CHAPTER-4
RESEARCH METHODOLOGY

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4.1 INTRODUCTION

In responding to the challenge of globalisation, businesses entities are organised differently compared to the past. Changes have been made to the supply chain in the form of new development such as company organisational structure, just-in-time delivery, warehousing and logistics operation. Before, businesses wanted to own all the activities encompassed in their supply chain, but now they only control the strategic core of their supply chain activities and depend more on external business partners.

The present business model, single companies are not able to survive on their own; they can survive only as part of the supply or value chain in an increasingly competitive business environment. It is the supply chain, which will bring true competitive advantage to companies, by satisfying customers’ needs and lowering operating costs. Therefore the role of supply chain management is critical in managing issues that arise across organisational boundaries, improving corporate competitiveness and profitability in today’s operating environment emphasised that individual businesses no longer compete as solely autonomous entities, but rather as supply chains.

Research is an academic activity and as such the term should be used in a technical sense. Research is an original contribution to the existing stock of knowledge making for its advancement. It is the pursuit of truth with the help of study, observation, comparison and experiment. In short, the search for knowledge through objective and systematic method of finding solution to a problem is research.

Research methodology is a way to systematically solve the research problem. It may be understood as a science of studying how research is done scientifically, here we study the various steps that are adopted by researcher in studying research problem along with the logic behind them.
The research aims to study the important contributing factors of supply chains in small scale manufacturing units and its various aspects. The supply chain is often referred to as a value chain. A typical supply chain includes information, funds and physical material flows, which run parallel to the value chain. The management of small scale manufacturing units faces many problems in managing a supply chain, e.g. correct forecasting method, inventory management, make or buy decisions, strategic decisions and evaluating performance of the firm with respect to supply chains, etc.

Researcher feels that small scale manufacturing units can improve profitability by implementing supply chain in a proper manner in their organisations. Researcher’s interest is to understand the awareness of SCM practices among small scale manufacturing units.

4.2 RESEARCH TOPIC

“Management of supply chain in small scale manufacturing units
(with special reference to Ahmednagar MIDC area)”

4.3 OBJECTIVES OF THE RESEARCH

1. To study the product management and strategic network design for products manufactured in small scale manufacturing units.
2. To study the demand analysis and procurement procedure followed by small scale manufacturing units.
3. To study the outsourcing of procurement of materials and components and its overall distribution planning used to survive in the competitive market.
4. To study the logistics management of small scale manufacturing units.
5. To study the product development for customer satisfaction and to study CRM.
6. To study the overall performance of small scale manufacturing units.
4.4 SCOPE AND LIMITATIONS OF THE STUDY

The scope and limitations of the study are briefly stated below. This research aims at studying the management of supply chain. The research sample selected for this is drawn from industrial area of Ahmednagar MIDC.

1. Research is restricted to small-scale manufacturing units in Ahmednagar MIDC area and no other area will be considered.
2. The research is concerned upon a randomly selected sample to fifty small-scale manufacturing units.
3. The study aims at examining the supply chain management aspect, no other management aspects will be considered.
4. The findings of the study are based on primary and secondary data. The primary data has been collected through responses received from owners, managers and workers working at different levels of organisation.
5. The study is limited to small-scale manufacturing units engaged in manufacturing activities, small-scale units from other fields viz, service sector are not taken in consideration.

4.5 HYPOTHESIS

1. Product management and strategic network design helps small scale manufacturing units to manage their products.
2. Procurement procedure is dependent on demand analysis followed by small scale manufacturing units.
3. The outsourcing of procurement of materials and components decides the distribution policies of small scale manufacturing units.
4. Logistics management has significance with reference to efficiency of small scale manufacturing units.
5. CRM practices of small scale manufacturing units improve customer’s satisfaction.
6. Performance measurements of small scale manufacturing units give direction to supply chain management.

4.6 METHODOLOGY

4.6.1 Collection of data

The sample consists of fifty small-scale manufacturing units from MIDC area of Ahmednagar city which were selected by random sampling from the list of manufacturing units published by MIDC office, Ahmednagar. Despite of all possible and pertinent efforts made by the researcher only 44 respondents extended their cooperation and filled the questionnaire. Thus the effective size of the sample is 44 out of 50.

