CHAPTER 7

CONCLUSIONS, IMPLICATIONS
AND SCOPE FOR FUTURE WORK

This research has been started with a high vision in order to improve the productivity by applying and implementing engineering procedures in textile fabric processing industries. In the literature, various research studies have been conducted on manufacturing, automobile, banking and a few chemical and their allied firms. But there is a dearth of research studies that contribute, evaluate and forecast the productivity related issues in the textile and fabric processing sectors.

The research study has examined the level of productivity by minimizing the drawbacks that are studied and identified meticulously in the textile fabric processing and dying industries located in Erode, Tirupur and Karur districts of Tamil Nadu, South India. Keeping all these aspects in mind, the following steps are earmarked in the research work.

1. The research work has developed and validated the Productivity and Quality Dimensions (PQDs) by empirical study.

2. The highly affective productivity and quality dimensions are precisely prioritized by fuzzy Failure Mode and Effect Analysis (FMEA).
3. The identified high risk dimensions are analyzed and demonstrated through various case studies by designing a robust framework.

7.1 CONCLUSIONS

The following conclusions are arrived from the present study:

1. After an extensive survey, the work identified ten critical dimensions for PQDs and their role in both fabric manufacturing and allied textile sectors. Survey instruments comprising 90 items with respect to the textile sector have been industrialized based on the data collected from the various spectrum of people.

2. A filled in questionnaire measuring every dimension for productivity and quality (PQ) enhancement has been collected and those measures have been validated by multivariate techniques.

   - The practical drawbacks and demerits that exist in the traditional FMEA are prioritized and solved by Fuzzy Weighted Geometric Mean Method (FWGMM).

   - The risk factors of O, S and D were taken into consideration in the process of failure modes. It has given an excellent result that makes them more realistic, more practical and more flexible because there is no need to build any if then rule base.

3. The intent of productivity cycles was demonstrated with case studies along with a set of sample computations when applying the robust framework to the industry. Robust
framework for PQ measures has been proposed and demonstrated through case studies. The following conclusions have been arrived at from case studies:

i) **Case Study I:** This case study measured the improper utilization of textile machines such as Jigger, Squeezing, Stenter and Calendering machines. Its results concluded that the Overall Equipment Effectiveness (OEE) was very low and pinpointed idling of machines.

ii) **Case Study II:** This dealt the procedures and computational steps of Total Productive Maintenance (TPM). The average increased percentage of OEE of all fabric machines are 24.74%. The variations before and after implementing TPM are hugely raised.

iii) **Case Study III:** It discussed the implementation procedures and undesirable effects in fabric industry and it was solved by Theory of Constraint (TOC).

iv) **Case Study IV:** Total productivity (TP) of fabric 1 and 3 indicated financial loss for the industry because Break Even (BE) value is greater than TP as the base period (Period 0) is considered. Although

- The BE value was 8.1% and 2.1% more for fabric 1 and 3 in base period respectively. This indicated the necessity of improving the utilization of resources that correspond to fabric 1 and 3. In other words, there was a financial loss to the firm as far as product 1 is concerned.
• In a real world situation, if such a trend persists for a certain predetermined number of time periods, the firm may decide to discontinue the manufacture of fabric 1 and 3. This case study concluded that management realized its poor planning with respect to fabric 1 and 3 in the base period.

• Total Productivity of Firm (TPF) value was 0.977 which was less than the value of BE (0.991). The TPF was 1.4% less compared to BE. So the firm may decide to discontinue the manufacture of fabric 1 and 3. Otherwise, the financial loss to the firm as far as fabric 1 and 3 were concerned would be irreparable.

