

# Supplier-Oriented Knowledge Management in the Automobile Industry

Hrushikesh D. Sawant<sup>1</sup>, S.N.Teli<sup>2</sup>, L.M. Gaikwad<sup>3</sup>

<sup>1</sup>PG-Student, Mech. Engg. Dept. SCOE, Kharghar, Navi Mumbai, Maharashtra

<sup>2</sup>Associate Professor & Head, Mech. Engg. Dept. SCOE, Kharghar, Navi Mumbai, Maharashtra

<sup>3</sup>Asst. Professor, Mech. Engg. Dept. BVCOE, Belpada, Navi Mumbai, Maharashtra

<sup>1</sup>hrushielectra@gmail.com, <sup>2</sup>shivanandteli@yahoo.com, <sup>3</sup>lokpriya2004@yahoo.co.in

---

## Abstract:

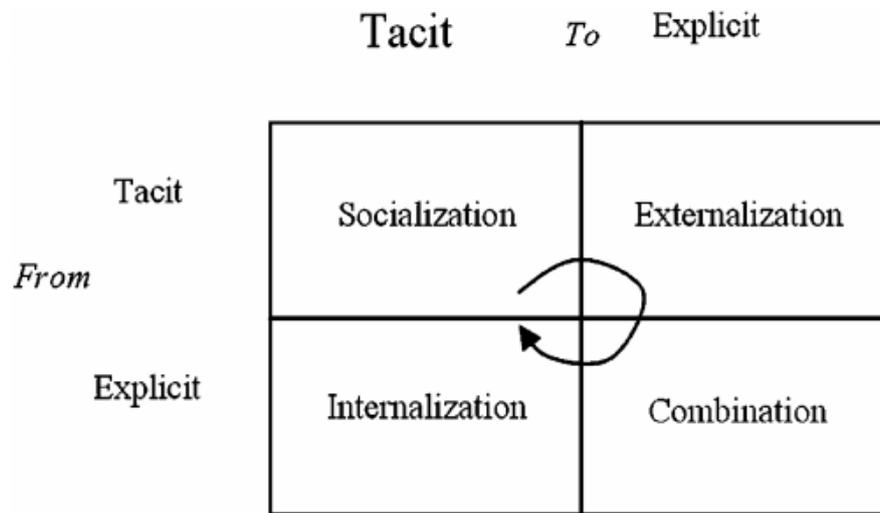
This study focuses on the impact of knowledge management in supplier relations within the automobile industry, on financial and product performance. A model of the relationship between supplier-oriented knowledge management, including its associated processes, and performance is described. Knowledge sharing through face-to-face communication is positively related to both product and financial performance, while technological knowledge sharing has a positive impact on product performance under conditions of high technological dynamism. Supplier involvement in the production process is related to product performance and use of knowledge management tools is related to financial performance.

**Key words:** Knowledge management, Supplier, Automobile industry

---

## 1. Introduction:

Knowledge, knowledge workers and Knowledge Management are topics receiving increasing attention from a variety of discipline. A recent survey by the Journal of Knowledge Management revealed that 92% of the responding executives indicated that they worked in knowledge intensive organizations. At the same time new technologies have been developed to better enable the management of knowledge. Knowledge Management is an emerging discipline as the potential uses, features and benefits of the current incarnation of Knowledge Management are still being defined and as increasing numbers of people and organizations begin to explore this new form of communication and organizational learning. Much work remains. From the Nonaka's model as shown in figure 1, KM is described as knowledge creation process, which represented by spiral conversion mechanism. We believe that each process (socialization, externalization, internalization, combination) managing organizational knowledge assets such as lessons learned, best practices, report, technical documents and so on. We can also elaborate the model by showing some examples of KM technologies that may be applied to facilitate the knowledge conversion process such as described in (Marwick 2001).



