
World Class Manufacturing: A Review

Ekta (PG student)

YMCA University of Science & Technology, Faridabad, Haryana

Rajeev Saha

Asst. Prof. (ME), YMCA University of Science & Technology, Faridabad, Haryana

ABSTRACT

The usage of world class manufacturing (WCM) techniques have developed as a compelling tool for the manufacturing firms with a specific end goal to make themselves a brand in competitive environment. Utilization of these practices have brought the procedure improvement, productivity improvement, quality improvement and cost diminishment for the firms. This paper gives a blend of WCM techniques by identification of enablers of world class status in a manufacturing domain. These enablers can be implemented independently or on the whole for taking a manufacturing firm a step closer to the world class status.

Keywords

WCM, manufacturing firm, enablers, competitive environment

INTRODUCTION

The brisk changes in the business condition because of its one of exceptional qualities, the development of worldwide rivalry among the manufacturing firms, tightening of business segments and spread of the IT through firms have put weight on business to persistently audit and embrace their customary manufacturing system. Each one of the manufacturing firm is looking always better approaches to accomplish the advantages through new manufacturing strategies. Firms must create vital goals which, upon achievement, result in an upper hand in the commercial market. Mostly, for all manufacturing firms, an expanded profitability and better general productivity of the production line are the most critical objectives. Most firms might want to discover the equation for a definitive profitability change technique. Firms regularly experience the ill effects of the absence of a precise and steady strategy. Innovation is an essential procedure for the constant changes keeping in mind the end goal to add to the monetary development in the manufacturing business, particularly to contend in the worldwide market [9],[29]. In addition to innovation as a mode for development and change, there are numerous different methods for development in the manufacturing business[30].In today's competitive world every manufacturing firm want to compete at global level and attain world class manufacturer status. WCM figures out which set of exercises should be attempted by recognizing what is required by the organizations to contend at word class level. Also, WCM itself includes many factors efficiently identified with advancement, for instance, raw materials, vitality, hardware, work, and administration. This world class manufacturer status cannot be achieved by conventional manufacturing techniques and performance measurement systems. WCM concept has been adopted by firms to compete at global level, hence increasing the profits of the firm and image of the firm at global level. This paper reviews the concept of WCM and identification of the enablers for identification of WCM.

WORLD CLASS MANUFACTURING

The word WCM is given by Hayes and Wheelwright [25].The term WCM is utilized in light of the fact that it is a gathering of systems which causes the manufacturing firms to contend at worldwide level. WCM is one of the theories concentrating predominantly on production .Utilization of these methods should empower the rest of manufacturing firms to repeat the achievement of the firms that have attained WCM status. The objective

of WCM is 'consistent and rapid change'[26]. WCM is a set of ideas, methods and theories, which set benchmarks for creation and production for another firms to look after [14]. The persistent change in quality, cost, lead time, client administration and adaptability will prompt 'World-Class' status [26]. WCM refers to numerous systems and innovations intended to empower an organization to coordinate its best rivals [18]. The expression "WCM" is name given to a novel advancement that is occurring in most aggressive manufacturing operations over the globe by utilizing different tools and strategies for improved quality and service changes [1]. World Class Manufacturers are those who at first develop world class maintenance system by integration of total productive maintenance, six-sigma and lean tools and techniques [27]. The point of world class manufacturing is to accomplish worldwide intensity by embracing the different standards, for example, "no waste", "no stock", "no disappointment", "no imperfection"[24].WCM depends on three pillars: Computer integrated manufacturing (CIM), total quality control (TQC) and just-in-time (JIT) production are the three central methodologies in modern fabricating which may empower a maker to increase upper hand for achieving World-Class status [28]. WCM is made out of six measurements: workforce abilities and capacities, technical management skills, contending through quality, workforce support, revamping fabricating building, and incremental change approaches [25].

