster approach.

Industrial cluster is an economic phenomenon, and the current industrial clusters mainly apply the theory related to industrial economics to research classification of industrial clusters, formation mechanism, innovation networks, competitive advantages and so on, attaching much more importance to the macro-level, strategic, qualitative study and application.

Supply chain management is an analytical tool that uses the combined knowledge of operational research, mathematics, economics, and information discipline to do the qualitative and quantitative analysis of personnel, financial, goods, and information flow problems in enterprise management. It is a management tool aimed to reduce the cost, paying attention to the micro-operation, operation management, and quantitative studies and application.
The concept of supply chain has different connotations at different times, and different scholars have different views. Domestic and foreign researchers in related fields give points of view on supply chain from different perspectives. However, an official study of the supply chain issue is generally believed to date back to the 1940-60s\textsuperscript{1,2,3,4}.

We can easily infer that the early understanding of the supply chain was confined to the production process within manufacturing enterprises. As the evolution of supply chain management took place more and more focus was given to the external business factors and the external environment. Balancing the internal processes to meet the external demands and influence became critical for improving the performance of the supply chain.

Supply chain processes in a normal industry segment and that in a cluster are significantly different:

a. In a cluster they tend to be based on the local culture and geography whereas in a normal segment it is more global in terms of culture and geography.

b. Transactions in a cluster show informality whereas they tend to be more formal in nature in the other.

\textsuperscript{1} Heckert, J. B. and Miner, R. B. (1940), \textit{Distribution Costs}, The Ronald Press Company, New York.
\textsuperscript{2} Lewis, H. T. (1956), \textit{The Role Of Air Freight In Physical Distribution}, Harvard University, Boston, Graduate School of Business Administration, Division of Research.
\textsuperscript{4} Chen, I.J. and Paulraj, A. \textit{International Journal for Production Research} 2004 volume 42 No1
c. Constituents in a cluster are more or similar in size, characteristics and processes where in an industry segment the constituents are heterogeneous⁵.

Developing countries offer excellent scope for labour intensive industries and the textile industry is one such where the trade requires low cost labour a great deal. Consequently such industries involve cross national networks and nodes for coordination from ‘A to Z’ in the process of the supply chain.

India offers a great scope to the textile sector by virtue of the strength in their production base-natural fibre/yarn or synthetic - be it cotton or jute or polyester etc.

Expansion of this industry has witnessed the following:

a. The chains become more and more production driven at the back end and ‘buyer driven’ from the front

b. Developing countries have sensed an opportunity to spur the trade led industrialisation

c. Bigger manufacturers tend to control the chain both at the design stage and at the retail stage⁶.

The expression “it is hard to be competitive in a sea of inefficiency” takes on a special meaning in the context of industry cluster. From a global perspective and value for the ultimate customer, the performance of firms is determined not only by

⁵ Research on relevance of supply chain and Industry cluster: confidence-han@163.com
what happens within the firm, but also by a range of activities and relationships outside the firm. For example, overseas buyers are dependent on local suppliers, which are in turn dependent on their lower-tier producers, to perform to required standards of quality and efficiency, while logistics condition the critical delivery times.

Therefore, competitive performance and efficiency are a function of linkages among domestic enterprises within the framework of the industry cluster chain as a whole, rather than only that of individual firms. Understanding the influence of the global and local forces on small and medium firms helps improving the ‘pay offs’ in an industry cluster.

Some of the factors that resulted in benefits of externalities for firms within them are technology availability, access to a skilled labour, access to inputs and marketing advantages. These externalities provided competitive advantage both domestically and internationally. Firms located in industrial clusters are highly competitive in the neoclassical sense, and they do not offer much of product differentiation.

The major advantages of industrial clusters arise from simple propinquity of firms, which allows easier recruitment of skilled labour and rapid exchanges of commercial and technical information through informal methods. They exhibit an efficient and competitive capitalism and minimal transaction costs under conditions of limited scale of economy.

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7 Vom Hofe and Ke Chen, Whither or not Industrial Cluster: Conclusions or Confusions? Industrial Geographer, 2006, Volume 4 Issue 1, 2-28
Economic geographers have tried to explain the existence of clusters on the basis of cost minimisation or maximisation of profit. The preferred locations for new entrepreneurs are those where demand is large or supply of inputs is more convenient and these are places where other producers of similar goods are already located. Other economists have argued that the competition that exists between firms located in a cluster drives productivity and innovation creating new resource endowments such as skilled staff and technological know-how.

Evolution of supply chain concepts and an intensive propensity to apply these, coupled with the evolution of cluster concepts have resulted in economic globalization.