**Fig. 1: Takeuchi's KM Model (1995)**

While there are many processes of KM, such as gathering, searching, filtering, conceptualizing, projecting and transferring (Park and Kim, 2006), this study presents KM as a combination of five specific processes. These are:

1. Knowledge sharing and distribution
2. Knowledge generation and development
3. Knowledge codification and storage
4. Organization leader roles and
5. Reward systems.

## 2. Literature Review:

**Daniel Palacios Marques et.al (2006)** in their research work studied the connection between knowledge management practices and firm performance.

**Kwong-Chi Lo, Kwai-Sang Chin (2009)** This paper aims to develop a user-satisfaction-based knowledge management performance measurement model, including identifying the assessment criteria sourced from user-satisfaction-based core values, critical success factors and phases of knowledge management process. With the aid of the developed measurement model, organisations could assess the strength and weakness of their own knowledge management system and practice and then identify areas for improvement. User-satisfaction-based core values, critical success factors and five-phase knowledge management process are identified through

literature review and analysis, and expert interviews, with the aid of system modelling techniques. The seven user-satisfaction-based core values, eight critical success factors and five-phase knowledge management process are identified as the basis of the assessment criteria.

**M.D. Singh, Ravi Shankar et.al (2006)** Knowledge management involves strategies and processes of identifying, capturing, and leveraging knowledge to enhance competitiveness. The new world of knowledge-based organizations is distinguished from the organizations of the last millennium by its emphasis on monitoring and controlling the organization by shared knowledge derived from internal and external data sources. It believes in continual transformation of the knowledgebase according to changing business strategy.

**Balasubramanian et al. (1999)** define knowledge management as an organizational capability that allows people in organizations, working as individuals, or in teams, projects, or other such communities of interest, to create, capture, share, and leverage their collective knowledge to improve competitiveness and performance.

**Raisinghani (2000)** conceptualizes the concept of knowledge management as the concern for the creation of structures, which combine the most advanced elements of technological resources and the indispensable input of human response and decision making, a view that resonates with the knowledge-based theory of the firm developed by Grant (1996).

**Hansen et al. (1999)** have identified two broad approaches to the management of knowledge in organizations, viz., the personalization approach and the codification approach. The personalization approach would include face-to-face communication, communication through such structures as networks of people, cross-functional teams, committees, task forces, training and development, internal knowledge sharing through benchmarking and job rotation, and creation of strategic alliances. The codification approach refers to the technological route for knowledge management and would include the setting up of databases, data warehouses, decision support systems, ERP systems, and electronic networks for communication and sharing knowledge.

### 3. Supplier oriented knowledge management:

In addition to the social and technological components of knowledge management within organizations described above, for the purpose of coordination, the knowledge management literature also indicates that organizations manage the process through which they acquire, and organize knowledge from outside the organization (from suppliers) and disseminate such knowledge and information within the organization (Alavi and Leidner, 2001; Teigland and Wasko, 2003). These and other researchers (Zack, 1999) suggest that the processes that are set up for the specific enhancement of the data and information obtained from various entities in the environment, such as suppliers, constitute a key component of knowledge management. Such processes, focused on suppliers, can be labelled supplier-focused knowledge management.

Although the literature on supplier relations in the auto industry has been developing for some time (Clark and Fujimoto, 1989; Dyer, 1996, 1997; Dyer and Nobeoka, 2000; Belzowski et al., 2003; Kaufman et al., 2000; Martin et al., 1995; Mudambi and Helper, 1998; Takeishi, 2001), the specific focus on collaboration for knowledge sharing purposes is fairly new (Belzowski et al., 2003; Dyer and Nobeoka, 2000; Takeishi, 2001). With the exception of the few studies that utilize this new focus, most of the others in the literature focus on supplier relations from perspectives such as transaction costs, collaborative versus adversarial relations, and variables such as asset specificity and location specificity. A focus on collaborative supplier relationships for knowledge sharing purposes has been argued to be a very important determinant of competitive advantage in the automobile industry (Dyer and Nobeoka, 2000), among others such as pharmaceuticals (Pisano, 1994), and hence the need to examine such knowledge management vis-à-vis suppliers has gained increased importance. We identify and focus on several processes involved in the management of knowledge vis-à-vis suppliers in the Brazilian automobile industry. We then empirically test for the impact of these processes, within the framework of our supplier-focused knowledge management model, on product and financial performance. Such empirical tests in the automotive industry exist only at a qualitative, case study level in this literature (Dyer and Nobeoka, 2000; Takeishi, 2001). We integrate this literature, provide a model, and thus make important contributions to this literature in the context of the Brazilian auto industry.

