CHAPTER 7

CONCLUSION

In this part of the report, the author has come to conclusions about the study and arrived at certain managerial implications which will hopefully create more awareness among management and employees about the strategic importance of WCM practices, principles and techniques to manufacturing operations in the Chennai manufacturers. Finally, the major limitations of the study and scope for future research are elaborately discussed in this chapter.

7.1 GENERAL CONCUSSION

The thirst of this research study is to explore how the World Class Manufacturing (WCM) practices, principles and techniques (which could be described as outperforming the industry’s global best practices, principles and techniques) have been implemented in Chennai manufacturing firms, to identify the critical driving and resisting forces toward the implementation of WCM principles and techniques in Chennai manufacturing firms, and to provide guidelines for the successful implementation of WCMS by Chennai manufacturers. Manufacturing has always been a competitive and diverse industry. Today, the rate of change is increasing at a rapid pace and uncertainty is a constant. An organisation’s success is dependent upon its ability to stay ahead of trends and to respond dynamically to market opportunities and fluctuations. Manufacturers need to increase productivity, optimise their profits and cash flow, lead industry trends, and drive competitive advantage to be successful. Success in manufacturing is dependent on making the right connections to improve business performance.
and value for all stakeholders - shareholders, customers, suppliers, business partners and employees.

The manufacturing industry has experienced an unprecedented degree of change in the last three decades, involving drastic changes in management approaches, product and process technologies, customer expectations, supplier attitudes as well as competitive behaviour. In today’s highly dynamic and rapidly changing environment, the global competition has lead to the implementation of WCM practices, principles and techniques by manufacturing firms in their journey of achieving the manufacturing excellence. The global marketplace has witnessed an increased pressure from customers and competitors in manufacturing as well as service sectors.

Manufacturing is the bedrock of our economy. When times are good, manufacturers are able to cope with the global competitive challenges. But when the economic pendulum swings in the other direction, then the pressures of meeting the competitive priorities are likely to put world class manufacturing in the spotlight. World class manufacturers need to use every tool available to gain a competitive advantage. Organizations that want to survive in today’s highly competitive business environment must address the need for world class manufacturing system to produce the diverse product range with state-of-the-art product features, coupled with high quality, lower costs, and more effective, swifter Research and Development (R&D). In today’s fast-changing marketplace, slow and steady improvements in manufacturing operations do not guarantee sustained profitability or survival of an organization. Thus the organizations need to improve at a faster rate than their competitors, if they are to become or remain leaders in the industry.
Results of a research study by Dr Richard J Schonberger, (inventor of the term and concept world class manufacturing), examining lean management trends among 604 of the world’s best known publicly held companies has the UK on top by a significant margin with companies including BP, Cadbury Schweppes, GKN, Lucas, Pilkington, Tate and Lyle, Vickers. These are world class companies who do not wait for things to happen to them; rather they proactively challenge the status quo, continuously innovate, and commit investment to R&D and new product development. They devote effort to their processes, plant and people in a bid to continuously improve what they do. In world class manufacturing, we will find a culture of involvement where the people working on the shop floor make the decisions because they know more about the processes than the managers do.

The dynamics of global business era paves the way for the evolution of WCMS. Manufacturing companies need to adopt WCMS to achieve an excellence in the competitive priorities of business including quality, cost, durability, flexibility, delivery, productivity, innovations, process capability, etc. There has been a marked increase in the awareness of the term World Class Manufacturing (WCM) to an almost universal level over the last 5 years. It was evident from the study that all the manufacturers located in and around Chennai are aware of WCMS. The study also reveals that all manufacturing companies were found to have practiced/implemented at least any one of WCM practices, principles and techniques at least one year ago. Almost 8 out of 10 manufacturing companies participated in the survey were found to have ISO certification and more than half of the respondents (52.0 percent) have claimed that they are actively practicing six-sigma programs in their manufacturing operations.
When asked about the attributes of WCM considered to be most important by the manufacturers, this study clearly indicates that ‘product quality is of paramount importance’ was found to be the most important attribute of a world class manufacturer with the highest mean (4.44). More interestingly, majority of the respondents (more than 7 out of 10 manufacturing companies) were able to give a good explanation of what they felt WCM was and it indicates that manufactures have a strong view of what constitutes world class.

‘Improving quality’ with the mean score of 4.10 is still at the top of the agenda for most manufacturers, with over 80 percent of respondents citing it as a key business priority for their business to become world class. When asked about lean initiatives considered to be a key focus in the journey towards becoming world class, ‘Kaizen (continuous improvement)’ with the highest mean of 4.26 was found to be the top of key lean initiatives implemented by manufacturing firms to achieve competitive edge in their business operations. It is clear from the results of the survey that ‘customer focus’ (mean=3.82), ‘management commitment’ (mean=3.72) and ‘continuous process Improvement’ (mean=3.54) were rated among the top priorities in terms of the implementation of TQM principles by Chennai manufacturers for achieving world class status.

