International Journal of Modern Engineering Research (IJMER)
www.ijmer.com Vol. 3, Issue. 3, May - June 2013 pp-1582-1586 ISSN: 2249-6645

Jit: Various Aspects of Its Implementation

D. K. Singh[1], Dr. Satyendra Singh[2]
[1]*Division of MPA Engineering, Netaji Subhas Institute of Technology, New Delhi – 110078*
[2]*Deptt. of Mechanical Engineering, B. T. Kumaon Institute of Technology, Dwarahat-263653 (Almora) Uttarakhand*

Abstract: *Many factors affect JIT implementation directly or indirectly. Factors such as product quality and lead time directly affect the implementation of JIT. On the other hand, factors such as work environment, working conditions, motivation, flexibility whether manufacturing or organizational affect JIT implementation indirectly, although their impact is no less important than those affecting directly. The present paper thoroughly explores these factors and discusses the extent to which they affect JIT and its implementation.*

Keywords*: JIT, Kaizen, TQM, Quality Circle, Lead Time, FMS, Information Technology, Supply chain, SCM.*

I. Quality Management Approach and JIT

Quality is a powerful tool for productivity improvement. It can be measured using many parameters. It should comply design specifications, which is measured in terms of percentage of defects, incidence of reworking times and frequency of replacement. Quality ensures reliability and maintainability of product, defined as the ability of the product to perform its intended functions without failure over time, and in case of failure, the facility to restore it. Quality has a key role in inventory management. It ensures defect-free products and reduces work-in-process (WIP) inventory drastically. It reduces inspection costs, which has a direct impact on production cost. It reduces lead time and ensures speedy delivery of products to a customer. A customer is more easily attracted towards quality products because of their ability to satisfy him to the maximum level [1]. Customer satisfaction through quality has become the necessity for a company to survive in the market. Quality is being used as a competitive weapon to excel. At the same time, the company registers increase in sales and profits due to increased level of quality driven customer satisfaction. Quality products have short stay and waiting time before being sold in the market and offer increased rate of consumption and hence increased circulation of material flow, which in turn, reduces the level of in-process inventory. On the other hand, poor quality products are more likely to be rejected and may affect the brandability of a company and thus loosing the customer's goodwill. Also, poor quality products render the production system less productive as they increase machine down time and involve longer processing time.

JIT particularly influences the quality dimension more directly connected to a production system. The principle of quality at source should be used where errors or defects in a product or service is detected and rectified at the source and not passed on to the customer. Quality at source starts with the quality of raw material. It will result in saving in inspection cost and the cost associated with replacing the defective items. Issues considered vital today may not be relevant tomorrow. So adapting to the change becomes more relevant at a particular point of time. Predicting the impending changes, keeping in mind customer's requirements, and proacting accordingly can produce miraculous results for the organization. This requires dynamics from within and quickness to respond. It applies to quality also. Attaining one time improvement in quality is not enough. Quality needs to be continuously improved upon to make it always relevant and in demand [2]. And doing so will make the task of JIT implementation always easier. Kaizen is useful in improving the existing features or adding features in the product. Improved quality has many positive implications for a company wishing to stay longer in the market. Kaizen encompasses incremental improvement everywhere. Total quality management (TQM) is an integrated management concept directed at continuous improvement of product or service quality [3, 4]. It immensely helps in improving manufacturing environment. JIT and TQM have played key role in improving organizational effectiveness in today's competitive and ever-changing world market. While JIT philosophy concentrates more on improving manufacturing efficiency by eliminating non-value added activities and minimizing inventory, TQM, on the other hand, thrusts upon improving the overall effectiveness of a company through a focus on quality improvement [5]. JIT eliminates waste through simplification of manufacturing processes [6, 7], eliminates excess inventory in order to reduce related production cost and emphasizes on the use of small lot size so as to meet quick customer requirements.