### **3.1 Supplier knowledge sharing:**

Recent additions to the supplier relations literature within the auto industry have identified the importance of knowledge sharing and the building of a network for such purposes (Aoshima, 2002; Belzowski et al., 2003; Dyer and Nobeoka, 2000). Outside of these recent attempts, much of the rest of this literature does not directly examine knowledge sharing in supplier relations in the auto industry. However, this literature does provide indications to the effect that collaborative supplier relations and information sharing in a network mode are likely determinants of competitive advantage in this industry (Dyer, 1996, 1997; Mudambi and Helper, 1998). Dyer (1996) found evidence which suggests that specialized networks of suppliers provide a competitive advantage to manufacturers in the auto industry (Millington et al., 1998). In Dyer's (1996) study, one aspect of specificity, viz. Location specificity, was closely thought to be linked to the degree of information sharing between supplier and manufacturer. The degree of such information sharing is a crucial component of our concept of supplier-oriented knowledge management. Such information sharing is usually either assumed to exist (Dyer, 1996) in studies of the auto industry or qualitatively assessed in case study methodologies (Dyer and Nobeoka, 2000). We hypothesize for and directly measure such information sharing in this study as components of our concept of supplier-focused knowledge management, thus providing valuable additions to the literature.

In addition to information sharing, Dyer (1996) also emphasized the resulting benefit of conversion of tacit knowledge to explicit knowledge through these supplier networks, as an important element contributing to competitive advantage in the auto industry.

Dyer and Nobeoka (2000) focus on a rich qualitative investigation of the nature of the knowledge sharing practices at Toyota within their network and sub-networks. Such interpersonal processes of knowledge sharing (as opposed to technological routes) are more capable of converting tacit knowledge to explicit knowledge, a crucial component contributing to competitive advantage. Very little work exists along these lines of investigating multiple processes of knowledge sharing across organizational contexts in the auto industry (Aoshima, 2002). We include knowledge sharing, using both media rich, face-to-face communication, and through technological networks such as electronic data transfer and reliance on knowledge management tools, in our conceptualization and measurement of the knowledge sharing component of supplier-focused knowledge management. Thus, we conceptualize and operationalize both the personalization and codification approaches to knowledge management identified in the literature (Hansen et al., 1999). The central argument is that knowledge sharing is a crucial component of supplier-focused knowledge management and thus its impact on performance.

### **3.2 Supplier integration in the production process:**

Although the supplier relations literature has mainly focused on the innovation benefits of close ties with suppliers in the product development process (Dyer and Singh, 1998; Kaufman et al., 2000; Pisano, 1994; Takeishi, 2001), such close relations with suppliers and integration into the production process also provides several benefits in the manufacturing realm (Millington et al., 1998). Evidence from the auto industry (Millington et al., 1998) suggests that the benefits of suppliers possessing knowledge of the manufacturer's production process and integration into their production provides benefits such as reduced costs in multiple areas, flexibility under varying demand conditions, reduced risk of disrupted deliveries, possibility of sequencing production of pre-assemblies and assemblies, and the potential for experiential learning by producing a focused set of components/products over the long run. Such benefits were identified by Millington et al. (1998) in the context of their investigation of 'local assembly units' near manufacturers. However, such local units achieved these benefits only by engaging in higher levels of interactions, resulting in higher knowledge of the production process and higher integration into the production process of the manufacturer.

