CHAPTER VII
CONCLUSION

7.1 INTRODUCTION
This chapter presents summary of this research work. The important findings, contribution of present work and its limitations are highlighted in the subsequent sections. The futuristic scope of this study brings out the new scope of research in this field.

7.2 SUMMARY OF RESEARCH WORK

1. After a brief description of the topic the first section of this work reviewed the literature related to JIT supply chain from several books, journals articles, research notes and relevant web sites. Systematic literature review (SLR) a well-known methodology to derive important conclusions from literature survey through descriptive and thematic analysis has been used. Based on this review, various dimensions and related attributes of JIT supply chain has been recognised. It is also observed that a trend of research in this field is increasing.

2. A Classification scheme has been suggested based on stringent literature review related to JIT supply chain. Further, identified attributes of JIT supply chain has been classified into five dimensions. The frequency of citation of an attribute in descriptive analysis has been treated as its importance.

3. Important research direction has been identified after perceiving the gaps between theory and practice.

4. Four research questions are set up to find the applicability of JIT in supply chain. To answer these questions two sets of hypotheses are formed.

5. A brief explanation of each attributes has been carried out. The benefits of JIT supply chain have been outlined. A major challenge due to complexity of the system has been explained with the help of General System Theories (GST).

6. Survey of Indian industries has been carried out to find out the applicability of supply chain. The results of these survey indicated that many Indian industries are keen to adopt just in time in supply chain. It is also observed that Indian industries are making serious efforts towards implementing JIT.

7. From the survey it is found that JIT has potential to improve performance of supply chain in Indian Industries.
8. Two Model works are proposed here to select suitable supplier and distributor for those firm intended to implement JIT Supply chain.

9. Some of JIT tools like zero inventory, nil wastage and pull productions are hardly implemented in any firm, on the other hand firms do not want to leave the novelties and benefits of Just in time. Therefore a new trend has started in the firm to implement partial JIT with acceptable level. An ANP model has been proposed here to compare the performance based existing supply chain (TSC), JIT supply chain and Hybrid supply chain. It is found that HSC is recommended by most of the industries.

10. Overall, the applicability of JIT supply chain in Indian industries is being implemented at reasonable level and there is evidence of performance improvement of supply chain. In last five years e-biding, on-line shopping, e-governance, video-conferencing, on line consultation etc. can be seen as support of JIT supply chain.

7.3. SPECIFIC CONTRIBUTION OF THE PRESENT WORK

The specific contribution of this research work in the field of JIT supply chain is discussed as followings.

1. Present work has highlighted JIT supply Chain management and its applicability in Indian industries. This kind of study is very limited as indicated by the literature, hence opens up the new horizon of supply chain literature.

2. The result of literature review has been expressed through thematic and descriptive analysis. The thematic analysis suggests categorising the whole study into five. They are conceptual articles, survey, case studies, empirical/ modelling and literature reviews. Sufficient number of research articles of each category has been included, so that a balanced conclusion may be derived. The forty six attributes of JIT Supply chain has been identified. These forty six attributes are classified into five dimensions i.e. Procurement process, Manufacturing process, distribution process, information handling and human involvements. Among the various attributes; supplier selection, few suppliers, long term relationship, flexible supply, pull production, visual control, productive maintenance, quality product, quick delivery, responsive distributor, warehousing, dedicated staffs, seamless information sharing JIT as a culture, etc. are important one.
3. As interest in knowing the performance of supply chain due to JIT has increased, so this study also specifically explores the 14 parameters under which performance of the firm can be investigated. These are; flexibility, longevity, quality, Reduced cycle time, Reduced inventories level, Reduced scrap, efficient Warehousing, Responsiveness, Delivery Speed, Connectivity of SC nodes, Return on Investment (ROI), Asset Turn Over (ATO) and market shares.

4. Investigation of JIT applicability in supply chain of Indian industries has been done through survey, interviews and consultancy. It is found that applicability of JIT in terms of level of application, benefits, importance, difficulties and challenges are high. Though results are contradictory still the benefits of JIT in supply chain cannot be ignored. Similarly to investigate the performance of Supply chain due to JIT, the analysis of second part of survey is used. The performance has been investigated through the performance of supplier, manufacturer, distributor, information handling and business. ANOVA has been used to test Hypotheses in connection of a statement relating the positive or no effects of JIT supply chain on mentioned issue.