IDENTIFICATION OF ENABLERS

Through extensive literature review different enablers for the implementation of WCM are identified and then are divided into groups. Implementation of these enablers in any manufacturing firm will help firm to become competitive in the world market and will also help to improve the manufacturing system of the firm and work culture in the firm. 62 enablers have been identified through the literature review and then divided into following eight groups:-

1. FOCUS ON COMPETITIVE QUALITY

In the modern competitive manufacturing environment, rapidly changing business strategies and with the introduction of the new products in the market, it is very difficult for a firm to survive. So, companies should not only focus on quality rather should focus on competitive quality to face the competition. Following enablers will help a firm to attain this and make name in the world of manufacturing excellence:-

- Top management commitment [8], [10-12], [14]
- Six Sigma [6], [10], [13]
- Total quality management (TQM) [1], [6], [10], [13], [18], [20]
- Improvement culture [8], [23]
- Focused improvement [3], [8-9], [21]
- Intelligent manufacturing [1], [18]
- Kaizen [2], [7-10], [19]
- Kaizen blitz [2], [8]
- Process quality management [11]
- Strategic flexibility [5]
- Total quality control (TQC) [1], [12], [14-15], [18], [23]
- Kaikeku [2], [8]

2. IMPLEMENTATION OF LEAN MANUFACTURING SYSTEMS

Lean manufacturing system helps to reduce the wastes associated with the techniques, processes, human resources and help the firm to work in a better way for achieving world class status. Following enablers are required for the implementation of WCM:-

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- Just in time (JIT) production [1], [14], [16], [18], [20]
 - Muda [7]
 - JIT purchasing [1], [14], [18]
 - Kanban [1], [9], [18]
 - Lean six sigma [4]
 - Lean manufacturing [1], [6], [10], [13], [16-17]
 - Quick changeover/Single Minute Exchange of Dies (SMED) [9], [14]
 - 5S [9], [13-14]
 - Muri analysis [9]
 - Optimized production technology [1]
 - Mura analysis [9]
 - Logistic management [1]

3. TOTAL PRODUCTIVE MAINTENANCE (TPM)

Total Productive Maintenance (TPM) came into existence during the quality revolution [31]. TPM is viewed as a valuable tool for improving the manufacturing efficiency by amplifying the effectiveness of production facilities [32], [33]. Following is the enablers for the TPM implementation:-

- Maintenance cycles [9]
- WO tag [9]
- AM Tag [9]
- PM tag [9]
- Early equipment maintenance [9], [21]
- Early product management [9]
- Inspection cycles [9]
- Poke yoke [9], [10], [14]
- Autonomous and professional maintenance [3], [9], [21]
- Control cycles [9]

4. COST EFFICIENCY

Every firm wants a cost efficient system so that high profits can be achieved. For Achieving more profits it is essential that the means for the increasing the cost efficiency should be followed by the manufacturing firm. Through this the waste money will be minimized and firm will move one step closer to attain the word class status. Following are the enablers for achieving this:-

- Reduced operating costs (marketing and production) [1]
- Business process re-engineering (BPR) [1], [8], [18]
- Economical Justification [1]
- Cost deployment [3], [9], [21]
- Simultaneous engineering [1], [18]

5. CUSTOMERS FOCUS

Main aim of any firm is to satisfy the customers. A company will have a good status in the global market if and only if the customer's needs are being recognized and fulfilled. For this following enablers have been identified from the literature review:-

- Logistics and customer services [3], [9], [13], [23]
- Focused improvement [3], [8-9], [21]

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- Need of customers [1], [11-12], [21], [23]
 - Response of customers [1]
 - Customer management [8], [10], [16]

6. COMPANY POLICIES

A company's policies should be designed in such a way to keep the company ahead of the other manufacturing firms in the global market. Following enablers have been identified:-

- Global issues (environment-market) [1], [9-10], [21]
- Local competitiveness [1]
- Government pressures [1]
- Improving the range and quality of services [1]
- Avoiding losing market share to competitors who are already implementing [1]
- Time to market [1], [12]
- New opportunities [1]

7. HUMAN RESOURCES

Human resources of a firm play the most important role in the success of the firm. If the human resources of the company have not right attitude towards the firm and the proper training is not provided to them the success of a company is very difficult to be achieved. Following are the enablers:-