These knowledge aspects were not assessed directly in this case study (Millington et al., 1998) but were assessed in (Dyer and Nobeoka's, 2000) case study of Toyota's network. The literature still lacks quantitative evidence of such supplier knowledge of the production process, and integration into the production process, and the resulting impact of these on product and financial performance. Increased knowledge of the interdependencies of the production process and of the interfaces in such processes spans across both manufacturing and product development processes, since these are fundamentally interlinked (Clark and

Fujimoto, 1989). Pisano (1994) provided evidence from the pharmaceutical industry for the positive link between knowledge and the product development process, especially in terms of the time for development. Within the context of the supplier-focused knowledge management model, increased levels of supplier knowledge of the production process is likely to help in their collaborative efforts with manufacturers. As suggested above, higher levels of supplier knowledge integration into the production process is likely to make these suppliers manufacturer chains more highly capable of structuring and organizing the production process to provide more flexibility and quickness and the competitiveness resulting from it (Takeishi, 2001). Higher levels of supplier involvement in the production process are also necessary to prepare them for higher levels of sharing knowledge and thus easier conversion of tacit knowledge about interfaces and interdependencies to explicit knowledge. Such conversion is crucial for firms trying to build specialized networks with suppliers to build their competitive advantage.

Information technologies and flexible manufacturing technologies have allowed for the inexpensive modification of production set-ups and sequences and thereby increase the inter-firm know-how of their specific interfaces (Dyer and Singh, 1998; Kaufman et al., 2000). Although these technologies increase the resource availabilities in these areas, the actual competitive advantages accrue only to those firms that have the capabilities to utilize these technology and knowledge resources, as evidenced by the motivational challenges, among others, faced by Toyota in building its supplier network to share knowledge (Dyer and Nobeoka, 2000) and the difficulties faced by North American firms to replicate such links (see Martin et al., 1995). Thus, it becomes imperative to investigate actual levels of supplier knowledge of the production process and their level of integration into the manufacturer's production process, because these are the crucial underlying variables that impact product and financial performance.

### **3.3 Supplier early involvement in product design:**

In addition to supplier involvement in the production process, involvement in the earlier stages, viz. design, can improve crucial capabilities such as anticipating for and designing for tacit knowledge of interdependencies and for managing interdependencies in an optimal manner to enhance ongoing quickness of the process and its flexibility (O'Grady, 1999). The supplier relations literature has touched on the innovation benefits of close ties with suppliers in the product development process (Dyer and Singh, 1998; Eisenhardt and Tabrizi, 1995; Kaufman et al., 2000; Pisano, 1994; Takeishi, 2001). It has become common practice in the auto industry for suppliers to set up shop within the manufacturer's premises and to be involved in the project right from the design phase (Millington et al., 1998; Takeishi, 2001). Such practices maximize location specificity, which Dyer (1996) argued to be strongly connected to information and knowledge sharing. Such knowledge sharing is in the specific form of technical exchange and cooperation in the technological realm. Thus, early involvement of the suppliers in the product development and manufacturing process, in the form of collaborative design and in the

form of technical exchange and cooperation, is a critical component of the supplier-oriented knowledge management.

The direct examination of early supplier involvement in design in terms of its impact on performance in the auto industry is rare (Takeishi, 2001). We contribute to the literature by directly examining this empirical relationship between early supplier involvement in design and product and financial performance.

The information systems literature on knowledge management provides an in-depth analysis of the impact of technological knowledge management tools on organization performance. Specific knowledge management systems, built on custom-designed knowledge management architectures (Zack, 1999) have been known to relate strongly to organizational performance (Armstrong and Sambamurthy, 1999; Davenport et al., 1998). The codification approach to knowledge management (Hansen et al., 1999) is entirely consistent with this view of the impact of the technological route to knowledge management. Our study suggest that supplier early involvement in product design in the form of higher levels of interaction between suppliers and manufacturers using technological knowledge management tools, as well as the early involvement of suppliers through co-design, will result in higher levels of product and financial performance.