When respondents were asked about the IT Systems/Applications in relation to how they assist their world class journey, ‘design systems (e.g., CAD, CAE and CAA)’ with a highest mean value of 3.98 was considered to be the most powerful IT systems/applications currently implemented by the Chennai manufacturers. It was found from the survey that the practice of ‘keeping the equipment at its highest productive level by maintenance crew’ was rated top (mean=3.79) among the key maintenance practices performed by manufacturing firms in Chennai for improving the equipment effectiveness.
and maintenance. When asked to elaborate on the detail of how, exactly, manufacturers were helping their suppliers to improve, ‘meeting with the suppliers to discuss improvements’ was found to be the most important practice adopted by Chennai manufacturers with a highest mean response of 4.08. Skills remain a high priority for the manufacturing industry. As respondents were allowed to indicate their level of agreement with the company’s approach to ensure employee skills, it was found that ‘training is ad hoc and on the job’ was found to be the company’s key approach with the mean (4.23) in response to ensuring employee skills.

Every manufacturing company is concerned with building and sustaining a competitive advantage in its turbulent markets. A strong competitive advantage is driven by customer requirements and aligns the company’s resources with its business opportunities. Competitive advantage can be achieved in different ways such as outperforming competitors on price or product, responding quickly to changing customer needs in designing products, or providing rapid design or delivery. This study uses seven competitive performance indicators to evaluate the competitiveness of each manufacturing plant as: quality improvement, costs reduction, reduced time to market (or delivery speed), constant innovation, improvement of efficiency and productivity, flexibility in operations, and offering quality products/services at affordable price. The survey results indicate that all the competitive performance indicators were found to have a mean response of greater than 3.0 and were recognized as the core of manufacturing capabilities that leads to the competitiveness of manufacturing firms in the global market.

The study has also come to conclusion that the Chennai manufactures are still actively realizing the WCM benefits from the application of WCM practices and principles. The results of the study confirmed that the drivers of WCM positively affect the implementation of
the WCM techniques by manufacturing firms in Chennai. ‘Improved product quality’, ‘increased customer satisfaction’, ‘increased employee involvement’, ‘improved company image’, ‘increase in profitability, ‘improved delivery times’, ‘increased productivity/efficiency’, ‘improved competitive edge’ ‘reduction of costs, wastes and defects’, ‘improved work culture’ and ‘increased staff motivation and morale’ were found to be the significant benefits that emerge from the implementation of WCM principles and techniques.

On the other hand, implementing the WCM principles and techniques has many barriers especially in developing country like India. Thus, the survey results also confirmed that the barriers of WCM negatively affect the implementation of the WCM principles and techniques by manufacturing firms. The most significant barrier to the application of WCM principles and techniques within the manufacturing companies was felt to be the ‘investment costs’. Linked to this, the other significant obstacles that might prevent or delay the implementation of WCM principles by the manufacturing firms were found to be ‘the nature of manufacturing facility’, ‘a lack of understanding of the approach throughout the company’, ‘the attitude of shop floor staff’, the inability to quantify the benefits, the attitude of middle management and time constraints.

Given the very positive findings relating to the application of WCM principles in this report, it is perhaps surprising to see a significant quarter of respondents (25.6%) have claimed themselves the accolade of having achieved world class status and more than 40% believed they were close to being world class. Focusing on a set of twelve lean manufacturing practices, this study reveals that a significant 17.6 per cent of respondents claiming to have achieved lean manufacturing status already, 23.2 per cent believe they are very close to being lean, and a quarter (25.6%) think they are
quite close to being lean. The majority of manufacturing companies currently focused on the implementation of WCMS report satisfactory progress, with almost 6 out of 10 respondents participated in the survey have reported that their companies are effectively implementing WCMS. It was also found from the survey that “not a statutory requirement” and “not demanded by customers” were found to be the main reasons for not actively practicing WCMS by less than half of the respondents.

The research findings also indicate that there was a significant difference among most of the research variables considered to be the key for the effective implementation of WCMS by small, medium and large scale manufacturing firms. This would indicate that the mean scores of the WCM principles and techniques implemented by medium scale companies are better than that of the small scale companies and the mean scores of the WCM principles and techniques implemented by large scale companies are better than that of the medium scale companies. The results also show that there were significant differences between the demographic characteristics of manufacturing firms in terms of the implementation of WCMS (i.e., WCM Practices, Lean Initiatives, TQM Principles, IT Systems/Applications, and Maintenance Practices).

