



INTERNATIONAL JOURNAL OF PURE AND APPLIED RESEARCH IN ENGINEERING AND TECHNOLOGY

A PATH FOR HORIZING YOUR INNOVATIVE WORK

STUDY THE JOINT IMPLEMENTATION OF JIT, TQM, TPM, SCM AND ERP PARADIGMS FOR ENHANCING MANUFACTURING SYSTEMS PERFORMANCE

G. E. CHAUDHARI¹, DR. S. G. PATIL²

1. Associate Professor, J. T. Mahajan College of Engineering, Faizpur(M.S.),India
2. Principal, IBSS College of Engineering, Amravati

Accepted Date: 05/03/2015; Published Date: 01/05/2015

Abstract: Past research on Just-in-Time (JIT), Total Quality Management (TQM), Total Productive Maintenance (TPM), Supply Chain Management (SCM), and Enterprise Resource Planning (ERP) generally investigate the implementation and impact of these programs in isolation. They are not mutually exclusive and inconsistent. They complement each other by reinforcing mutually, inducing side-effects in favor of other paradigm's, mutual stimulation and exploitation of shared values. The recent literature reports the discussion on joint implementation of JIT and TQM; TPM and TQM; SCM and ERP; JIT, SCM and TQM; JIT, TQM and TPM; JIT and SCM; TQM and ERP. The apparent linkages between JIT, TQM, TPM, SCM and ERP strategies and practices raise two questions that remain yet to be addressed, namely which specific elements of these strategies are consistent with each other, and how do they complement each other to improve firm's performance.

Keywords: JIT, TQM, TPM, SCM, ERP, Integrated Manufacturing Program.

Corresponding Author: MR. G. E. CHAUDHARI



PAPER-QR CODE

Access Online On:

www.ijpret.com

How to Cite This Article:

G. E. Chaudhari, IJPRET, 2015; Volume 3 (9): 147-154

INTRODUCTION

Improving manufacturing performance for sustainable competitive advantage has been and continues to be an ongoing concern for modern manufacturing. Numerous operations paradigms, initiatives, and practices have emerged in recent years in response to this competitive pressures calling for improved product quality, increased responsiveness, and shorter lead times, but at lower cost. Just-in-Time (JIT), Total Quality Management (TQM), Total Productive Maintenance (TPM), Supply Chain Management (SCM), and Enterprise Resource Planning (ERP) are few among them which received particular attention in both academic and practitioner community. Each paradigm copes with the issue of improving the overall performance, based on a particular viewpoint and logic, which originated a rich set of practices and tools. Just-in-time (JIT) is a philosophy aimed at to produce and deliver finished goods just in time to be sold, subassemblies just in time to be assembled in to finished goods, fabricated parts just in time to go into assemblies, and purchased materials just in time to be transformed in to fabricated parts [1]. The TQM philosophy has a broader focus on improving the overall effectiveness of a company through a focus on continuously improving and sustaining quality products and processes by capitalizing on the involvement of management, workforce, suppliers, and customers, in order to meet or exceed customer expectations [3,4]. Total Productive Maintenance (TPM), which is built on the preventive maintenance concept, is a manufacturing program designed primarily to maximize equipment effectiveness throughout its entire life, which involves its entire human resources. When implemented fully, TPM dramatically improves productivity and quality, and reduces costs [2,6]. Supply Chain Management (SCM) is a process oriented, integrated approach to procuring, producing, and delivering products and services to customers, covering the management of material, information and financial flows [5]. Effective management of the supply chain is viewed as the driver of reductions in lead times and material costs, and improvements in product quality and responsiveness [5]. Enterprise Resource Planning (ERP) systems have emerged as the core of successful information management and the enterprise backbone of organizations. It is a software system that aims to provide an integrated application environment with a fast and seamless access to single uniformed information throughout the entire organization. Among the most important attributes of ERP are its abilities to automate and integrate an organization's business process; share common data and practices across the enterprise; and produce and access information on a real-time environment.