### **3.4 Moderating factor: technological dynamism**

The supplier relations literature (Dyer and Nobeoka, 2000; Sanchez and Mahoney, 1996) suggests that increasing levels of knowledge sharing in manufacturer- supplier combinations has an important impact on competitive advantage of organizations by providing the capability to more effectively handle environmental change. Higher levels of collaborative relationships focused on knowledge sharing provides firms with the capabilities to reduce costs, bring products to market quicker, stabilize and improve quality, and reduce risk of disruptions, all of which cushion the effect of environmental change. Conversely, the rate of environmental change could affect the relationship between supplier-focused knowledge management and product and organizational performance as identified by some in this literature (e.g. Clark and Fujimoto, 1989; Dyer and Nobeoka, 2000; Eisenhardt and Tabrizi, 1995; Kaufman et al., 2000; Takeishi, 2001). Such environmental change, under certain conditions, makes supplier-focused knowledge management more important and therefore more strongly associated with performance, than under other conditions. Specifically, supplier-focused knowledge management could be more important and have a stronger impact on performance under conditions of high environmental change than under low environmental change conditions (see Hitt et al., 2000, for a related argument and empirical finding). Hitt and colleagues (2000) found results supporting their argument that there is a generally a greater willingness to share knowledge in emerging economy enterprises than those in developed economies. Brazil's auto parts industry has been identified as a 'hot' sector with high growth rates. This, in combination with the presence of highly competitive steel, glass, and rubber industries, and massive investments to the technology sector of Brazil makes for a highly dynamic economic and technological environment (Hoskisson et al., 2000).

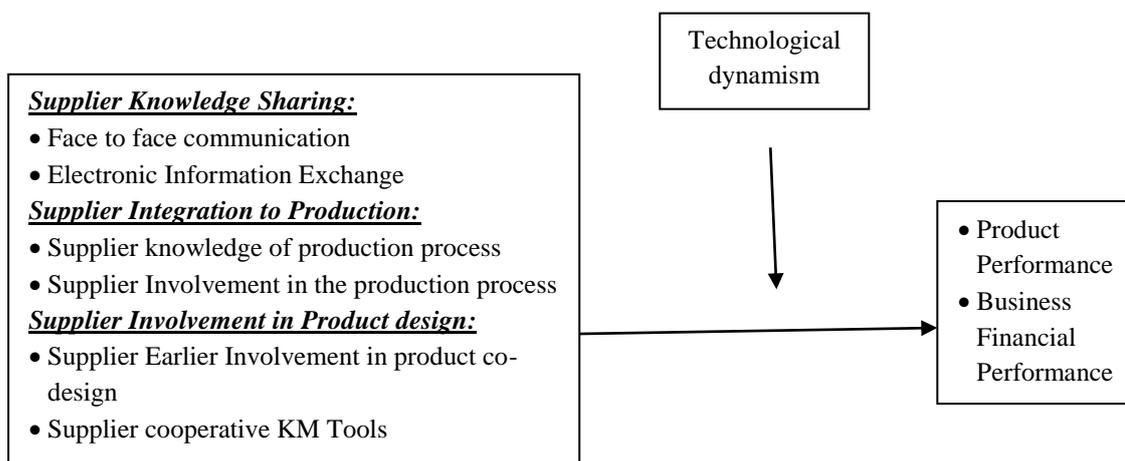
Following suggestions in the supplier-relations literature (e.g. Clark and Fujimoto, 1989; Dyer and Nobeoka, 2000; Eisenhardt and Tabrizi, 1995; Kaufman et al., 2000; Takeishi, 2001) we focus on technological dynamism as one of the major factors that results in environmental uncertainty and creates the need for strategic flexibility. When competitors introduce new products using new technologies at a rapid pace, thereby increasing the level of product variety, it forces all manufacturers to respond strategically or put themselves in the strategic position of being able to respond to such changes. Knowledge management in general and supplier-focused knowledge management in particular serves to provide this capability of flexibility and quick response. Thus, it stands to reason that such knowledge management becomes more important under conditions of high technological dynamism than under conditions of low technological dynamism. Therefore, we included the level of technological dynamism measured as the rate of technological change as a relevant moderating variable that impacts the relationship between supplier-focused knowledge management and firm performance. Additionally, under conditions of rapid technological change, the conversion of tacit knowledge to explicit knowledge becomes more challenging and calls for increased levels of interaction, collaboration, cooperation, and knowledge sharing. This is because the bases of both tacit and explicit knowledge change with the rapid changes in the technology. Thus, rapid changes in product design and the manufacturing process, as is the case in the auto industry (e.g. Clark and Fujimoto, 1989), necessitates higher levels of knowledge management between suppliers and manufacturers, without which the manufacturer's strategic flexibility and responsive ability is likely to suffer. Eisenhardt and Tabrizi (1995) found some evidence of the moderating impact of uncertainty (in the form of unpredictable products) on the relationship between supplier involvement and product performance (in the form of speed of product development). The above suggests that technological dynamism as measured by the industry rate of technological change is likely to moderate the relationship between supplier-focused knowledge management and performance. This moderating impact is likely to apply to each of the components of supplier-focused knowledge management.