II. Geographical Considerations And JIT

Proximity of suppliers to their manufacturers has immense impact on JIT implementation. If suppliers are near to the site of manufacturing, uncertainty relating to transportation of materials can be managed without much problem, hence continuity in the production system can be ensured as usual. At the same time, transportation costs are drastically cut short. It leads to reduction in overall costs of production, and timely delivery of goods to customers with highest level of customer satisfaction. That is, it accelerates JIT implementation. In case, when suppliers are scattered apart, the coordination activities of supply chain network are relatively complex, raising uncertainty in timely supply of raw materials. This condition forces the unit to keep surplus stock to meet the fluctuating demand level. It may increase inventory holding cost. Japan is the most suitable example for JIT implementation. Because of Japan's geography and the long-term relationships between suppliers and manufacturers, Japanese suppliers tended to be located much closer physically to their customers, making daily delivery possible. As a result, the costs of transportation and storage got reduced significantly; and secondly it also reduced the manufacturing lead times. Wilson [8] has pointed out that one of the principal reasons why Toyota became successful in implementing JIT lies in the fact that its suppliers were located in the same area as the company itself existed. He further

states that, in the United States components often have to be shipped through hundreds of miles of distance and may be getting delayed by adverse weather conditions, particularly in winter. O'Neal [9], while addressing geographical considerations between manufacturers and suppliers has found that geographical dispersal impedes JIT implementation.

III. Organizational Components: Structure, Culture And Openness And JIT

Organizational structure is the formal system of task and authority relationships that control how people coordinate their actions and use resources to achieve organizational goal [10, 11]. For any organization, an appropriate structure is one that facilitates effective responses to problems of coordination and motivation. Choosing the right number of managers and hierarchical levels is important, as it affects decision making, which influences organizational effectiveness. The choice affects communication and motivation. Having too many hierarchical levels may hinder communication. As the chain of command lengthens, communication between managers at the top and bottom of the hierarchy takes longer. Decision making slows, and the slowdown hurts the performance of organizations that need to respond quickly to customer's needs or the actions of competitors. Also, as the number of levels in the hierarchy increases, the authority and responsibly of managers decrease and this affects the motivation in the organization. Motivation provides conducive atmosphere for JIT implementation. In fact, it accelerates JIT implementation. In order to implement fast decision, number of levels should be carefully decided and to be kept at minimum. Quality circle, an important component of JIT, is the best example of limited number of persons acting in a group and delivering best for the organization. JIT requires fast decision making so as to accelerate the processes.

Organizational culture is the shared values, principles, traditions and ways of doing things that influence the way organizational members interact with each other and with suppliers, customers and other people outside the organization. In most organizations, these important shared values and practices have evolved over time and determine, in large degree, what employees perceive about their organizational experiences and how they behave in the organization [12,13,14]. The important role of human resource management practices in JIT implementation has been stressed upon by many researchers [15, 16]. For successful implementation of either JIT or TQM, a change in corporate culture or a conducive organizational climate has been regarded as one of the major common infrastructural supports [17, 18, 19, and 20]. Organizational climate represents the enduring characteristics of a company that is reflected in the attitudes employees show towards the policies, practices and conditions in the work environment. Many researchers have emphasized on the critical role of Japanese culture in the successful implementation of JIT [21, 22, and 23]. Japanese culture inspires and encourages the individual to achieve a goal which is within reach, but requires a great deal of discipline and development of a higher level of commitment to achieve. Japanese workers are totally committed to their work and the company. They are loyal, co-operative, and flexible and willing to work long hours when needed. Workers are offered life-time employment, decisions are taken collectively involving people from top to bottom, and the management keeps a paternalistic approach towards workers and has respect for their workers. This kind of relationship between workers and managers help to build a platform of trust and belief, where one can rely upon another, and may contribute in a supportive way. As workers develop a better sense of ownership of the process, they tend to suggest more for improvement. Employee motivation and cooperation are critical in JIT implementation. Koufteros [24] has found that employee involvement is an essential element for pull production system, which is a major characteristics of a JIT system. Toyota did not stop working on JIT after originating it and continue to improve its implementation. Some of the US companies have adopted the Japanese culture approach to implement JIT and have reported success [25, 26]. More and more companies are changing their work atmosphere and getting inspired by the Japanese culture.

Management systems and processes are gradually becoming more participative in nature. The reliance of JIT on a participative management style implies a higher level of employee involvement and empowerment than would have been seen in traditional organization [5]. Flexibility in management is the essential element for survival amidst the turbulence of the changing environment especially, in the global changing international trade scenario and competitiveness in the world market. More transparency and a greater sense of participative decision making at different levels of management are vital. JIT works most effectively in participative atmosphere, as it induces free flow of information among the participating members which is essential for fast and effective decision making. The free flow of information has led to the creation of a borderless world in a big way. The business is being globalized as a consequence of the creation of a borderless world. Japanese work atmosphere is very much participative in nature and so is the principal reason of success of JIT. Participative decision-making at different level of management is helpful in JIT implementation. Organization continues to grow, when it encourages participation and empowerment at every level. Increased participation and empowerment energize greater performance, produce better solutions to problems, and greatly enhance acceptance of decisions. It has been found that group dynamics work to overcome resistance to change, increase commitment to organization, reduce stress levels, and generally make people feel better about themselves and their worlds [27]. Higher level of participation results in increased motivation among the employees. If individuals within the organization see their ideas and efforts contributing to the performance of the business, they will be encouraged still further. On the other hand, if seemingly good ideas are constantly overlooked, this will lead to increased frustration. The Japanese management stresses upon the interaction between management and employee. William Ouchi [28] has focused on the characteristics of an organization. He listed the distinguishing features of Japanese organizations such as lifetime employment, collective decision making, collective responsibility and holistic concern for employees.

