Chapter-7

CONCLUSIONS AND SCOPE FOR FUTURE WORK
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In today’s world where consumerism is rising at rapid pace, markets are volatile and unpredictable than ever before, traditional strategies of business have become obsolete. Supply chain has added a new dimension to business strategies. Supply Chain management is a set of strategies used to effectively integrate suppliers, manufacturers, Distributors, Retailers and customers itself so that merchandise is produced and distributed so as to minimize system build cost while satisfying the customer needs. Hence, the topics mainly focused in the present research includes inventory optimization in a Supply Chain, adopting Data Mining, Genetic Algorithm and study on impact of RFID implementation on inventory management.

These aspects have been extensively studied in the present research and solution methodologies have been developed for inventory optimizations problems involving highly complex mathematical relationships. This chapter is divided into two sections highlighting on the contributions of the present research and giving directions for the scope for future studies.

7.1 CONTRIBUTIONS OF THE PRESENT RESEARCH

Motivation for the research, problem identification and objectives have been presented in the first chapter along with the basic concepts and introduction to SCM, inventory management in a SC, Data Mining, Genetic Algorithm and RFID system are highlighted and plan of the research work i.e. organisation of the research thesis has been summarized in this chapter.

The Second chapter deals with the Literature review which has been extensively carried out considering the issues of supply chain inventory management, various methodologies used for inventory management, application of Data Mining and Genetic Algorithm concepts in SC, importance of information technology in improving the SC performance and RFID technologies in SC.

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The extensive review resulted in identifying the scope and hence the objectives of the research work.

The third chapter discusses in detail the design of mathematical model for optimal inventory control for two stage, five member SC using DM and GA techniques.

The model for optimal inventory control is implemented and methodology has been illustrated with the help of a case study with hypothetical data, has been presented in the fourth chapter. The main emphasis in the chapter is on outlining this methodology which involves the following.

- Flow chart and DataSimulator.java program is written for generating hypothetical / simulated historical weekly inventory data (Data.csv) for five SC members, which can generate data for any given period of time.
- Flow chart and DataPreprocess.java program is written for generating EMA and EMA based inventory data (i.e. EMA.csv and EMA_P.csv) which uses generated historical inventory data (Data.csv).
- Flow chart and CreateDataBase.java program is written for generating the Inventory.mdb inventory data using EMA.csv and EMA_P.csv date files.
- WEKA Data mining software is used for generating frequent item-sets and Association Rules using classic Apriori algorithm.
- Further flow chart and RuleOptimizer.java program is written to carryout GA process to generate SC cost impact association rules for the best chromosome.
- The results obtained are evaluated by comparing best chromosome SC cost impact rules with other remaining rules for SC cost and confidence values.
- Finally, optimal inventory level for each member in SC is determined for the future use which improves the SC performance by reducing the Total SC Cost in the supply chain.
- And results obtained were plotted and represented graphically using MS Excel.
So, from the results and discussion made in the chapter 6 one can infer/say that the defined objective of the thesis is significantly achieved.

The model for optimal inventory control is appropriately designed and justifications of method employed are made by carrying out experiments with suitable data and obtaining the convincing results. Methodology of evaluation of best rules is extensively described.

The fifth chapter focuses on studying the application of RFID technologies in a three stage SC, its impact on inventory reduction SC and explains how the Information technology of Automatic ID i.e., RFID can monitor the overall SC activities covering Manufactures, DC and Retailers.

Three stage SC model is designed based on the sample of RFID data collected to understand implementation of RFID system.

Further, three cases studies are illustrated using actual RFID inventory data collected for optimal inventory management in a supply chain.

Based on the case studies, detailed discussions are presented on direct and indirect benefits of RFID implementation to understand its impact on inventory management in a 3 stage SC.

Finally, in the sixth chapter based on the results obtained in chapter 4 and 5 the results are analysed and discussed. And the optimal inventory model implemented in the chapter four is further analysed for different combinations of parameter like different period of time weekly inventory data (i.e. for 5 years, 10 years and 15 years) and also for different combinations of minimum support $S_{min}=10\%$ and minimum confidence $C_{min}=30\%$ and $60\%$ are used and the results are presented graphically using MS Excel.

### 7.2 SCOPE FOR FUTURE WORK

As a scope for future studies, the optimal inventory control model can be tested and analysed using real Supply Chain inventory data as an input data for Data mining process from data warehouse or data mart databases of the companies for a complex and real SC network with suitable modifications.
Different optimization techniques like Neural networks, game theory and Ant-colony can also be used as such techniques are suppose to deal with more complex scenarios than presented in this thesis.

Further research on application of Radio Frequency Identification will be of great interest. It is also to be mentioned that greater research interest may be directed towards the hardware aspects of Radio Frequency Identification like further cost reduction of RFID tag, reader and information technology systems.

RFID data privacy and security etc may also be incorporated as per the needs of the user.

The concept of Vendor Managed Inventory using RFID is still at its infancy in the Indian context and this area is very promising for further research study.