#### **4. A Model of Supplier-Oriented Knowledge Management:**

With the help of knowledge management and supplier-relations literatures the framework of supplier-oriented knowledge management is built. In addition to these literatures, we also draw from a recent qualitative study (Kotabe et al., 2007), in developing the model and its hypotheses. These literatures suggest that: (a) supplier knowledge sharing (e.g. Aoshima, 2002; Belzowski et al., 2003; Dyer and Nobeoka, 2000); (b) supplier knowledge integration to the production process (e.g., Millington et al., 1998); and (c) early supplier involvement in product design through the use of knowledge management tools (e.g. Dyer and Singh, 1998; Eisenhardt and Tabrizi, 1995; Kaufman et al., 2000; Pisano, 1994; Takeishi, 2001) are the three dimensions of supplier focused knowledge management. The three dimensions indicated here are suggested in the literature mentioned above but have not been directly examined in this literature. Moreover, most of this literature is

qualitative and thus the relationships remain to be tested (directly or indirectly). We blend these three dimensions into our model of the relationship between supplier oriented knowledge management and performance, in the context of the industry and its customers and present it in Figure 2. The model in Figure 2 indicates a direct and positive relationship between supplier-oriented knowledge management and financial and product performance. We include technological dynamism as a moderator variable that affects the relationship between supplier-focused knowledge management and performance.

The central thesis of the supplier-oriented knowledge management model we develop here is that it has a favourable impact on product performance as identified by its various characteristics such as cost, speed to market, quality, and reputation, in addition to its independent effect on financial performance. All the three components in our model enhance collaboration between suppliers and manufacturers with the focus on sharing and managing knowledge.



**Figure**

**Figure 2 A model for supplier oriented Knowledge Management**

## 5. Conclusion:

Following are the conclusions drawn from the study of supplier-oriented knowledge management system:

- The new world of knowledge-based organizations is distinguished from the organizations of the last millennium by its emphasis on monitoring and controlling the organization by shared knowledge derived from internal and external data sources.
- It believes in continual transformation of the knowledge-base according to changing business strategy.

- The objective of this paper is to understand the KM practices in an automobile industry in India, which are going through a major transition in this area. This paper presents knowledge management as a coordinating mechanism.
- Empirical evidence supports the view that a firm with a knowledge management capability will use resources more efficiently and so will be more innovative and perform better. The importance of training based on competency gap, SAP and R& D for enhancing the Knowledge of employee's is clearly pointed out in this research work.
- Knowledge sharing through face-to-face communication is positively related to both product and financial performance, while technological knowledge sharing has a positive impact on product performance under conditions of high technological dynamism.
- Supplier involvement in the production process is related to product performance, and use of knowledge management tools is related to financial performance.
- Supplier oriented knowledge management model that explicates the various means through which organizations in globally competitive industries can manage knowledge vis-à-vis external entities such as suppliers.