We can also conclude from the findings of survey that there was a strong positive relationship between the independent variables (such as WCM Practices, Lean Initiatives, TQM Principles, and IT Systems/Applications) and the dependent variables (such as WCMS Implementation, Competitive Advantage, and World Class Status). The results of Structural Equation Modeling (SEM) have shown that there is a strong interrelationship between the research variables (such as WCM Practices, Lean Initiatives, TQM Principles and IT Systems/Applications and Competitive Advantage). This would infer that most of the research variables can influence manufacturers’
attitudes toward gaining a competitive edge at their manufacturing operations and achieving world class accreditation.

7.2 MANAGERIAL IMPLICATIONS

One of the main objectives of this study was to provide some guidelines that might be of importance to promote implementation of WCM principles and techniques in manufacturing industrial sectors located in and around Chennai. Based on the results of this study, the following managerial implications are drawn by the researcher.

1) The manufacturers should acknowledge that the aim of being world class is not merely a matter of simply reducing the operating costs, improving quality, enhancing productivity, designing efficient factory layout or establishing state of the art manufacturing system. It is, in fact, the ability of the manufacturers to link the manufacturing capabilities with the market requirements to enhance the firm’s performance in order to meet and delight the expectations of customers continually. The manufacturing firms should take into accounts the customer voices in the early design and manufacturing stages of the products.

2) Implementing the WCMS has many obstacles especially in developing country like India. Based on the results of this study, investment cost, nature of manufacturing facility, work force resistance, lack of understanding WCM principles, inability to quantify the benefits and improper training have been found to be the most important obstacles to the implementation of WCMS. Therefore, the world class practices and principles should be implemented through the act of taking appropriate measures by senior management like allocating the required financial resources; providing training programs to educate work force about WCM practices, principles, philosophies, and techniques; active
participation by employees; and creating a mature learning environment in which people can invest their ability, the confidence, and the commitment to take the responsibilities/initiatives and ownership to implement the world class manufacturing system effectively.

3) Because the implementation of WCM techniques takes a long time, manufacturing firms that are willing to implement them should be patient and persistent until the expected benefits of WCMS are realized and obtained. In order for any organizational effort to succeed in the global business environment, there must be a substantial management commitment of management time and organizational resources. The purpose must be clearly and continuously communicated to all personnel from the top management, through the middle management, and down to the operative employees. Management must consistently apply the principles and techniques of WCMS to achieve continuous improvement in the processes, products, and services.

4) The manufacturing firms in Chennai must think globally. The consequences of not doing so would be a penetration of their own markets by overseas competition. They must also expect more complexity in business, products, and process as the international competition has become more intense and even chaotic and the global market has changed rapidly. To beat out the turbulent and complex market, manufacturing firms in Chennai must think in terms of a global market place in order to compete effectively and focus on customers, suppliers, and competitors from a global perspective.

5) Policy makers in Chennai industrial sectors should enhance the capability of manufacturing firms that are willing to implement WCMS through the increased funding, incentives, and training and educational programs. Implementing the WCMS has lead to many benefits that
should be achieved by manufacturing companies located in and around Chennai. Therefore, allocation of financial resources by banking institutions, the training and education programmes that increase the awareness level of the manufacturing firms about WCMS and prepare the employees to meet the potential changes demanded by the WCMS are the very critical requirements in this stage.

WCM has emerged as a result of many business drivers. Firstly, the changes in the driving forces for manufacturing strategy, from an initial push to improve current business processes to achieve savings and improve efficiency, the companies have come to be driven by a desire for greater supplier involvement and customer service in later implementation which lead to the adoption of mass customisation production philosophy. Secondly, competitors’ use of the WCM techniques and response to customers also has a strong effect on the adoption of the most advanced WCM techniques for the production purposes. Thirdly, as a result of its growing ability to bring new opportunities and to facilitate the development of the new organizational forms and structures needed to meet the continuously emerging changes in business imperatives, the WCM importance increases as it becomes involved in each task in today’s business. Finally, IT developments are also forcing organisations to be up-to-date in their use of advanced technologies regarding delivery of speedy and high quality information, as well as facilitating greater degrees of communication and integration across business units and external partners.

7.3 LIMITATIONS OF THE STUDY

Despite its strengths, the study has certain limitations. It is important to view this study in the context of its limitations. First, the research model developed in the study is an initial attempt in understanding the journey of WCMS adopted by the manufacturers in Chennai and how far they
think they have come across that accreditation. The survey is limited to manufacturing sites located in and around Chennai. Clearly, there is a need to replicate the results of the study to the manufacturing firms located in other parts of India and abroad.

Second, this study was purely based on the cross-sectional survey data gathered via self-reported structured questionnaires. Any study based on the survey through a pre-designed questionnaire suffers from the basic pitfall of the possibility of differences between ‘what is reported’ and ‘what is true’ because of biased responses of the respondents or the problem of filters in the communication process. Third, due to the paucity of resources and time, it has not been possible to explore the possibilities of changes in the opinions of the respondents over time.