4.6.2 Primary data

To collect the facts and figures from the sample selected, a pilot questionnaire was prepared and provided to twenty five subjects and was requested by researcher to read the statements and make tick marks for appropriate choice on the questionnaire itself. Researcher got the normal distribution curve on the basis of pilot survey as well as comments from the respondents about the questionnaire. After thorough study and detailed discussion with guide and prominent personalities from the subject field the deficiencies were removed by redrafting the questionnaire and filling the gap to cover all the aspects of supply chain and the data expected and is distributed to the respondents of the sample chosen.

Interview is a direct method of collecting data which involves presentation of oral-verbal stimuli and reply in terms of oral-verbal response. Personal interviews and group interviews were conducted for gathering more correct and confidential information. Researcher got the intimate aspect of individuals on the research topic at the time of the interview.
In order to supplement the information through the questionnaire method, interviews of all the respondents were conducted with the help of an interview guide. To collect various information like product, business objective, outsourced procurement, work procedure, management policy & distribution channels personal interviews of entrepreneurs, was conducted. The interviews stimulated the respondents to express their views and opinions truly and frankly. Thus the tools like, structured questionnaire and interviews were used by the researcher for the purpose of collecting primary data.

Since science begins with observation and must ultimately return to observation for its final validation. Researcher used various types of observation like – *participative and non participative observations*. Efforts were also given by researcher to collect information about facilities received by small-scale manufacturing units in lieu of manufacturing and marketing the product. Trade associations, other knowledgeable professional groups, specialized research and other institutions, specialized agencies such as consultants etc, were also contacted for internal sources such as records reports register etc.

With the help of all these types of observations the researcher collected the information for its validation and objectivity.

### 4.6.3 Secondary data

Information regarding government orders, rules, schemes to support small scale manufacturing units, through relevant official literature survey was carried out in various libraries, published survey reports, newspapers, magazines, trade journals which were published weekly, fortnightly or monthly was also referred and its outcome was considered while giving recommendations.
4.6.4 Processing of data

The main objective of the present research was to study the management of supply chain of small scale manufacturing units in Ahmednagar city. Thus the data collected was processed with the help of computer and is presented with the help of tables, charts, graphs, bar charts, pie charts. Standard statistical tools were used for the analysis of data. Finally inferences were drawn and these were reported at the appropriate places in different chapters. All these findings are summarised in the last chapter. Bibliography has been given at the end.

To test the hypothesis that “Logistics management has significance with reference to efficiency of small scale manufacturing units.” the researcher found it difficult to quantify the data for calculations. After discussion with the guide and statistician it was decided to give marks to the choices of the questions related to the logistics and take a total of marks obtained in all the questions and take a percentage of it. It was also decided to take 70% marks as optimum score for small scale manufacturing units.

4.6.5 Statistical methods used for calculation

In order to test the efficiency of logistics in small scale manufacturing units there logistic performances were compared with the overall performance at 70%. t-test and z-test were used.

- t-test is based on t-distribution and is considered an appropriate test for judging the significance of a sample mean or for judging the significance of difference between the means of two samples in case of a small sample when the population variance is not known. The relevant test statistic, t, is calculated from the sample data and then compared with its probable value based on t-distribution (to be read from the table that gives probable values of t for different levels of significance for different degrees of freedom) at a specified
level of significance for concerning degrees of freedom for accepting or rejecting the null hypothesis.

$$ t = (X - \pi_o / \sigma) * \sqrt{n-1} $$

Where, $X$ = mean of the distribution
$\pi_o$ = assumed mean (70 in this research)
$\sigma$ = standard deviation
$n$ = number of observations

- **z-test** is based on the normal probability distribution and is used for judging the significance of several statistical measures, particularly the mean. The z test statistic is worked out and compared with its probable value (to be read from table showing area under normal curve) at a specified level of significance for judging the significance of the measure concerned.

$$ z = (X - \pi_o / \sigma) * \sqrt{n-1} $$

Where, $X$ = mean of the distribution
$\pi_o$ = assumed mean (70 in this research)
$\sigma$ = standard deviation
$n$ = number of observations

- **$X^2$-test** is based on chi-square distribution and as a parametric test is used for comparing a sample variance to a theoretical population variance.

$$ X^2 = \sum \left( \frac{O_i^2}{E_i} \right) * N $$

Where, $E_i$ = row total * column total / $N$
$O_i$ = observed frequency,
$E_i$ = expected frequency
$N$ = total of frequency

- Measure of central tendency and dispersion was used to compare data and conclusions were given.

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