JIT is an innovative approach and it is people oriented. Rubenstein [29] has stated that innovation process is essentially a people process and that organizational structure, formal decision-making processes, delegation of authority and other formal aspects of a so called well-run company are not necessary conditions for successful technological innovation.

World class manufacturers put great stress on team work and people involvement at every stage of operation and activity.

An organization must aspire to move along a path from closed system to open system. While secrecy breeds gossip, mistrust, feelings of being alienated and devalued, organizational transparency ensures the trust and support of all concerned. In view of the complexity of tasks, managers are expected to be open to multiple routes of solving problems. Freedom at the workplace is the independence employees need in order to be motivated and perform to the best of their abilities. Freedom encompasses flexibility on the opportunity to voice their opinions freely and the freedom to exercise their creativity to achieve organizational goals. When people have freedom at work, they ought to give their best. They become emotionally committed to the organization, as opposed to become merely rationally committed. Emotionally committed employees go the extra mile in any assignment, actively seek new challenges and remain engaged with the organization through good times and bad. Freedom at workplace makes employees feel empowered, with a strong sense of ownership and contribution, a freedom to make mistake and to have the power to innovate. It is therefore evident that a democratic organization is a 'progressive' organization and employees who are allowed to follow democracy in the truest sense are happy, engaged and most importantly, productive. Harber [30] has stressed on the need for open management and an ability to accept comments and criticisms from employees, as well as, a need to move away from adversarial roles to a sharing of information and goals for successful implementation of JIT. Decision made with an open mind without any presumptions or constraints eliminate many problems of the organization. Shingo [31], when discussing 'Toyota Production System', also balanced JIT techniques with equal emphasis on respect for humanity to generate sense of ownership and pride of work. One of the important factors which Monden [32] considered essential for effective implementation of JIT included respect for humanity that emphasizes employment involvement, cross training, job design, empowerment and communication.

IV. Manufacturing Environment and JIT

Productivity of a manufacturing unit is linked to the optimum utilization of its resources-materials, capital, energy, labour, equipment and technology. Manufacturing environment helps in achieving this goal by making the related process smoother and easier. Good manufacturing environment facilitates in the production of customized products offering many advantages including total customer satisfaction. Manufacturing environment plays a very important role in the successful implementation of JIT. It offers right kind of production atmosphere needed to produce right product at right time and in right quantity. As a result, wastes are eliminated and production cost is optimized. JIT aims rationalization of the production system, which can be achieved through elimination of waste, reduction in defects, increase in machine's utility, improvement in manpower efficiency and reduction in other non-productive works. Hence, it is one of the effective means to control inventory flow, prevent its storage and manage it effectively. JIT is a technique in which stock held by the company is measured in terms of hours of production rather than in days or months [33, 34]. It eliminates waste through simplification of manufacturing processes [6, 7], eliminates excess inventory in order to reduce related production cost and emphasizes on the use of small lot size so as to meet quick customer requirements. Inventory managed on JIT basis removes many types of uncertainties in a production system. It ensures timely delivery of customized products to the customers and thus helping the organization in the long run to acquire its brand status. Manufacturing environments such as preventive maintenance and product flexibility help in reducing inventory. Preventive maintenance reduce the untimely breakdown or failure of machine or its components, which may cause frequent interruption in the operation of a production system, leading to inventory pile-up, which is against the spirit of JIT. Regular maintenance measures ensure continuity in operations, helping the organization running smoothly, without thinking about in-process inventory.

Flexibility in manufacturing system is an effective tool for surviving in the new manufacturing environment involving extreme uncertainties, keeping in mind the unpredictable behaviour of the customer and dynamic nature of market. The success of JIT implementation depends to a great extent on how the organization responds to make atmosphere conducive for innovative developments. The reduction of set up time is crucial for reaching high levels of product flexibility [35, 36]. Reduction in set up times allows increased frequency of set up as well as reducing internal lead times, thereby increasing capacity utilization. The shorter lead time enhances customer response. Also, due to shorter queues in different phases of the processes, results in reduced inventory level. The importance of innovation and organizational theory in implementing a radical innovation such as JIT was stressed by many [37, 38, and 39].