Fourth, a generalization of the study results might be critical since other industries not covered by our study may be influenced by different impact factors. This may exhibit an effect on the identified relationships. Furthermore, a comparison of WCM practices in the countries and in the industries would be interesting. Additionally, longitudinal studies might have great potential identifying certain developments in the field of WCMS.

Finally, the implementation of WCMS is by nature a never-ending process (continuous improvement). Because of this and the limited framework of a thesis, it would be impossible to show all of the long-term effects of WCM practices, principles and techniques on manufacturers and their respective effects on the operational performance of an organization. Because of these limitations, the scope of the thesis will be restricted to information obtained from the survey related to the implementation of WCMS by Chennai manufacturers. It is hoped that this thesis will serve as a foundation for further study of the topic. Despite these limitations, the study provides a rich picture
on the journey of implementation of WCMS by Chennai manufacturers and achievement of world class status in the global business environment.

7.4 SCOPE FOR FURTHER RESEARCH

The limitations discussed above may affect the current study and should be considered in the future study to overcome these limitations. A logical progression of this research study would be to carry out a similar study concerning the private sectors and the results of which could be compared with this research. The same proposed world class manufacturing practices, principles, techniques, drivers and barriers developed by the current study could be employed in such a study. Furthermore, more research needed to study how the perceived importance of these WCM practices, principles, techniques, drivers and barriers may differ across each industry such as manufacturing equipment, chemicals and plastics, telecommunications, hardware equipment, textiles, home equipment, scientific and medical equipment, management consulting, and software development. With a better understanding of these issues involved in WCMS, managers will be able to make informed decisions and allocate the necessary resources to make the implementation of WCMS a success in the long-term.

Moreover, this research could be enhanced by expanding the current driving and resisting forces. The impact of organizational culture on WCM implementation could be investigated to add further depth to those forces. Finally, similar studies in other developing countries could be carried out and comparative studies with other less developed countries and more developed countries could be also carried out to find out the similarities and dissimilarities concerning the driving and resisting forces toward the implementation of WCM practices and principles in different contexts.
This study is based on the effect of implementation of WCM practices and principles on competitive advantage of the organization measured in terms of operations performance like improvement of quality, reduction of costs, delivery speed, constant innovation, and flexibility in operations. It can be expanded to include other functional areas of the organization such as marketing, engineering, purchasing, productivity-based performance, workforce improvement, etc. The WCM practices and principles can also be extended by including Japanese quality management practices, principles, tools, and techniques such as employee empowerment, internal and external customer focus, problem solving, process improvement, statistical process control, process capability, etc.

The IT Systems/Applications construct can also be improved by applying more indicators like Robotic System, Computer-Aided Manufacturing (CAM), Flexible Manufacturing System (FMS), Computer-Integrated Manufacturing System (CIMS), Artificial Intelligence (AI), Group Technology (GT), etc. Instead of limiting to an observational study, an experimental type of study can be adopted to determine quantitative benefits from the application of WCM practices and principles in the manufacturing firms. This will lead to generate an integrated framework for WCM practices and principles towards improvement of the competitive edge of the manufacturing firms in the global context.

Hopefully, this thesis will serve as a foundation upon which future research can be based. Understanding the impact of world class manufacturing system on manufacturers is in itself a continuous process and will naturally require additional research in order to expand the knowledge boundary. Although this thesis has attempted to expand the knowledge boundary relating to world class manufacturing practices, principles and
techniques adopted by manufacturers, it has in no way depleted the opportunities for research in this area. By expanding the existing knowledge base, this thesis has exposed many new opportunities for future research. Continued research would allow for the verification of the conclusions of this thesis, ultimately providing a better understanding of the subject matter.

Additional research into world class manufacturing philosophies would be particularly useful in verifying conclusions made in this thesis. The survey instrument used for this thesis is admittedly more focused on practices, principles and techniques than on philosophies. This is primarily due to the fact that it is inherently more difficult to write survey questions that accurately measure philosophies than to write questions, which accurately measure practices, principles and techniques. When the survey instrument was developed it was believed that by measuring practices, principles and techniques, philosophies would also be indirectly measured. Unfortunately, the data collected from the study suggests a disconnect between practices and supporting philosophies often exists.

Future research focusing on world class manufacturing concepts and philosophies would be likely to develop stronger conclusions because of the stronger correlations that should result from a more complete survey instrument. Although this thesis was able to establish the existence of relationships between various components of the proposed model, to determine the exact nature of these relationships will require additional research. Further studies can also be made focusing on other areas of manufacturing hub in India and abroad to allow for a new comprehensive WCM framework to be built upon to meet the needs of the manufacturing firms in their drives towards a journey of world class.