International Journal of Engineering Sciences Paradigms and Researches (IJESPR)
Vol. 48, Special Issue, (TAME-2019, April 4-5, 2019)
(An Indexed, Referred and Impact Factor Journal approved by UGC- Journal No. 42581)
ISSN (Online): 2319-6564
www.ijesonline.com

CRITICAL REVIEW OF WORLD CLASS MANUFACTURING MODELS

Rajeev Saha

Department of Mechanical Engineering, J.C. Bose University of Science and Technology, Faridabad, Haryana - 121006, India.
E-mail: rajeevsaha@gmail.com

Abstract
To become a global omnipotent in manufacturing arena requires updating the manufacturing system at regular intervals with future insight. Integration of newer technologies in manufacturing system and improving the manufacturing processes is the need of the hour. Only roadblock is the high cost involved for integration of newer technologies with a shorter product life cycle. Many authors have presented their version of World Class Manufacturing (WCM) model keeping in view of concurrent practices. However, seldom any organization has used WCM models verbatim to serve the purpose of making them a WCM organization. This paper presents a critical review of various WCM models available.

Keywords: World Class Manufacturing, Models of World Class Manufacturing.

1. Introduction

World Class Manufacturing may be referred to as benchmark manufacturing practices which other organizations would like to follow. Most of the manufacturing practices labelled as world class and being followed by the organizations were developed to increase productivity. However, World Class Manufacturing encompasses lot more besides manufacturing practices. It relates to a culture driven by continuous improvement process in manufacturing.

Hayes and Wheelwright in 1984 coined the term 'World Class Manufacturing'. The concept of 'World Class Manufacturing' was then redefined by various authors by reinforcing it with new ideas as per relevancy to the newer technologies and concepts. Major contribution came through Hall (1983), Hayes and Wheelwright (1984), Schonberger (1986), Gunn (1987), Maskell (1991), Sharma (2008), Nachiappan (2009), andOkhovat(2012). Dudek (2016) has divided different World Class manufacturing models into three generations. First-generation models are based on the conceptsofTotal Quality Control (TQC), Total Productive Maintenance (TPM) and Just In Time (JIT). Second-generation models are based on the concepts ofTotal Quality Management (TQM), Total Productive Maintenance (TPM), and Lean Management (LM). Third-generation models are based on the conceptsofLean Six Sigma (L6S), Total Productive Maintenance (TPM),andAgile Management (AM).

2. Literature Review

Hayes and Wheelwright (1984) framed six practices to be followed by manufacturing firms to become a World Class Manufacturing firm. Following are these six practices:
1: Workforce skills and capabilities
2: Management technical competence
3: Competing through quality
4: Workforce participation
5: Rebuilding manufacturing engineering
6: Incremental improvement approaches

Schonberger (1986) developed a list of sixteen principles of world class manufacturing. First four principles are general in nature. Fifth principle refers to design, the supplier and the partner. Sixth and seventh principle refers to operations. Eighth and ninth principle refers to human resources. Tenth and eleventh principle refers to quality and process improvement. Twelfth and thirteenth principle refers to control on information for operations and improvement. Fourteenth and fifteenth principle refers to capacity. Sixteenth principle refers to marketing and customer presentation.
1. Teaming up with customers
2. Know your customers, know the competition, know the best practice
3. Continual, rapid improvement in universal customer wants
4. Frontline teams involved in change and strategic planning

5. Cut to the few best components, operations and suppliers
6. Cut flow time and distance, start-up/changeover times
7. Operate close to customer's rate of use or demand
8. Continual training for new roles
9. Expand variety of rewards, recognition and pay
10. Continually reduce variation and mishaps
11. Frontline teams record and own process data at workplace
12. Control root causes to cut internal transactions
13. Align performance measures with universal customer wants
14. Improve present capacity before new equipment and automation
15. Seek simple, flexible, movable, low-cost equipment in multiples
16. Promote, market and sell every improvement

According to Gunn (1987), World-Class manufacturing rests on three pillars: computerintegratedmanufacturing (CIM), total quality control (TQC) and just-in-time (JIT) production methods.

According to Maskell (1991), World Class Manufacturing should include following four particulars:
• A new approach to total product quality
• Just-in-time (JIT) production techniques
• Change in the way the workforce is managed (Workforce Management)
• A flexible approach to customer requirements (Flexible Production)

As per Sharma and Kodali's (2008)manufacturing excellence model, WCM is based on good practices grouped in four pillars: TQM (Total Quality Management), LM (Lean Manufacturing), TPM, and JIT.

Nachiappan, Anatharaman and Muthukumar (2009) based their model on the set of good practices grouped in three pillars of TPM, Six Sigma, and LM.

Okhovatet. al. (2012) based WCM model on the set of good practices grouped in two pillars of Lean Six Sigma and TPM.

3. Critical Review

Most of the organizations have little interest in the models as each one of them have their own style and approach for running their organization. As per convenience different tools and techniques are fitted in to suit the manufacturing environment. Howsoever, few of the tools and techniques are popular and have become almost a necessity for overall improvement of an organization.

Lean management is one of the most practiced and popular system used for improvement. Within lean, 5S is used to improve efficiency by eliminating the waste of motion looking for tools, materials or information ultimately improving the work environment.

Total Productive maintenance is again important to make an organization free from breakdown of machines or free from any untoward incident of maintenance which may result in loss of production. There are eight pillars of TPM which helps in ushering of TPM culture within the organization.

Agile management is buzzword today as customer wants to have a product customized as per their requirement. While on one side it is contrary to the belief of lean manufacturing wherein to be agile an organization must have all support systems at its disposal for quickly adapting to the requirement of the customer. It has resulted in another development of a leagile system, wherein an organization tries to be agile while maintaining a lean approach.

4. Conclusion

World Class Manufacturing models have evolved from quality control concept to agile manufacturing. As the manufacturing technologies advances, newer models will keep on creeping for betterment. Yet, the models are more of an academician interest, wherein an organization develops its own WCM model based on the market demand of products and global competitiveness.

References

Dudek, M. Generation of the world class manufacturing systems, CLC'2016: Carpathian Logistics Congress, Zakopane, Poland, 2016. e-ISBN: 978-80-87294-70-3.

Gunn, T.G., 1987. Manufacturing for Competitive Advantage: Becoming a World Class Manufacturer, Ballinger Publishing Co., Cambridge, MA.

Hall R.W., 1983. Zero Inventories, Dow Jones-Irwin: Homewood, IL.

Hayes, R.H., Wheelwright, S.C., 1984. Restoring Our Competitive Edge: Competing Through Manufacturing.Wiley, New York.

Maskell, Brian H., 1991. Performance measurement for world class manufacturing: A model for American companies, Cambridge, MA: Productivity Press.

Nachiappan R.M., Anatharaman N., Muthukumar N., 2009. Integrated Approach to Total Productive Lean Six Sigma (TPLSS). Journal of Operations Management, Vol. 8, No. 2, pp. 14-35.

Schonberger, R.J., 1986. World Class Manufacturing: The Lessons of Simplicity Applied. Free Press, New York.

Okhovat M.A., Ariffin M.K., Nehzati T., Hosseini S.A., 2012.Development of World Class Manufacturing Framework by Using Six-Sigma, Total Productive Maintenance and Lean. Scientific Research and Essays, Vol. 50, No. 50, pp. 4230-4241.

Sharma M., KodaliR., 2008.Development of a Framework for Manufacturing Excellence.Measuring Business Excellence, Vol. 12, Issue 4, pp. 50-66.