The recent trend toward JIT management system and the ever increasing pressure to reduce work-in-process (WIP) inventories while simultaneously increasing quality has forced companies to install highly integrated, computerized manufacturing system, such as flexible manufacturing system (FMS). A Cellular based flexible manufacturing system is an important tool to produce manufacturing flexibility. The multi cell FMS is suitable for produce to order environment, leading to increased flexibility in final products. Cellular manufacturing uses the principle of group technology (GT), where families of parts with similar manufacturing processes are grouped together, greatly helps in inventory management. It is an innovative approach to ensure variety in the production with additional benefits of reduced material handling, reduced work-in-process (WIP) inventory, reduced setup time and manufacturing lead time, and simplified planning, routing and scheduling activities [40]. Increased global competition, demand for an increased variety of products, reduced product life-cycles and time-to-market are forcing new strategy to adopt. The mass production is being replaced by mass customization of goods and services [41].

V. Shorter Lead Time And JIT

In a dynamic market, where everything is uncertain and unpredictable, it becomes vital for an organization to acquire the ability to fulfill customer's specific demands in very short time. For this to become reality, orders consisting of only a few

items are required to be transferred directly from vendors to shops and need to be supplied within short lead times. The shorter lead time enhances customer response. In a conventional manufacturing system, material handling equipments and setup have their own problems and require delicate handling. It takes some reasonable time to equipment or product changeover, which makes lead time longer. A flexible manufacturing system (FMS), on the other hand, eliminates or reduces majority of shortcomings of conventional system and thus has the ability to reduce the manufacturing lead time drastically. Reduced lead time can help fulfill customer's demand on time, and can produce goodwill for the company. In other words, it increases the life of the business, which has strategic importance.

VI. Supply Chain Management And JIT

The success of a company depends to a great extent on how well it manages its supply chain relationships. Inventory management is closely linked to supply chain management. A supply chain is defined as a network of facilities and distribution options between start and end points that include the functions of procurement of raw materials, transformation of these materials into intermediate and finished products, and the distribution of the finished products to the end users [42].

Supply chain management (SCM) effectively integrates the information and materials flow within the supply chain network starting from product design to delivery [43]. Integration of related activities of a production system facilitates smooth flow of materials within the system, thereby cutting the level of in-process inventory drastically. As a result of effective supply chain management, right product is made available at right time to the customer, which is mainly due to reduced cycle times because of simplified and accelerated operations [44, 45]. This is in tune with the working with JIT. Organizations are realizing the importance of information technology in the success of supply chain management. The use of information technology has not only provided global markets for a company, but also has eliminated many associated problems. It has resulted in reduced lead time, making on-time delivery more reliable and predictable; and thus paving the way for effective implementation of JIT.

VII. Information Technology (It) Based Inventory Management And Jit

Information system is a system of sharing information, and consists of computer hardware, communication technology and software designed to handle information related to business functions [46]. It serves to smooth many organizational functions. An effective information management system coupled with proper manufacturing planning will significantly reduce piling of stocks and lead time and ensure timely delivery of quality products to the customer, endorsing the very basic concept of JIT system. An SCM information system is designed to provide information and information processing capability to support the strategy, operations, management analysis, and decision-making functions in an organization's supply network. It provides high quality, relevant and timely information flow that effectively supports decision-making for inventory replenishment, capacity activation, and for synchronizing material flows at all tiers within the supply chain [47]. The use of telecommunication based networks such as Internet, Intranet, Extranet and EDI helps to gain competitive advantage for the organization. It has made sharing of information easier and faster and organizations using Internet have grown faster in a very short interval of time.

Since suppliers are scattered and sometimes far apart, it is essential to integrate their activities both inside and outside of an organization. This requires an integrated information system for sharing information on various value-adding activities along the supply chain. Information technology is like a nerve system for supply chain management [48]. Hence development and use of effective information system for supply chain management is of utmost importance. A supply chain network can fail in the absence of effective information system. The "Bullwhip Effect" is the most important effect caused due to inefficient supply chain network. It describes the propagation and amplification of orders from one reordering system to another upstream in a supply chain. This effect causes uncertainty in the supply chain management leading to increased on-costs as organizations in the supply pipeline mitigate against the potential risks in customer service levels by, say, increasing available capacity or increasing stock holding [49].