The starting point is to maximize the advantages of individual firms among the system, so as to enhance the corporate/industry competitiveness on the basis of collaboration and integration; a lot of similar characteristics have been shown in the process of operation: external economic effects, both competition and cooperation mechanisms, specialized flexible production, trust and cooperation-based internet culture and so on\textsuperscript{8}.

Therefore, there is a link between supply chain and industry cluster providing wider scope for investigations. This dimension interested the researcher to look into issues impacting supply chain performance in an industrial cluster.

Industry cluster is the geographical concentration of the supply chain. If supply chain involves more number of spatial locations, it is possible that supply

chain superposition can occur in one or more spaces. In a way, it could be considered that industry cluster is a local concentration of one or more such supply chains in the given space. Such a local concentration of the supply chain includes the fact that supply chain concentrate in the local area and in a certain space; in fact, it is very difficult to find out a supply chain concentrate entirely on a spatial location. Firms in the front end and those in the tail end can share industrial infrastructure, human resources, intellectual property rights, and managerial knowledge so that they can be organically combined together.

Thus a good operational environment is available for the supply chain in the industry cluster that could directly result in the increase in overall performance of supply chain. Industrial cluster increase collaboration and shared effects between enterprises (nodes) of the supply chain. In addition, the enterprise cooperation within the cluster carries a unique advantage. Because of geographical proximity, close ties between the leaders, and the fact that the operating mechanism of industrial clusters is based on such human factors as trust and commitment, the businesses within the cluster form a common formal or informal code of conduct and practice, and establish a close cooperative relations among one another, thus reducing the opportunistic tendency and minimising the risk and cost of cooperation.

Such cooperation will bring together suppliers, customers and even competitors in the supply chain to share skills and resources, enhancing inter-enterprise sharing effects of supply chain. Industrial clusters reduce inter-firm transaction costs and this can improve operational efficiency of supply chain.
Therefore, in a cluster, information costs and the possibility of unethical opportunism will be reduced, so that the transaction costs within the cluster can be made less than market transactions, thus increasing business efficiency. Trust and cooperation between firms will lead directly to a significant decrease in internal negotiation costs, costs of supervising and monitoring performance between upstream and downstream enterprises in the supply chain, so as to minimize the transaction costs in the whole supply chain.

All the above analysis enabled the researcher to choose ‘apparel segment’ in the textile cluster in Tirupur for an in depth study. The study is based on the units located in the same area where the firms may be expected to face the same economic and other conditions that would impact the perceptions on supply chain performance.

The following quote from a UNIDO study [General review study of SME clusters in India, 1997] on integrated clusters of small firms in India, substantiates the choice of this research setting:

“There is a high degree of inter-dependence witnessed in the case of hosiery, textile processing and metal products, in all of which it is possible to split the production process and farm out to separate firms due to non perishable character of the product. Second, this becomes feasible if it requires a degree of specialization for each of the processes involved. This phenomenon may also be witnessed due to splitting up of units to remain small for easy management, for escaping labour regulations that come into force when the firm grows to become large and/or to enjoy the policy related advantages that the small firms are entitled to.”
1.2 Need for the research

Cost focus and responsiveness to demand by businesses in the supply chain will eventually bring about the rise in overall level of profits and competitive capabilities. In short, the intrinsic relationship between the supply chain and industry cluster makes it possible for both of them to co-exist in a symbiotic way and seek common development. This relationship solves such issues as insufficient resources existing in the operations of traditional enterprises and development of regional economy, as well as paradoxes between dispersed operation and diversity from market demands. Therefore, we should make full use of the intrinsic relationship between the supply chain and industry cluster to make an integration so as to boost industrial competitiveness, thereby making it pave the way for economic development and stepping up the competitiveness of the regional economy.

Business decisions, actions and ultimate impacts are influenced by:

1. corporate social responsibility focusing on the rewards that companies can realise by understanding the dynamic and constantly changing stakeholder expectations and investing in better management of their social and environmental impacts.

2. the role of the local economic environment in terms of firms trading and competing together to strengthen the ability of individual firms to thrive in an industrial cluster.

3. the health of the macroeconomic environment, the quality of public institutions and the ability of firms to innovate and adopt new technologies.
Each of these above areas have identified and examined an empirical phenomenon that has emerged organically and tried to understand the factors that drive or constrain its development. To go further and actively design and implement tools, strategies and policies to foster more competitiveness as well as greater collaboration with SME clusters, in order to overcome obstacles to business driven development.