Specifically, our study has identified and presented evidence in favour of face-to-face knowledge and information sharing, electronic knowledge sharing, early involvement in product design, reliance on knowledge management tools for technological exchange, and supplier knowledge of manufacturer production processes.

### References:

- [1] Armstrong, C. P. and Sambamurthy, V. (1999). 'Information technology assimilation in firms: the influence of senior leadership and IT structures'. *Information Systems Research*, 10, 304–27.
- [2] Alavi, M. and Leidner, D. E. (2001). 'Knowledge management and knowledge management systems: conceptual foundations and research issues'. *MIS Quarterly*, 25, 107–36.
- [3] Clark, K. B. and Fujimoto, T. (1989). 'Lead time in automobile product development: explaining the Japanese advantage'. *Journal of Engineering and Technology Management*, 6, 25–58.
- [4] Daniel Palacios Marques, Fernando Jose Garrigos Simon(2006),"The Effect of Knowledge Management Practices on Firm Performance", *Journal of Knowledge Management*, 10, Issue: 3, Page: 143 - 156.
- [5] Davenport, T. H., De Long, D. W. and Beers, M. C. (1998). 'Successful knowledge management projects'. *Sloan Management Review*, 39, 43–57.
- [6] Dyer, J. H. and Nobeoka, K. (2000). 'Creating and managing a high-performance knowledge-sharing network: the Toyota case'. *Strategic Management Journal*, 21, 345.
- [7] Eisenhardt, K. and Tabrizi, B. (1995). 'Accelerating adaptive processes: product innovation in the global computer industry'. *Administrative Science Quarterly*, 40, 84–110.

- [8] Hansen, M.T., Nohria, N. and Tierney, T. (1999). 'What's your strategy for managing knowledge?'. *Harvard Business Review*, 77, 106–118.
- [9] Kwong-Chi Lo, Kwai-Sang Chin (2009), "User-satisfaction based Knowledge Management Performance Measurement", : *International Journal of Quality & Reliability Management*, 26, Issue: 5, Page: 449 - 468.
- [10] Hitt, M., Dacin, M. T., Levitas, E., Arregle, J-L. and Borza, A. (2000). 'Partner selection in emerging and developed market contexts: resource-based and organizational learning perspectives'. *Academy of Management Journal*, 43, 449–67.
- [11] Hoskisson, R. E., Eden, L., Lau, C. M. and Wright, M. (2000). 'Strategy in emerging economies'. *Academy of Management Journal*, 43, 249–67.
- [12] Jenny Darroch (2005), "Knowledge Management, Innovation and Firm Performance", *Journal of Knowledge Management*, 9, Issue 3, pp.101-115.
- [13] Kotabe, M., Parente, R. and Murray, J. (2007). 'Antecedents and outcomes of modular production in the Brazilian automobile industry: a grounded theory approach'. *Journal of International Business Studies*, 38, 84–106.
- [14] M.D. Singh, Ravi Shankar, Rakesh Narain, Adish Kumar (2006), "Survey of Knowledge Management Practices in Indian Manufacturing Industries", *Journal of Knowledge Management*, 10, Issue: 6 Page: 110 – 128.
- [15] Pisano, G. (1994). 'Knowledge, integration, and the locus of learning: an empirical analysis of process development'. *Strategic Management Journal*, 15, Special Issue, 85– 100.
- [16] Sanjay Kumar Singh (2008), Role of Leadership in Knowledge Management: a Study", *Journal of Knowledge Management*, 12, Issue 4, pp.3-15.
- [17] Zack, M. H. (1999). 'Managing codified knowledge'. *Sloan Management Review*, 40, 45–58.