5. A model has been developed to select a supplier capable of supplying the raw material to a JIT manufacturing firm. The framework of interpretative structural model (ISM) has been developed with the help of experts. The required JIT practices from the supplier have been investigated and ranking of same has been done. Based on the priority of practices a firm select the supplier for its JIT supply chain. The method specifically brings out an easy way to get suitable supplier for the industry using JSC to move its material.

6. In another model a JIT distributor has been investigated for his suitability in JIT supply chain. Graph theory application (GTA) model has been used to find out the JIT distributor selection Index (JDSI). Highest score of JDSI is selected as distributor for the JIT manufacturing firm.

7. To know the actual applicability of JIT in supply chain by the Indian manufacturer, three types of supply chains are proposed keeping JIT as centre point. The three supply chains are traditional supply chain, JIT supply chain and Hybrid Supply chain. Analytical network process (ANP) has been used to find out relative advantages over each other. The expert’s opinion has been taken to get relative comparisons of selected performance criteria. It is found that Indian practitioners of JIT do not like to follow strictly the concept of JIT, for example;
nil inventories, zero waste and nil lead time. But they follow other novelties of JIT like flexibility, quality at first time, visual control, follow of 5 “S”, quick and safe delivery, proper arrangement of warehouses etc.

8. Being a developing economy, India is likely to be a business destination for developed countries. These countries have used JIT supply chain to improve their flow of material and information. The same expectation may be seen in India also. This study is exploring all those prerequisite conditions to meet JSC for better tomorrow.

9. The study will benefits the business to grow, to increase customer satisfaction, to guide the top management, to motivate staffs for dedicated work culture and to create a win- win situation for all Supply Chain stake holders.

7.4 LIMITATIONS OF THE PRESENT WORKS

Though intensive care has been taken to find out the applicability of JIT Supply Chain of Indian industries still few limitations restricted this study. The following limitations are out lined;

1. This study is a survey based and bigger firms are taken into accounts. Smaller industries can also be taken for JIT practices because these industries are very vital to support the requirement of bigger firms. For example manufacturing of plastic products, small metallic and fibre components are very urgent requirements of the automobile manufacturers.

2. The effects of some attributes have been neglected for making the study simple and which could have changed the result if considered.

3. Literature analysis has considered the research articles published in reputed journals from1985 to starting 2014. Some more attributes might have been cited in upcoming research articles in years to come.

4. For multiple comparisons use of software could not be used due to limited funds.

5. Survey was restricted to North and West Indian regions, other regions could have been included to predict the result more accurately.

6. Given opinion by Selected experts might be influenced with one another, hence chances of biased opinion cannot be neglected.
7. In selecting the right supply chain only three alternatives were given in-front of experts, more alternative have given the different choice than the choice of Hybrid Supply chain.

8. Developing nature of Indian economy keeps changing the quality and other aspects. Hence this study represents the current situation and its result may vary in coming years.

9. As empirical data of Indian firms regarding applicability of JIT in Supply chain could not be encountered in the literature, hence the result of survey could not be validated.

10. In developing the ISM and GTA model for selection of supplier and distributor respectively has been done on prevalent attributes in literatures. Whereas different industries have different set of practices (Attributes), which resembles the actual necessity for JSC and could have changed the present results.

7.5 SCOPE FOR FUTURE WORK
Though a rigorous study of the applicability of JIT Supply Chain has been done and various factors have been recognised still few might be untouched. For example this thesis does not cross the limit of supply chain stake holders and no opinions of customers have been included in this research. However few more work can be suggested after this study.

1. Customer’s opinion can be included in survey for the feedback of responsiveness of the JIT supply chain.

2. Research is required to investigate the effects of new developments in fields of engineering and technology like e-tendering, cross docking, 3 PL and on line marketing on JIT supply chain.

3. Continuous compression of lead time in moving material from one end to hands of customer has limitations. There is an obvious need to analyse the supplier – buyer’s relationship.

4. A more comprehensive study to make effective JIT Supply chain through training and support should be carried out.

5. Effect of rewards, incentives, promotions, discounts and penalties may be studied in JIT supply chain, which could not be taken due to extreme diversion of motive of this research.
6. An inventory model for supplier, manufacturer and distributor is required to be set up separately for each one.

