9. CONCLUDING REMARKS

In recapitulation, it is to be stated that, the overall aim of this research study is to develop a continuous quality improvement model and framework for automotive SMEs using auto core tools.

The initial literature review and study identified the key drivers and methods for implementing auto core tools and continuous quality improvement. This scenario, therefore, suggests that many SMEs are still in direct need of a robust model and framework capable of providing them with the mechanisms of the simple but effective process of ACTs implementation to achieve CQI. The operational level factors called process performance parameters those influence the business performances of the small-scale automotive industries were then identified for SMEs. There can be many process indicators which can be useful for business processes but key performance indicators identified based on the literature review are the cost of quality, reduction in in-process and final rejections. The research, therefore, conducted using case study method in four cases companies where auto core tools have been implemented and quality improvement achieved through KPIs. The results of the research are constructive and continuous quality improvement has been achieved.

9.1 Achievement of set research objectives

The objectives of the study are stated in Chapter - 2 of this report. Their accomplishment is described hereafter.

The first objective is to develop continuous quality improvement model for small-to-medium scale automotive industries by implementing and analyzing the impact of auto core tools. It is important research objective set out to develop the continuous quality improvement model using auto core tools for SMEs. The research, therefore, conducted using case study method in four cases companies where auto core tools were implemented. Key performance indicators (KPIs) have been monitored to measure the quality improvement as explained in chapter - 5. The results of the research have been constructive.
and continuous quality improvement has been appreciated. Hence, the model and framework for justifying ACTs for continuous quality improvement within SMEs have been developed, as discussed in chapter - 6.

Second is to determine how automotive core tools can be adjusted from the large scale industries to small scale industries. To achieve this aspiration, the research study conducted a critical analysis of published work within the subject of continuous quality improvement, automotive core tools, and its related attributes, presented in Chapter 3. These encompassed the background theories on continuous quality improvement concepts and the benefits organizations derive from implementing automotive core tools within their business. The different automotive core tools and their applicability were included in the identification process of the key drivers for implementation. This idea stemmed from the fact that implementation requirements on the usage of automotive core tools were necessary for providing an understanding of their capability in SMEs. Nevertheless, the literature review presented a number of fundamental issues such as the cost of deployment and competence of the people in SMEs as amongst the most pertinent factors that may be the obstacles for implementation. Moreover, these findings have been supported by several authors who maintain that the application of ACTs and achievement of CQI within an organization is not simple and attracts enormous resources.

Furthermore, the literature review exercise scrutinized several other continuous improvement models and frameworks. However, none of these models and frameworks provided information for automotive core tools implementation. In fact, no such model and framework were developed for SMEs for continuous quality improvement using ACTs. This scenario, therefore, suggests that that, many SMEs practitioners are still in direct need of a robust model and framework capable of providing them with the mechanisms of the simple but effective process of ACTs implementation to achieve continuous quality improvement.
The third objective is to determine the operational level factors called process performance parameters those influence the business performance of the small scale automotive industries. This task required review of past research as well as the engagement of a sample of carefully selected SMEs as case companies where ACTs to be implemented within their premises. There can be many process indicators which can be useful for business processes but key process indicators identified based on the literature review are the cost of quality, reduction in rejections, etc.

The fourth objective is to identify the impact of each of the core tools, specifically in small-medium industries, their linkages, and how the core tools, if used correctly in a process based management system, can lead to continuous improvement, defect prevention, and the reduction in variation. To accomplish this objective, key performance indicators have been selected and monitored to gather the quantitative data. Also, the improvement opportunities identified because of each auto core tool has been also documented and their implementation has shown significant impact on KPIs. The initial case studies and case studies after the development of the model (validation stage) both have shown the remarkable quality improvement (more than 50% improvement) in key performance indicators, such as in-process stage rejections, customer returns, final stage rejections and cost of quality. The improvements in KPIs, which are indicators of continuous quality improvement, signposts the impact of each auto core tool for quality improvement.

The fifth objective is to test and validate the developed continuous quality improvement model through real-life case studies. It is imperative objective to prove the importance of developed model and framework. The developed model and framework have been then validated through real-life case studies, as presented in Chapter - 7. The auto core tools have been implemented by five case companies by following developed model and framework. The implementation of auto core tools has shown significant improvement in KPIs, more than 50% improvement. These results have validated the developed model and framework for SMEs. This suggests that model and framework is capable of accomplishment of continuous quality improvement.


9.2 Research Implications

The major implications from the outcome of this research study are strengthening the SMEs with following capabilities.

- Helping automotive SMEs to implement ACTs by following developed framework.
- Helping automotive SMEs to achieve continuous quality improvement by implementing ACTs.
- Helping automotive SMEs to standardize processes, reduces rejections at all stages and improve the customer satisfaction.

Few additional benefits envisaged from this study are as below:

- Potential automotive core tool users, mainly SMEs can make informed decisions on the overall economic viability of its adoption at an early stage.
- Companies may also strategies automotive core tool based on factors such as the cost of quality, readiness and benefit analysis and risk assessment.
- A company can project what it anticipates achieving the return on investments (ROI) from implementing ACTs.
- The framework is a precursor for implementing the concept of ACTs. It allows a potential ACTs using the company to make assessments on its capabilities and the capacity of its resource for the intended project.
- A company can easily claim the highest maturity of manufacturing processes after implementing ACTs.
- Highest mature manufacturing processes and implementation of ACTs in SMEs improves the confidence of their potential customers and gives direct access to them.
- Companies can also evaluate the strengths and weaknesses of their manufacturing processes based on their current KPIs result.

9.3 Limitations

However, validation exercises highlighted some limitations in the system usability.
• The attitude of SMEs to devote resources to improvement projects identified after implementation of auto core tools was very restricted. The research was not able to extract resources, mainly capital investments, easily and sufficiently for improvement projects, due to which all improvement projects have been not implemented whereas some have taken longer time for implementation. The adequate allocation of financial resources may have multiplied the improvements.

• Another limitation of this research may be the number of case companies, SMEs, selected. Even though Nine SMEs, four SMEs for initial case study and five SMEs for validation, have been chosen but more number of SMEs may have increased the accuracy of the results.

9.4 Future research directions
The author suggests further research investigation be carried out within the other sector (other than automotive) to perceive the applicability of the developed model and framework. This assertion curtails from the fact that the research conducts of developing model and framework for ACTs implementation in SMEs, concentrated mainly on small-to-medium automotive manufacturing firms.

The researcher also recommends further work in evaluating the developed model and framework’s cost-benefit analysis. This exercise should include issues such as; the cost and time of training and the level of education, a user should possess.