ABSTRACT

Warranty expenditure of automotive company does affect the bottom-line adversely. Global automakers reportedly spend billions of dollars in warranty servicing, and the trend is heading north. The issues of faster detection and effective fixing of emerging warranty problem at an earlier stage, well before the problem becomes obvious, certainly leads to huge savings in the cost and enhances brand building. The complexity of these issues increases manifold for the automotive organization involving multiple dealers, multiple models, multiple plants, multiple assembly lines, thousands of customers and suppliers scattered over a large geographic area, coupled with faster new product introduction.

The aforesaid vital warranty issues have been addressed in this thesis by proposing a novel framework, based on Rough Set theory. The proposed framework is capable of extracting or mining thousands of competing statistical significant as well as insignificant hypotheses, while discarding the statistical independent hypotheses, from a large heterogeneous warranty database. These hypotheses, in fact, show the association between the condition and decision attributes and help detect the root cause of a problem. A heuristic is proposed to track the emerging warranty issue and the information regarding its root cause is fed back to the corresponding entity, either within or beyond the supply chain, depending upon the availability of data, to help formulate an action plan to mitigate the problem at the earliest. During the process of hypotheses (rule) generation, this framework actually affects dimensionality reduction of the heterogeneous database through a novel approach based on Link analysis. Based on this framework, a GUI (Graphical User Interface) has been developed in VB (Visual Basic) environment. Its simplicity enables the user, to choose interactively, between competing hypotheses with ease, as each of the generated hypotheses is provided with estimated objective rule interestingness measures like Confidence, Coverage, Support, Lift, Chi-square, Phi-

coefficient and R^2. The developed framework is used to analyse real-life warranty data of an automotive manufacturing company. The results look quite promising and can be used for the tangible and intangible benefits of the concerned organization.

The generic nature of this developed framework enables it to be used for finding patterns in the domain of engineering, social science, medical science etc. This framework is very much compatible to the analysis of warranty data that are nominal, clean, pre-processed and presented in a decision table format. It can also handle non-nominal data with equal efficacy, provided it is clustered to reduce the Kolmogorov complexity of the data set, prior to the implementation of this framework.