Tirupur has grown considerably over years and it would immensely benefit researchers and supply chain professionals to look into the causative factors that gave the impetus – could be the adoption and consequent benefits of industrial cluster approach or the entrepreneurial spirit that the SMEs in Tirupur seem to inherit somehow or the strong supply chain orientation among the supply chain network.

According the industry experts, “the Tirupur industry has the ability to take up orders at short notice”. The industry is also able to produce the entire range of knitwear at low cost and good quality.

The occasional delays in delivery, the inability of many firms to match the quality standards demanded at higher price points and the inability of the industry at the lower end of the market to compete with the Chinese and exports form Bangladesh and Sri Lanka are some of the weaknesses.

It may not be possible to precisely how much each of these factors contributed to the economic performance of firms in Tirupur but it is essential to
understand how strong the perceptions of the SMEs are in internalising the significance of supply chain orientation and its benefits.

If the perception level is inadequate, then one can very well advocate how this can be improved upon. It is this background on which this study has embarked on by interacting with different stakes in the supply chain network.

A lot of research has been happening exclusively on SMEs or clusters on their supply chain performance using either ‘financial or non financial’ metrics though a few efforts can be traced to efforts looking SME clusters with focus on both ‘financial or non financial’ - multidimensional performance measures.

This research on “Determinants of Supply Chain Performance among SMEs in Tirupur Textile Cluster” aims at combining SMEs and cluster concepts and at evolving a composite performance measurement tool that can be dynamic in nature giving flexibility in the choices and combination of parameters to be measured depending on the business environment.

1.3 Objectives of the research

A global trend is that buyer-seller relationship is transforming from adversarial competitive to collaborative relationships. To respond dynamic business circumstances, it is important to know what factors enable development of collaborative partnerships with suppliers.

The fundamental objective of a high performance of supply chain is to produce products to match customers’ demand cycle, while producing the greatest value possible to the buyers/customers. The increasingly competitive environment
calls for speedy, cost efficient, accurate and reliable supply chain. Supply Chain Management is no longer a matter of operational and functional areas of the firm. Today, it is a strategic issue demanding top-level management attention. This means that ability of the SMEs to adopt flexibility in production schedules to ensure delivery performance a responsive supply chain becomes essential.

If we look at competition today, it is "supply chain versus supply chain" This brings out a situation that competitors might focus on developing superior supply chain performance and the companies will have to find or develop metrics to capable of measuring such a performance.

Supply chain benchmarking in this set up should focus on the three key outcomes of success namely better, faster and cheaper.

A supply chain network uses resources of various kinds: manufacturing resources (machines, material handlers, tools, etc.); storage resources (warehouses, automated storage and retrieval systems); logistics resources (trucks, rail transport, air-cargo carriers, etc.); human resources (labour, scientific and technical personnel); and financial (working capital, stocks, etc.). The objective is to utilise these assets or resources efficiently so as to maximize customer service levels, minimize lead times, and optimize inventory levels.

The industry cluster among the SMEs has both the vertical and horizontal linkages. In the case of vertical linkage the larger firms for SMEs are feeders influence the supply chain performance where as in the case of horizontal linkages it is more the choice of the SMEs to adopt the supply chain practices and hence the
researcher preferred to look into detail on the horizontal linkages among the SMEs in the Tirupur textile cluster.

The Supply Chain Performance of the SMEs in the apparel segment in the textile sector in Tirupur, therefore can be considered to be the combined effect of ‘delivery performance, production flexibility, supply chain responsiveness, improvements in margins and asset utilisation’. The first three are customer facing and the last two are internal facing.

Therefore the present study intends:

- To analyse the trends at macro level on exports from India, manufactured products exports, textile and textile products export performance and then relate to performance at industry level of the apparel manufacturing units at Tirupur.

- To analyse supply chain performance of units located at Tirupur based on their perceptions. Supply chain performance would be based on delivery performance, supply chain responsiveness, production flexibility, margin representing cost efficiency and asset utilisation. Ideally observed data along with their perceptions measured on a scale are gathered and chosen as a reliable method for analysing SMEs.

- To explain in their perception critical factors like customer (buyer) relationship; quality initiatives; management commitment to Safety, Health and Environment; business focus and labour diversity which influence supply chain performance.
To analyse if there is any significant variation when it comes to measuring the Supply Chain Performance between the export oriented units and non-export oriented units.

1.4 Methodology

Descriptive research design is followed in this study because it describes data and characteristics about the population phenomenon being studied. Descriptive research answers the questions who, what, where, when and how. This research is used to find out the basic reason or to identify the cause of something that is happening.