VIII. Supplier-Manufacturer Relationship

The supplier's relationship with manufacturer is important in the context of quality of raw materials being supplied. JIT emphasizes on strong supplier relationship as it makes the system more dependable and eliminates any uncertainty regarding manufacturing schedule, which strongly influences lead time. Burt [50] has thrown light on supplier dependency and its selection and management in respect of a modern manufacturing plant. The manufacturer can work with suppliers to improve overall quality, and to ensure that its supply needs are met. In this way, the manufacturer can eliminate many of its own inspection and control functions. The continuous improvement in this relationship is beneficial in the interest of both parties. A partnership type relationship can prove to be extremely useful and can go a long way in maintaining good relationship between the two. Benefits may be shared proportionately and supplier should be rewarded for on-time delivery of supply materials to the manufacturer. The partnership relation helps them to know each other's requirement more precisely, and makes them answerable for everything, whether good or bad. The result visible in terms of increased product quality, higher productivity and increased benefits.

References

[1]. Singh, D. K (2006). An Exploration of the Components of Customer Satisfaction Affecting JIT Implementation, Prestige Journal of Management and Research, Vol.10 (1&2), pp. 87-95.
[2]. Singh, D.K (2009). Just in Time: Concept and Practices, Ane Books Pvt. Ltd, New Delhi.
[3]. Flynn, B.B; Sakakibara, S and Schroeder, R.G (1995). Relationship between JIT and TQM: Practices and Performance, Academy of Management Journal, Vol. 38, pp. 1325- 1360.
[4]. Lau, R.S.M and Anderson, C.A (1998). A Three-Dimensional Perspective of Total Quality Management, International Journal of Quality and Reliability Management, Vol. 5, pp. 85-98.
[5]. Lau, R.S.M (2000). A Synergistic Analysis of joint JIT-TQM Implementation, International Journal of Production Research, Vol. 38(9), pp. 2037-2049.
[6]. Schonberger, R.J (1986). World Class Manufacturing: The Lessons of Simplicity Applied, Free Press, New York.
[7]. Harmon, R.L and Peterson, L.D (1990). Reinventing the Factory: Productivity Breakthroughs in Manufacturing Today, Free Press, New York.
[8]. Wilson, T.G (1985). Kanban Scheduling - Boon or Bane, Production and Inventory Management, Vol. 26(3), pp. 134-143.
[9]. O'Neal, C (1985). Customer- Supplier Relationships for Just-in-time, CIV Review, Vol. 2(3), pp. 33-40.
[10]. Barnard, C.I (1948). The Functions of the Executive, Harvard university Press, Cambridge, Mass.
[11]. Etziomi, A (1964), Modern Organizations, Prentice Hall, Englewood Cliffs, N.J.
[12]. Shadur, K and Kienzle N.A (December 1999). The Relationship between Organizational Climate and Employee Perceptions of Involvement, Group and Organization Management, pp. 479- 503.
[13]. Hatch, M.J (October 1993). The Dynamics of Organizational Culture, Academy of Management Review, pp. 657-693.
[14]. Smircich, L (September 1983). Concepts of Culture and Organizational Analysis, Administrative Science Quarterly, p.339.
[15]. Spencer, M.S and Guide, V.D (1995). An Exploration of the components of JIT: Case Study and Survey results, International Journal of Operations and Production Management, Vol. 15, pp. 72-83.
[16]. White, R.E; Pearson, J.N and Wilson, J.R (1999). JIT Manufacturing: A survey of Implementation in Small and Large U.S. Manufacturers, Management Science, Vol. 45, pp. 1-15.
[17]. Bright, J and Cooper, C.L (1993). Organizational Culture and the Management of Quality, Journal of Managerial Psychology, Vol. 8, pp. 21-27.
[18]. Emery, C.R; Summers, T.P and Surak, J.G (1996). The role of Organizational Climate in The implementation of Total Quality Management, Journal of Managerial Issues, Vol. 8, pp. 484-496.
[19]. Glover, J (1993). Achieving the Organizational Change necessary for Successful TQM, International Journal of Quality and Reliability Management, Vol. 10, pp. 47-64.
[20]. Morris, L (1994). Organizational Culture and TQM implementation, Training and Development, Vol. 48, pp. 69-71.
