CHAPTER 6

CONCLUSIONS

Global competition, rapidly changing technologies and shorter product life cycles have contributed in making the current manufacturing environment extremely competitive. Organizations face significant uncertainties and continuous changes. Customers are demanding a greater variety of high quality, low cost goods and services. Organizations must consequently develop new methods and perspectives to meet these market needs in a timely and cost effective manner. Traditional manufacturing approaches are no longer sufficient competitive weapons by themselves. Creating a world class organization is one response to deal with such challenges. A firm, which is world class and possesses a set of different strategic options, can respond effectively to dynamic and volatile environments. In world class manufacturing, the focus is on continuous improvement. Performance measurements should therefore activate continuous improvement. As organizations adopt world class manufacturing, they need new method of performance measurement to check the continuous improvement. In this research work, development and validation of performance measures for world class manufacturing has been focused.

In chapter 2, some of the well-known traditional and non-traditional techniques of performance measures as well as some popular conceptual performance measurement frameworks have been reviewed. The review has revealed that traditional performance measurement systems are invalid for the measurement of world class manufacturing practices as they are based on outdated traditional cost management
systems, lagging metrics, not related to corporate strategy, inflexible, expensive and contradict continuous improvement. Non-traditional performance measures concentrate on time and cost only. These measures neglect other operational performance measures such as quality, flexibility, delivery, etc. Without controlling and improving these operational measures companies will not be able to compress lead time and reduce cost. Review of conceptual performance measurement frameworks has revealed that these frameworks pay very little attention to the selection and testing of appropriate performance measures and do not consider the performance measures capturing the entire domain of the world class manufacturing. The limited literature available on the performance measurement of WCM, which is based either on examinations of current best practices or the authors’ personal experience indicates a need to:

- Develop and validate a comprehensive set of performance measures and their variables which take into account all aspects of WCM.
- Develop a framework which integrates all performance measures and which can be used for the continuous improvement of organizations rather than just a monitoring and controlling tool.

Chapter 3 presents the method developed and used for the development and validation of the performance measures for world class manufacturing. A set of sixteen performance measures for world class manufacturing – top management commitment; knowledge management; employee training; innovation and technology; customer involvement; employee empowerment; environmental, health and safety; supplier management; production planning and control; quality; flexibility; speed; cost; customer service; customer satisfaction; and company growth – developed from the
review of literature and the discussions held with the practitioners is described in this chapter. A summary of review of 194 research publications from various research areas like accounting, cost, JIT, supply chain management, TPM, TQM, MRP, benchmarking, manufacturing strategies, business process reengineering, human resource, knowledge management, benchmarking, manufacturing, etc., is also presented for the purpose of theoretical justification (content validity) of the sixteen performance measures. Using the previously mentioned 194 research papers, 185 representative variables/items defining the scope and meaning of the sixteen performance measures for WCM were developed. Finally, by using the nominal grouping techniques (NGT), thirteen items/variables were dropped to get 172 variables/items relevant to the WCM performance measures.

Chapter 4 describes the development of a survey instrument and its pre-testing along with the data collection methodology and the analysis of the collected data. The region wise, sector wise and manufacturing segment wise distribution of respondents show that all regions, sectors and manufacturing segments are adequately represented by the data collected. Analysis of the respondents by size (number of employees) and annual turnover shows that the respondent organizations are largely medium and large sized. Mean experience of respondents is 15.5 years and many of the respondents fall in 10-25 years experience categories which is sufficient to conclude that most of the respondents have had the adequate experience to understand the various performance measurement systems used in the industry and also they have a mature understanding of the importance of the performance measures. Designation wise analysis of the sample shows that all managerial levels of hierarchy are represented by the sample. Almost all responding companies have a written Vision/Mission statement, quality
policy statement and safety policy statement. All these companies had implemented at least one of the world class manufacturing practices such as TQM, TPM, AMT, Six Sigma, JIT in their organization. This amply denotes that the respondent organizations are as per the targeted organizations, i.e., world class organizations. The importance index analysis of the collected data shows that the items/variables established for the measurement of the performance measures have been properly selected as practitioners categorized most of the items/variables as very important (53.5%) and important (44.2%). Only 2.3% items/variables were categorized as preferred and none of the items/variables came under less important and not important categories.

Chapter 5 discusses the reliability and validity analysis of the performance measures carried out by using SPSS® 11.5 for MS Windows®. The Pearson correlation coefficient (CIMTC) for the various measurement items/variables of the performance measures indicates that the items have a high correlation among themselves (average CIMTC is 0.56) and only 14 items have been found to have less than the generally accepted correlation value of 0.3, which were subsequently dropped prior to further analysis. All the sixteen performance measures are found to be reliable as the values of reliability coefficient (Cronbach’s alpha) for these performance measures are greater than the generally accepted value of 0.6. The Cronbach’s alpha values for the performance measures range from 0.6929 to 0.9495. However, during the detailed item analysis, 81 of the items correlated highly to other construct scores relative to their own construct score and have been dropped. Finally, the Cronbach’s alpha values range from 0.7922 to 0.9498. This demonstrates that the performance measures have relatively high scores of reliability. The computed values of correlation matrix, Barlett’s test of sphericity (at p≤0.0001) and Kaiser-Meyer-Oklin (0.524-0.867)
measures of sampling adequacy show a high strength of relationship among the remaining items. The factor analysis shows that all the proposed sixteen performance measures are unidimensional with adequate item loading ranges. From these results, it can be concluded that all the proposed performance measures have construct validity. Finally, the proposed framework of the 16 performance measures is presented in this chapter.

Some specific research contributions of the work:

1. The extensive review of literature revealed that the organizations adopting world class manufacturing need new methods of performance measurement based on continuous improvement.

2. Developed a method for the development and validation of the performance measures for world class manufacturing.

3. Developed sixteen performance measures for world class manufacturing based on an exhaustive review of literature and discussions with the practitioners.

4. Developed items/variables defining the scope and meaning of the sixteen performance measures of world class manufacturing.

5. Developed a survey instrument to collect the data for the validation of performance measures of world class manufacturing.

6. Assessed reliability and validity of the performance measures of world class manufacturing by using SPSS® 11.5 for MS Windows®.

7. Developed a framework of performance measures for world class manufacturing.
Limitations and scope for future research:

This study covered only four manufacturing sectors in India. To test the wider validity of the instrument, similar studies may be undertaken across a larger number of industries. Further, to test the robustness of the instrument, studies may also be carried out in different countries.

Performance measures have been developed based upon self-reported information from the respondents. The items in the questionnaire were subjective in nature. Respondents were asked to rate items based on their perception, as to the extent to which the items were applicable in their respective companies. Hence, the lack of objective measures might have introduced certain amount of bias into the data collected. Moreover, the wordings of the respective items might have certain impacts on the results of factor analysis. Items worded in a similar manner tend to load together as a single measure (Carmines and Zeller, 1979).

Further, this study has focused on manufacturing industry only and as such refinements to the performance measures developed in this study could be undertaken to adapt the instrument for world class service organizations.