Macro analysis is done using data from published sources (RBI / SIDBI/ Government of India and so on) to study performance of exports and more specifically on readymade garments and that of Tirupur units at the industry level.

To capture trends, a period of fifteen years is chosen from 1995-96 to 2010 -11. The terminal period was chosen as the year where latest information is available.

Incidentally, it also covers recovery from the global meltdown in year 2008-09. The beginning year 1995-96 captures reasonably the beginning of liberalisation era which was from 1991-92. But there would be a lag and performance could take three years to get reflected. Effect of any structural adjustments in policies at the government level will take time to reach the grass root and also get stabilised. Hence, the year 1995-96 would well reflect the requirement for the study.

On empirical analysis, a cross-section design entails the collection of data on more than one case and at a single point in time in order to collect a body of
quantitative or quantifiable data in connection with two or more variables, which are then examined to detect patterns of association. In the present study researcher adopted a cross-sectional research design to provide a ‘snap-shot’ of whether adoption of supply chain enhance the performance of the company.

‘Cross-sectional’ is the simplest variety of descriptive or observational epidemiology that can be conducted on representative samples of a population. The researcher has selected the cross-sectional study as it is relatively inexpensive and takes reasonable time to conduct. In addition, it can estimate prevalence of outcome of interest because sample is usually taken from the whole population and finally, many outcomes and risk factors can be assessed.

Supply chain performance is measured through ordinal scores of 1 (lowest) to 7 (highest) on five measures namely delivery performance, supply chain responsiveness, production flexibility, improvements in margin reflecting cost management and asset utilisation. The first three are customer facing measures and the last two are the internal facing measures.

The responses in all the five is a must and are additive in nature to capture total supply chain performance as all are given equal weight.

1.5 Sample, Sampling

Researcher has selected 177 respondents (59 with export orientation and 118 without this orientation focusing on domestic market ranging from small to medium sized companies which are in readymade garments production. 81 of these are small (with a ‘turn over of Rs. 30 crores or less’ or having a ‘workforce strength of 50 or
less’ or both of these) and the rest are medium. The respondents are from Tirupur, India. Data collection was done through questionnaire and the field work was also strengthened by personal meetings by the researcher.

Response units were arrived based on judgmental sampling procedure fulfilling the criteria of this research like the respondents have to be knowledgeable and skilled enough to understand and respond. This is required for the study as many manufactures would not have required skills and understanding to respond in detail to the questionnaire even with the researcher. About 10% of responses were discarded due to lack of complete information.

Content analysis of the existing secondary sources of information, discussion involving experts and local operators especially from logistics companies, industry experts, academia and government enabled the researcher to zero in on the possible respondents.

Hence, it is important to identify knowledgeable respondents who could truly depict the research situation and support research. This does not purport to influence the study as the population members would intuitively apply the concepts and principles of cluster theory and supply chain management. A pilot study of Tirupur as well as the pre-testing of the questionnaire was conducted.

The period of data collection was done during June 2010 to January 2011 for a period of 8 months within between two months hold back of research during their peak production period September and October 2010.
The decision about the development of the construct was taken after an extensive literature review, parallel to the empirical work.

1.6 Measures taken to ensure quality in this study

- Construct validity in the questionnaire and discussion with a scope to relate responses

- Use multiple data collection methods. Several data collection methods were used: interviews, documents, questionnaire, focussed group discussions and observations.

- Establish a chain of evidence between research questions, evidence and conclusions, and respondent review of draft case description.

1.7 Hypothesis

There are a few hypotheses which are discussed on determinants of supply chain performance in an industry cluster. This is being studied and part of the questionnaire and interview.

1. There is a positive association between supply chain performance and customer (buyer of output from the firm) relationship. This means that buyer/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 / Customer orientation..

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

1.8 Limitations of the study

A few of the limitations which the researcher faced during the process of conducting the research:

- There are other extraneous variables that affect the supply chain performance.
- The survey was limited only to one period interaction and ability of respondent to associate performance perception with actual and express correctly.
- The research has also got the limitation arising out of ‘human bias’ and ‘prejudice’ in answering the questions.
- The general conclusions or plausible replication of the concepts need to be carefully drawn for other clusters.
1.9 Chapter Scheme

We will the chapter scheme as follows:

Chapter 2: Review the selected literature on supply chain performance metrics and measurements

Chapter 3: Theoretical Framework

Chapter 4: Macro level Performance Analysis

Chapter 5: Empirical analysis and summarize the findings

Chapter 6: Conclusions

and the relevant annexures and bibliography.