2. RELATIOSHIP AMONG THE PARADIGMS

2.1 Relationship between JIT and TQM

Although JIT and TQM function effectively in isolation, their combination yields synergies for further performance improvements. The overlapping practices of JIT and TQM are more than coincidental and they are mutually supportive. The unique JIT and TQM practices add predictive power to the JIT and TQM related performance. TQM practices support JIT to minimize variation by handling the causes of inconsistent quality leading to lessen its effect on work flow, production planning, and the plant capacity. TQM practices like product simplification using design for manufacturability helps in reducing the set-up time, allowing the use of smaller lots which reduces work-in-progress. As TQM helps in reducing number of reworks and decreases the cycle time, the deviation in the schedule is minimized so as to respond market demand quickly. Thus TQM practices helps to improve the performance of JIT system [1,2,3]. JIT facilitates the detection of the causes of quality problems by providing access to recent traces, exposes shortcomings in quality assurance, minimizes the production of non-quality items, clarifies the 'client supplier' relationships, minimizes damages, deterioration and losses of materials and products, provides the operators

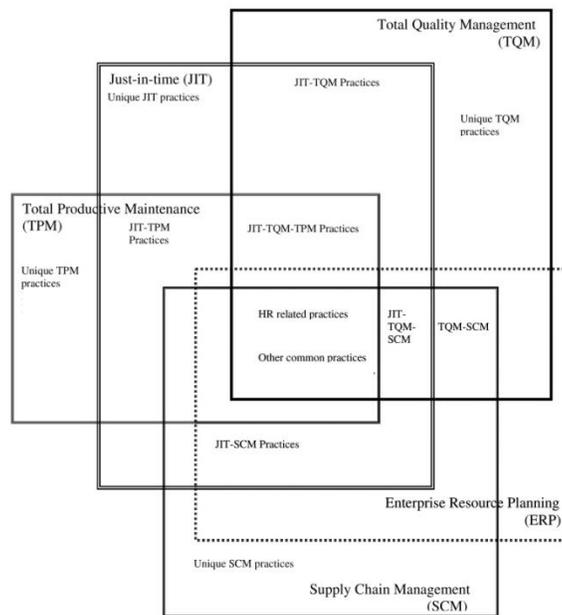


Fig.1 Relationship of the practices on overlap of paradigms

With a broader understanding of the importance of the quality of conformance, exposes quality problems and creates a sense of urgency to remove respective causes [2]. JIT's focus on lot size reduction improves process feedback and avoids the process to slip out of control. As JIT emphasize the reduction of the waste and inventory, it improves the quality performance by way of avoiding the possible damage in storage and handling. Thus JIT helps in keeping TQM on

toes and improves its performance. Firms that have implemented both JIT and TQM have achieved better performance than the firms which have implemented either JIT or TQM alone [4,6].

2.2 Relationship between TQM and TPM

A good brain and strong muscles are required to build strong enough manufacturing capability. TPM and TQM have a common and continuous goal of waste reduction. Some of the common themes of the two value systems include continuous improvement, employee empowerment, process focus, information gathering and analysis, and top management commitment. TQM facilitates the perception that problems found in a stage along equipment life cycle can be avoided by more proactive attitude in previous stages. It provides the means that can be applied for solving problems like equipment malfunction, breakdown maintenance and correction of design weaknesses. TQM makes to pay greater attention to the influence of equipment condition on the quality of conformance and relieves the need for extra production capacity. TPM contributes to ensure quality of conformance and helps to keep processes in controlled state. It reduces nonconforming items owing to improper set-up execution and human errors. TPM contributes in controlling the machine variation [2]. Total quality maintenance (TQMmain) is a strategy which enables the user to maintain and improve continuously the technical and economic effectiveness of process elements. This approach has resulted in increase in employee involvement in decision making, team work, improved skills and training. The combination of both the approaches works as a contrivance to exploit their complementarities and thus attain enhanced overall performance. As many companies across the globe are striving to achieve the synergy of TQM and TPM [3].

