CHAPTER – 6
CONCLUSIONS
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6.1 Introduction

This is the final chapter. The previous chapter summarizes the research findings. In this chapter, the conclusions of the research work are presented. Some practical suggestions to implement Lean Sigma to the software development process are discussed followed by recommendations for future research work.

6.2 Conclusions

The software industry has emerged as one of the most strategic industry in today’s global business environment and is consistently struggling with the pressure to improve their business and stay competitive in the global market by process improvement and cost reduction. The present study has explored the advantages, opportunities, challenges, knowledge, and attitudes in implementing Lean Sigma to improve software development processes. The conclusions of the present study are summarized below:

- Lean and Six Sigma practices have dramatically improved the quality, cost and lead-time by focusing on the efficiency of process in the manufacturing industry. The present study indicates that it offers similar advantages to the software industry also.

- The application of Lean Sigma to software development process is a very recent one. It is in its early stages of development.

- There are significant opportunities in adopting Lean Sigma approach to eliminate non-value-added activities, reduce cost, improve lead-time and cycle time, and increase the process efficiency in the software development activities to deliver value to the customer.

- Unlike manufacturing, the software development process is intangible in nature and not repeatable. Therefore, the challenges in implementing Lean Sigma to improve software development process are significant. However, the advantages of applying Lean Sigma to software development activities are equally great.
• It is also observed that the software community in India has significant level of knowledge and positive attitude in implementing Lean Sigma approach to improve the capability of software development process.

• The present study proposed a conceptual model – *Design for Improved Yield and Accuracy (DIYA)* for implementation Lean Sigma to the software industry.

6.3 Suggestions

Based on the present study, the following are suggestions for implementing Lean Sigma to the software development process:

• Compared to manufacturing, the software development process is not producing any physical product. Therefore, before implementing Lean Sigma to software development projects, it’s very important to understand the unique aspects of the software development process, identify opportunities for improvement, and setting up effective metrics to measure the process performance.

• It was observed that, most of the Lean Sigma training is based on the manufacturing process. Rather than giving the general training of Lean Sigma, training on Lean Sigma and the use of appropriate tools and techniques to improve the performance of software process can contribute dramatically.

• Do not rely on guesses and assumptions to improve the process. Instead of blindly following the process improvement there is a need to identify and define the problem from the customers’ viewpoint to quickly deliver value to them.

• To begin with, establish a real-time Kanban (pull system) screen (see Appendix A) to get the visibility of all work items in the software development process. Kanban screen presents the real time progress of the project work.

• Do not put the entire project team into Lean Sigma training. Discuss and buy-in from project team. Select one person who is interested and has got the potential to act as a change agent (catalyst) in the team. Train and mentor her/him to execute the project.

• Articulate the benefits of Lean Sigma in terms of financial returns by linking process improvement with cost savings. Make the project team financially
responsible for their decisions and actions regarding the implementation of Lean Sigma to improve the capability of software development process.

6.4 Recommendations for Future Research

Based on the present study, the following are recommendations for future research:

- From the present study, the data analysis indicated that the implementation of the proposed Lean Sigma model will bring significant improvement to current software development activities. Further research is needed to implement and operationalise this model to study the operational performance during the software development process.

- With Capability Maturity Model (CMM) many organizations find it difficult to match the process improvement goals and objectives with customer expectations in terms of quality, cost, and lead-time. Researcher and practitioners have attempted to integrate Six Sigma with CMM to address these issues which is not fully implemented. Because Six Sigma alone do not focus on lead-time. Lean is required. Therefore, integrating and comparing characteristics of Lean Sigma with the Capability Maturity Model (CMM) help software organizations improve marketplace competitiveness and achieve their business goals. More empirical research is needed in this direction.

- There is a great potential for the practical applications of Lean Sigma approach in future covering various disciplines and business domains. Therefore, there is a need to construct an appropriate Lean Sigma model and develop the implementation procedures within each business domain.

Application of Lean Sigma in services and transaction is very challenging as services and transactions cannot be measured easily and objectively. Lack of data availability and lack of objective metrics is a major concern to researchers and practitioners. Further, some tools are less used for service processes, and some tools need to be modified or adopted to be suitable for services and transactions. Therefore, there are great opportunities to contribute to Lean Sigma knowledge by enhancing the methodology to provide effective implementation of Lean Sigma to service industry.