- Employee involvement [8], [11]
- Learning and training [8], [23]
- Quality culture [8], [12]
- Quality circles (QC) [1], [18]
- People development [3], [8-9], [21], [23]
- Team work [8], [11]

8. MANUFACTURING PRACTICES

As the word class status cannot be achieved by the traditional methods of the manufacturing. New manufacturing practices must be adopted by the firms to save the time, improve quality and reduce cost of a product. Following manufacturing practices are being followed by the manufacturing firms to compete with the other firms:-

- Computer aided manufacturing (CAM) [1], [16], [18]
- Computer integrated manufacturing (CIM) [1], [16], [18]
- Flexible manufacturing system (FMS) [1], [10], [16], [18]
- Agile manufacturing [13], [16], [22]
- Group technology/cellular manufacturing [1]

CONCLUSION

The implementation of WCM tools and techniques in a firm leads to the better competitive advantage over the other firms. It comprises of the different tools, techniques, policies and methodologies which takes the firm closer to the word class status. The implementation of these WCM practices is difficult task due to blend of various tools, techniques used within manufacturing firm's policies. So, all these enablers need to be handled carefully so that the firm can attain the excellence in manufacturing and survive in the competitive

environment.

REFERENCES

- [1] Ismail Salaheldin, S. and Eid, R. 2007. The implementation of world class manufacturing techniques in Egyptian manufacturing firms: An empirical study. *Industrial Management & Data Systems*, 107(4), pp.551-566.
- [2] Sukarma, L., Azmi, H. and Abdullah, N.L. 2014. The Impact of World Class Manufacturing Practices on Company Performance: A Critical Review. *Applied Mechanics & Materials*, (564).
- [3] Murino, T., Naviglio, G., Romano, E., Guerra, L., Revetria, R., Mosca, R. and Cassettari, L.C.A. 2012. A world class manufacturing implementation model. *Applied mathematics in electrical and computer engineering*, pp.978-1.
- [4] Albliwi, S.A., Antony, J. and Lim, S.A.H. 2015. A systematic review of Lean Six Sigma for the manufacturing industry. *Business Process Management Journal*, 21(3), pp.665-691.
- [5] Lau, R.S. 1996. Strategic flexibility: a new reality for world-class manufacturing. *SAM Advanced Management Journal*, 61(2), p.11.
- [6] Snyder, K., Snyder, K., Ingelsson, P., Ingelsson, P., Bäckström, I. and Bäckström, I. 2016. Enhancing the study of Lean transformation through organizational culture analysis. *International Journal of Quality and Service Sciences*, 8(3), pp.395-411.
- [7] Suárez-Barraza, M.F., Suárez-Barraza, M.F., Dahlgaard-Park, S.M., Dahlgaard-Park, S.M., Rodríguez-González, F.G., Rodríguez-González, F.G., Durán-Arechiga, C. and Durán-Arechiga, C. 2016. In search of “Muda” through the TKJ diagram. *International Journal of Quality and Service Sciences*, 8(3), pp.377-394.
- [8] Ma, J., Ma, J., Lin, Z., Lin, Z., Lau, C.K. and Lau, C.K. 2017. Prioritising the enablers for the successful implementation of Kaizen in China: a Fuzzy AHP study. *International Journal of Quality & Reliability Management*, 34(4), pp.549-568.
- [9] De Felice, F., Petrillo, A. and Monfreda, S. 2013. Improving operations performance with world class manufacturing technique: a case in automotive industry. In *Operations Management. InTech*.
- [10] Haleem, A., Sushil, Qadri, M.A. and Kumar, S. 2012. Analysis of critical success factors of world-class manufacturing practices: an application of interpretative structural modelling and interpretative ranking process. *Production Planning & Control*, 23(10-11), pp.722-734.
- [11] Aquilani, B., Aquilani, B., Silvestri, C., Silvestri, C., Ruggieri, A., Ruggieri, A., Gatti, C. and Gatti, C. 2017. A systematic literature review on total quality management critical success factors and the identification of new avenues of research. *The TQM Journal*, 29(1), pp.184-213.
- [12] Kasul, R.A. and Motwani, J.G. 1994. Identification of world class manufacturing factors: a synthesis of literature. *International Journal of Commerce and Management*, 4(1/2), pp.50-68.
- [13] De Felice, F. and Petrillo, A. 2015. Optimization of Manufacturing System through World Class Manufacturing. *IFAC-PapersOnLine*, 48(3), pp.741-746.
- [14] Nazir, S.M. 2012. World-Class Manufacturing Practices-The Best Strategy for Indian Manufacturing Organization to Endure in New Millennium. *Abhinav National Monthly Refereed Journal of Research in Commerce & Management*, 1(6), pp.144-160.
- [15] Singh, K. and Ahuja, I.P.S. 2012. Transfusion of total quality management and total productive maintenance: a literature review. *International Journal of Technology, Policy and Management*, 12(4), pp.275-311
- [16] Gorane, S.J. and Kant, R. 2016. Supply chain practices: An implementation status in Indian manufacturing organisations. *Benchmarking: An International Journal*, 23(5), pp.1076-1110.
- [17] Bhamu, J. and Singh Sangwan, K. 2014. Lean manufacturing: literature review and research issues. *International Journal of Operations & Production Management*, 34(7), pp.876-940.
- [18] Schonberger, R. 1987. *Instructors Manual to Accompany World Class Manufacturing Casebook: Implementing JIT and TQC*. Free Press.
- [19] Anh, P.C., Yen, T.T.H. and Matsui, Y. 2014. Empirical study on transferability of kaizen practices in Vietnamese manufacturing companies.
- [20] Furlan, A., Vinelli, A. and Dal Pont, G. 2011. Complementarity and lean manufacturing bundles: an empirical analysis. *International Journal of Operations & Production Management*, 31(8), pp.835-850.
- [21] Gajdzik, B. 2013. World class manufacturing in metallurgical enterprise. *Metalurgija*, 52(1), pp.131-134.
- [22] Goriwondo, W.M., Mhlanga, S. and Mutsambwa, T. 2013. Agility for sustainability in Zimbabwe: A case study for manufacturing companies in Bulawayo. *China-USA Business Review*, 12(1).
- [23] Digalwar, A.K. and Sangwan, K.S. 2007. Development and validation of performance measures for world class manufacturing practices in India. *Journal of Advanced Manufacturing Systems*, 6(01), pp.21-38.

