CHAPTER 7

RESULTS AND CONCLUSION

7.1 INTRODUCTION

The entire world has become a global village and the level of operational and competitive requirements have risen to world-class and globally competitive status due to the advances of software systems. So, it is essential to develop a quality oriented software system for various industrial applications with high reliability. Software components are the most promising idea for efficient design of quality software systems. In these systems, component quality is also more important, but has received less attention by the researchers. By keeping this as core research concept in this thesis various issues in component based software systems are analyzed in the previous chapters. The work covers several research topics in the field of component based software system design, development and quality improvement. This chapter presents the results and conclusions drawn from the analysis of the new models, new initiatives and case study results of the research content.

7.2 DISCUSSION OF THE RESEARCH OUTCOME

The selection, adaptation, assembly and evolution processes in component software development are complex and includes several different approaches and analysis. The methodologies for this analysis are still developing, and there is a lot of need for further research in the area of
component based software and its analysis. Some issues are discussed in this research by improving its development process to assure the quality.

The different approaches are applied and analyzed in the case study of Enterprise Resource Planning. In this research, it is assumed that component based software development is applied in building ERP software. In the Genetic Algorithm based component selection approach, the right software components for ERP system is chosen with the fitness score of 94% by varying mating and mutation rate with limited components. Then, dependency based assembly algorithm is proposed and used to find the most important and also most interactive component for initial assembly. All the other components are ranked and assembled according to their interaction with other components based on dependency algorithm. According to this algorithm the sequence of the assembly of components is derived in the order of Human Resource Management, Project Management Component, Customer Relationship Management, Supply Chain Management, Financial Component and Manufacturing Component. Since quality of software is considered for continuous improvement of component software, the direction of the research moved towards quality improvement of the software.

In quality improvement, reliability is considered as most influencing factor to achieve high quality. So the reliability prediction and improvement are tried using usage ratio and severity analysis. It is predicted that improving the reliability of most impact components in CBS will give the total system reliability with significant improvement. Therefore it is planned to improve the quality of severity components. To do this, it is tried by applying SQFD by considering the voice of customer. This approach is applied on ERP software components to identify the reliability improvement. After applying the SQFD concept, the high level of reliability improvement is achieved
which is discussed in chapter 6. So it is concluded that SQFD technique is most suitable for quality improvement in component based software development.

This research helps us to recognize the software design with respect to selection and assembly process in order to decide how to manage the component based software development. Moreover, the research helps in the debugging of faults to improve quality according to the voice of customer. This research is beneficial for large software system development and also suitable for low, medium and large scale software companies especially in design, development and continuous improvement of the software. The outcome of the research is illustrated in Table 7.1.

### Table 7.1  Research approaches and its outcome

<table>
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<tr>
<th>Research Approach</th>
<th>Outcome</th>
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<tr>
<td>Genetic Algorithm for component selection</td>
<td>Selection of optimal components for a component based ERP software. Best fitness score for the given case study is 94% which is obtained by varying the mating and mutation rate.</td>
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<tr>
<td>Component Quality using QFD</td>
<td>Quality improvement of ERP software based on customer requirement. Reliability for ERP using usage ratio and severity before applying the QFD concept - 67% Reliability after applying QFD is 88%</td>
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</table>
The scope of the outcome of research is not only limited to the objectives which are mentioned in Table 7.1. It is also useful in the areas of project management, planning, project execution, decision making, real time systems, requirement engineering etc. Therefore, this research work can be considered as the perfect platform for addressing the requirements of modern businesses.

7.3 CONCLUSION

The basic difference between the current practice and the proposed methodology in fourth chapter provides a method to identify the best software components for component based software. This software component selection method was proved by taking the case study of Enterprise Resource Planning software. Same way a new algorithm for component assembly was developed and proved in the ERP software in fifth chapter. Then SQFD technique was applied on ERP software to improve the software design in chapter 6. Finally, this research helps in finding and improving reliability, software quality, software selection and software assembly.

7.3.1 Scope for Further Research

There are further scopes for extension in the following areas.

i) The proposed methodologies can be extended to any component based software to large software based applications such as automotive software based products, Software based medical electronics products, software based safety critical systems etc., by including their unique features.

ii) The component software quality measurement and improvement can be further developed using the techniques of
quality tools such as control charts, cause and effect diagram, Kaizen, six sigma, Design of Experiments etc.

iii) The component software development algorithm can be improved by considering selection criticalities, adaptation, coupling with hardware components and maintenance etc.

iv) The proposed models can be extended for supervisory control system, internet based software system, networking systems, parallel computing systems etc.

v) Reliability improvement model can be further extended by considering more parameters in component based software based systems.

There is no doubt that this research is a navigator for further research in many fields for academicians and practicing engineers in the area of component based software engineering with different perspective.