2.3 Relationship between JIT and TPM

TPM is often considered as an integral part of any JIT manufacturing system and essentially JIT cannot be successful without the use of TPM. If TPM implementation is firmly on course, this can foster JIT implementation by raising confidence in equipment availability and functioning, and, inversely, if the gradual reduction of inventories according to JIT reveals further shortcomings in maintenance, this can emphasize the need to deepen TPM dissemination. JIT facilitates the communication between production and maintenance personnel and exposes shortcomings in ensuring proper equipment operating conditions and emphasizes the importance of equipment availability for production[2] . On the contrary, TPM contributes to reduce the waste of materials and space, improves equipment reliability (sense of safety for

adopting cellular manufacturing, production smoothing and synchronization) and thus helps in reduction of buffers and safety stock.

2.4 Relationship between TQM and SCM

The integration of quality goals with supply chain goals may lead to cumulative capabilities which better prepare the organization to face dynamic, global competition. TQM and SCM appear to be rooted in very similar management principles[5]. Supplier management issues, like information sharing, establishment of long-term and trusting relationships with suppliers, mutual dependence and commitment are also advocated by the TQM philosophy. Also, internal integration, a prerequisite for SCM implementation is a key point in the TQM philosophy. Therefore it seems logical that TQM implementation may relate to supplier management aspects

in the SCM context. The SCM focuses on integrating the different parties together in order to meet the needs of the customers.

2.5 Relationship between JIT and SCM

JIT and SCM represent alternate approaches to improving the effectiveness and efficiency of an organization's operations function. Both JIT and SCM seek improvements in quality, the former by way of improvements in production processes, the latter by integrating development and production processes throughout the supply chain. Successful JIT implementation depends on the coordination of production schedules with supplier deliveries, and on high levels of service from suppliers both in terms of product quality and delivery reliability.

2.6 Relationship among JIT, TQM, TPM and SCM

In Japan it is said that in order to be strong enough in manufacturing one has to have good brains which requires Total Quality Management (TQM), but one also needs to have strong muscles or, in other words, strong manufacturing capability which require Total Productive Maintenance (TPM). Moreover, one has to have a good nervous system to connect brain with muscles, which means just-in-time production. So, in manufacturing, one needs to have TQM, JIT and TPM. But, the organization cannot work in isolation. It requires input in the form of quality material from various suppliers and is fulfilling the customer demand. SCM will help organization to interact with outside world along with manufacturing strategy. The relationship among JIT, TQM, TPM and SCM exist at a strategic level, and impacts business performance. The empirical surveys have also validated that if implemented complementarily (JIT TQM- TPM [2,3,6] and JIT-TQM-SCM [5]), will enhance performance of manufacturing system.

2.6 Relationship of ERP with JIT, TQM, TPM and SCM

An important characteristic of an ERP system is its ability to enhance communication among different business functions by creating a common, unique database that every subsystem can share. Marketing, production, and logistics information systems must be closely coupled in order to remain competitive. The JIT practices serve as the integrative mechanisms that also provide the foundation for improving information flows, and developing the employee involvement and commitment necessary to achieve a continuous improvement effort in the system. Well designed and successfully implemented ERP systems supply operational, tactical, and strategic information to all supply chain members. Therefore, integration of ERP and SCM in a JIT environment is a natural and necessary process. Technologically, ERP is said to be the backbone of SCM. With the correct ERP implementation at the beforehand, organizations can take advantage of e-SCM. ERP aims to improve internal efficiency by integrating different parts in the organization, while SCM focuses on external relationships with trading partners in the SC. ERP has had a positive impact on the ability of businesses to improve working capital, implement a total quality management (TQM) culture, lower inventory levels, optimize raw materials and sell and deliver products to the customers. The use of TQM principles augments ERP implementation. TQM necessitates organizational changes and seeks to improve all processes and every business activity. ERP is a process-based technology initiative. As such, implementing an ERP system requires changes in all processes. In this sense, TQM and ERP are complementary and share many common areas. TQM also precedes ERP implementation in establishing an organizational infrastructure for ERP initiatives [5]. In maintenance, there has been an increasing movement toward computerized maintenance management systems (CMMS). CMMS assists in managing a wide range of information on the maintenance workforce, spare-parts inventories, repair schedules and equipment histories. CMMS has been described as a tool for coordination and communication with production. While the capabilities offered by CMMS do not in any way reduce the amount of information to be processed by the maintenance organization, they do assist the maintenance function in managing the ever increasing complexity brought about by more complex and varied technologies and a workforce with highly specialized skills. A company might also consider using an ERP system for maintenance management, especially if its overall IT strategy is to use integrated IT solutions. Many large ERP software solution providers and several specialized software houses with more specialized solutions offered a variety of maintenance software programs to assist management.