• Also, Partial Productivity (PP) of fabric 3 did not satisfy the following law: “Total Productivity (TP) of product ‘i’ in terms of its Partial Productivities (PP)” and “Total Productivity of a firm as a function of Partial Productivities”. Hence, this case study proved that the management failed to plan and implement any improvement and maintenance measures for enhancing the productivity.

v) Case Study V: Break Even Point (BEP) crossed the Total Productivity (TP) in fabric 1 for period 1 and fabric 3 for the base period zero and one. Management should take actions with respect to concerned fabric otherwise the firm may decide to discontinue the manufacture of concerned fabric. But, TP value was 1.333 and 1.142 with regard to fabric 2 for period zero
and one respectively. The BE value was 0.978 and 0.982 for fabric 2 respectively. It assured that the profit of firm as far as fabric 2 was performed well. But, fabric 1 met the 1.5% loss because TP was lesser than BE for period one. Also, the firm attained loss of 0.2% and 12.1% for fabric 3 in the period zero and one respectively. Therefore, the industry has reason to be alarmed because there was a financial loss to the firm as far as fabric 3.

vi) **Case Study VI:** Fabrics 1, 3 and TPF did extremely well and the whole firm was performed well. It happened only after implementing productivity improvement tools and methods through FRPN (Fuzzy Risk Priority Numbers) along with robust framework. Also the absolute value of TP existed at the middle level of BE and PP curve. Furthermore, PP and TP of all fabrics satisfied the law. In this case study, TPF crossed BE. The value of TPF (1.059) is greater than BE (0.992) of the firm for all fabrics in the base period. The TP value (6.7%) was increased. Thus the TP increased by 6.7% for the base period and there was an increase of 1.2% for the period 1, in comparison to BE value. This also crucially indicates that the firm fulfills the total productivity and acknowledges the profit.

vii) **Case Study VII:** Quality Function Deployment (QFD) acknowledged the weakness of fabrics with respect to primary and secondary descriptions customer requirements and design requirements. The following suggestions are drawn from QFD case study.
- In the customer requirements characteristics, scale-up factor of $X_{16}$, $X_{32}$, $X_{46}$ and $X_{53}$ was 2.5 which indicated that more effort is needed for fabric weight, average time for product to fail, dimensional changes after washing and understanding the customer respectively. The absolute weight of $X_{51}$ is 3 which indicate that ability to share the information about process of the project which is not significant because of low value.

- The absolute weight of manufacturing dyeing process ($Y_{24}$) was 624 which indicated that a high effort is needed in technical requirements.

- Quality and continuous improvement of technical requirements ($Y_{12}$) was 746. This high value indicates that more concentration and effort are needed by management with respect to technical requirements.

- According to QFD case study, the firm needs to redesign and improve the quality parameters of fabric with respect to customer and technical descriptions.

4. This designed robust framework authorized very useful in identifying the faults and risk dimensions in the industries. It also provided solutions for the risk dimensions and ensured the profit margin for the firm.
7.2 IMPLICATIONS OF THE RESEARCH WORK

The extrapolations of present study are

- The study investigated the impact of an age of productivity and quality dimensions on the textile fabric industry and found influential dimensions in various ways.
- The outcome of the research has led to the design of research instrument which stipulates scientific guidelines and procedures for productivity and quality improvement. The identified dimensions predicted the performance of industry significantly.
- The holistic robust model can be used by the management of the fabric sector to measure the productivity and quality.
- Break even and total productivity analysis pinpoint the firms cost benefit analysis and lack of resource utilization. This analysis is realistic and useful to forecast the financial decision of fabric.
- The resource allocations and sensitivity analysis would do well if the quantifiable & tangible output and input factors were computed precisely and accounted for.
- The case studies helped productivity planners to formulate strategic plans for improving productivity of firm.

7.3 SCOPE FOR FURTHER WORK

The present study can be further extended in the following directions:

- The other PQDs can be solved for enhancing the industry performance such as quality of fabric, supplier performance etc.
• This robust framework can be applied to other manufacturing and service sectors too.

• The quality function deployment can be solved in other ways by fuzzy linguistic ways in order to enhance quality of fabric irrespective of productivity measures.

• The study can be carried out in other developing and developed economies to find out the suitability of the dimensions.

7.5 LIMITATIONS

• This study has been conducted only in three districts in the state of Tamil Nadu, India due to practical difficulties in terms of data collection and implementation.

• The steps involved in computations and mathematical equations are difficult.

Productivity with quality of any product is a never ending process because human involvement and their thinking are very crucial in the industry. Hence, process and products need to be continuously monitored, maintained and reviewed periodically for the survival of industry and economic.