7. Cost involved of JIT implementation in supply chain may be studied.

8. The results of ANOVA and ANP can be verified by the use of relevant software.

7.6 CONCLUDING REMARKS

1. The applicability of JIT supply chain is quite significant in terms of level of implementation, benefits and importance but equally difficult to implement as it faces lot of challenges. The industries in India have great need of JIT integration with supply chain in order to gain the competitive advantages. However JIT supply chain may not be useful unless implemented by dedicated staffs of the firms.

2. Survey of Indian firms indicated that difficulties and challenges in JIT implementation in supply chain are high in terms of supplier, manufacturer and distributor’s policies. The supply chain issues remains unresolved at various juncture in case of traffic congestion, inefficient transportation fleet, political motivated strike or dead lock, unrealistic demands by labour unions. Also implementation of nil inventories, pull production, nil wastage and no lead time is not possible completely. Another difficulty in JIT implementation is poor approach toward R& D. A significant difficulty in implementing JIT supply chain is huge investment in setting up fast communication system, visual control, training of employees and restructuring of process costs. Informal and casual auditing and dedicated efforts to get excellence are some reasons to slow implementation of JIT. It is also observed that various quality initiatives in MNC have made productive maintenance and quality circles as mandatory for staff related activities. This is showing a favourable sign of JIT implementation in Supply chain.

3. Second part of survey is about performance of JIT supply chain. The result of survey indicates that the positive aspects of performance of JIT supply chain has been seen in terms of; flexibility, quality, involvement of supply chain stakeholders, reduced cycle time, reduced manpower, improved ware houses, increased
responsiveness, improved delivery, accuracy of information sharing, fixed intervals of data sharing, return on investment, market share and improved assets turnover.

4. Model-1 has proposed that supplier of raw martial for JIT manufacturing firm must supply the demanded consignment on the tune of JIT. For that list of important attributes of procurement process in JIT supply chain has been ranked into six levels. The priority of one attribute may vary firms to firm. The ranking of attributes are in order of supplier plant audit, timely delivery, Supplier training and development, supplier certification, long term contract, fewer suppliers, lot sizes, frequent supply, mutual trust and response time.

5. A Graph theory application model has been developed to compare the distribution process of two distributors in JIT supply chain. The model has helped to recognise the rank of dimensions affecting the distribution process based on their JIT distributor selection index. The decreasing order of dimension is; Warehouse, use of technology, quick delivery, responsiveness, human involvement and order processing. The JIT Distribution Selection Index (JDSI) of two distributors gives leverage in selecting the best one. The highest JDSI value indicates the better level of JIT implementation by the distributor in delivery of finished product.

6. Many industries in India have initiated steps toward implementation of JIT in supply chain. However the nature of implementation is different. Indian practitioners prefer to use convenient components of Just in time like few suppliers, long term relationship among stake holders, flexible production and supply, quick transportation, fast communication, dedicated staffs and responsive attitudes. Whereas they are not able to achieve the concept of JIT like; nil inventory, nil lead time and nil wastage. Therefore this research has proposed hybrid Supply chain as most suitable in Indian context. With the use of ANP comparison based study of three supply chains has revealed that experts have preferred hybrid supply chain mostly among traditional, JIT, and Hybrid supply chains.

7. The Indian economy is growing at fast rate. Many multinational companies have been established by the various countries. The practices of JIT in developed nations remained key point to success of these countries. These countries still
believe that JIT is very much useful in Indian continent. Also many Indian industrialists have recognised the potential of JIT. Therefore Applicability of JIT in supply chain of Indian industries is very high.

7.7 SUMMARY
In summary JIT provides quick, accurate, reliable, cost effective, responsive and long term effective activities of supply chain. Due to which procurement, manufacturing, distribution, information sharing and human involvement have improved a lot. As a result it has been found that there is a sharp reduction in lead time, waste/ rework, level of inventory and improvement in flow of material, information, return in investment, assets turn over and market shares. But in India, the implementation of JIT is facing problem of poor infrastructures, technical support, highly reliability on imported technology, ill-fated labour unions, vast terrain, non-uniform taxes in various regions and political uncertainty. In general, it is recommended that Indian industries should take serious efforts to implement Just in time in Supply chain in phased manner to sustain competitiveness in today’s business.

--------