3. MANAGERIAL CONCERNS

Manufacturing managers are being hit from all sides with the latest fads. Managers should analyze carefully their unique environment and based on this analysis they should adopt the latest management practices. Best practices must be selected and adopted relative to the situation the company faces. Rejecting new approaches out of hand is a risky business, just as is adopting every new approach that comes along. The main problem the managers are facing is how the new program should be implemented to link into the practices that already exist. Establishing and maintaining linkages across all of their new and old initiatives is one of the most challenging problems. They requires a clear understanding of how the practices provides the basis for tying new initiatives into what the plant is already doing. The understanding of the linkages and tracks of integration and which are the

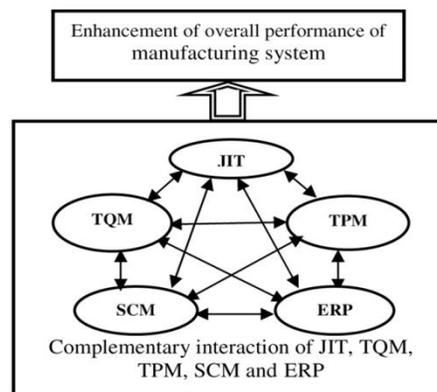


Fig. 2 Integrated Manufacturing Program

Shared practices and how the practices of one paradigm complement the other will surely help the managers in adopting new paradigm for enhancing manufacturing performance.

4. CONCLUSION

Each management paradigm has evolved with certain logic, view point and have provided certain managerial and operational practices and tools. The empirical studies on JIT, TQM, TPM, SCM and ERP have demonstrated that their implementation leads to improvement in performance. Nevertheless, the adoption of concepts and techniques derived from single paradigm may not be powerful enough to deliver the improvements and innovations that are required nowadays to insure the survival and growth of a firm. This study reveals the basis for complementary application of JIT, TQM, TPM, SCM and ERP. The linkages among these paradigms exist at strategic as well as operational level. When implemented synergistically, it

should be able to deliver the performance in terms of improved productivity, quality and delivery required in this irrepressible borderless competition.

REFERENCES

1. K. Vuppalapati, S. L. Ahire, and T. Gupta, "JIT and TQM: a case for joint implementation," *International Journal of Operations and Production Management*, Vol.15, No. 5, pp. 84-94.
2. D. I. Miyake, T. Enkawa, and A. C. C. Fleury, "Improving manufacturing systems performance by complementary application of just-in-time, total quality control and total productive maintenance paradigms", *Total Quality Management*, Vol. 6, No. 4, pp. 345-363.
3. K.O. Cua, K.E. McKone, and R. G. Schroeder, "Relationship between implementation of TQM, JIT, and TPM and manufacturing performance," *Journal of Operations Management*, No.19, 2001, pp. 675-694.
4. D. Seth and D. Tripathi, "Relationship between TQM and TPM implementation factors and business performance of manufacturing industry in Indian context," *International Journal of Quality and Reliability Management*, Vol.22, No.3, 2005, pp. 256-277.
5. Michael J. Tarn, D. C. Yen, and M. Beaumont, "Exploring the rationales for ERP and SCM integration", *Industrial Management and Data systems*, 102/1, 2002, pp. 26-34.
6. B.B. Flynn, S. Sakakibara, and R.G. Schroeder, "Relationship between JIT and TQM: practices and performance", *Academy of Management Journal*, 48, 1995, pp. 1325-1360.