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- [24] Palucha, K. 2012. World Class Manufacturing model in production management. Archives of Materials Science and Engineering, 58(2), pp.227-234.
- [25] Hayes, R.H. and Wheelwright, S.C. 1984. Restoring our competitive edge: competing through manufacturing.
- [26] Schonberger, R.J. 1986. The vital elements of world-class manufacturing. International Management, 41(5), pp.76-78.
- [27] Okhovat, M.A., Ariffin, M.K.A.M., Nehzati, T. and Hosseini, S.A. 2012. Development of world class manufacturing framework by using six-sigma, total productive maintenance and lean. Scientific Research and Essays, 7(50), pp.4230-4241.
- [28] Gunn, T.G. 1987. Manufacturing for Competitive Advantage Ballinger. Cambridge, MA.
- [29] Longo, F. 2011. Operational Strategies and Internal Logistic Costs Analysis in a Real Warehouse Based on Modeling & Simulation. IJCSI International Journal of Computer Science Issues, 8(4), pp.39-47.
- [30] Mosey, S. 2005. Understanding new-to-market product development in SMEs. International Journal of Operations & Production Management, 25(2), pp.114-130.
- [31] Ahuja, I.P.S. and Khamba, J.S. 2008. Total productive maintenance implementation in a manufacturing organisation. International Journal of Productivity and Quality Management, 3(3), pp.360-381.
- [32] Dwyer, J. 1999. More than a maintenance technique. Works Management, 52(9), pp.15-16.
- [33] Dossenbach, T. 2006. Implementing total productive maintenance: a successful TPM program will help you eliminate defects, machine breakdowns and accidents. Wood and Wood Products, 111(2), pp.29-32.