[21]. Manoochehri, G.H (1988). JIT for Small Manufacturers, Journal of Small Business Management, Vol. 26, pp. 22-30.
[22]. Mussel White, W.C (1987). The Just-in-time Production Challenge, Training and Development Journal, Vol. 41, pp. 27-29.
[23]. Gettel-Riehl, K and Kleiner, B.H (1987). Lesson from the Japanese Automotive Industry, Industrial Management and Data Systems, U.K; pp. 3-6.
[24]. Koufteros, X.A; Vonderembse, M.A and Doll, W.J (1998). Developing measures of time- based Manufacturing, Journal of Operations Management, Vol. 16, pp. 21-41.
[25]. Sakurai, M and Huang, P.Y (1984). Japan's Productivity Growth: A Managerial and Accounting Analysis, Industrial Management, Vol. 26, pp. 11-18
[26]. Suzuki, K (1985). Work-in-process Management: an illustrated guide to ProductivityImprovement, Industrial Management, Vol. 26, pp. 101-110.
[27]. McGrath, J.E (1984). Groups; Interaction and Performance, Prentice Hall, Englewood Cliffs, NJ.
[28]. William C, Ouchi (1981). Theory Z: How American Business can meet the Japanese Challenge, Reading, Addison Wesley, Mass.
[29]. Rubenstein, A. H (1976). Factors influencing Success at the Project Level, Research Management, Vol. 19(3), pp. 15-20.
[30]. Harber, D ; Samson, D. A; Sohal, A. S and Wirth, A (1989). Just-in- time: the issue of implementation, International Journal of Operations and Production Management, Vol. 9, pp. 13-22.
[31]. Shingo, S (1981). Study of the Toyota Production System from Industrial Engineering point of view, Japan Management Association, Tokyo.
[32]. Monden, Y (1983). Toyota Production System, Institute of Industrial Engineers, Atlanta, GA.
[33]. Karmarkar, U (Sept.-Oct.1989). Getting control of Just-in-time, Harvard Business Review, pp. 122-131.
[34]. Ward, P (May 1994). Logistics: a simple guide, Professional Manager, pp. 10-11.
[35]. Gerwin, D (March-April 1982). Do's and Don'ts of Computerized Manufacture, Harvard Business Review.
[36]. Browne, J ; Dubois, D ; Rathmil, K ; Sethi, S and Steckes, K. E (1984). Classification of Manufacturing Systems, The FMS Magazine.
[37]. Duncan, R (1979). What is the right Structure ? Decision tree analysis provides the answer. Organizational Dynamics, Vol. 7, pp. 59-80.
[38]. Ettlie, J. E ; Bridges, W.P and O'Keefe, R. D (1984). Organizational Strategy and Structural Differences for Radical versus Incremental Innovation, Management Science, Vol. 30, pp. 682-695.
[39]. Damanpour, F (1991). Organizational Innovation: A Meta Analysis of effects of Determinants and Moderators, Academy of Management Journal, Vol. 34, pp. 555-590.
[40]. Akturk, M. S and Turkcan, A (2000). Cellular Manufacturing System design using a holonistic approach, International Journal of Production Research, Vol. 38(10), pp. 2327-2347.
[41]. Pine, B.J (1993). Mass Customization- The New Frontier in Business Competition, Harvard Business School Press.
[42]. Kaihara, T (2003). Multi-agent based Supply Chain Modeling with Dynamic Environment, International Journal of Production Economics, Vol. 85(2), pp. 263-269.
[43]. Verwijmeren, M (2004). Software Component Architecture in Supply Chain Management, Computers in Industry, Vol. 53(2), pp. 165-178.
[44]. O'Brien, James. A (2003). Management Information Systems, Fourth Edition, Galgotia Publications, New Delhi.
[45]. Oz Effy (1999). Management Information Systems, Galgotia Publications, New Delhi.
[46]. Flowers, S (1996). Software Failure: Management failure, John Wiley, U.K.47. Soroor, Tavad; Tarokh, M.J and Keshtgary, M (2009). Preventing failure in IT-enabled systems for Supply Management, International Journal of Production Research, Vol. 47(23), pp. 6543-6557.
[47]. Yamaya, E; Wendy, C and Seltsikas, P (2002). Delivering Enterprise Resource Planning systems through Application Service Providers, Logistics Information Management, Vol. 15(3), pp. 192-203.
[48]. Metters, R (1997). Quantifying the "Bullwhip Effect" in Supply Chains, Journal of Operations Management, Vol. 15(2), pp. 89-100.
[49]. Burt, D.N (July-August 1989). Managing Suppliers up to Speed, Harvard Business Review, pp. 127-135.