Improvement of organizational Performance through the Technology

Ali Taheri[1], Majid Jamali[2], Davood Gharakhani[3] (Corresponding author)

[1] Department of business management, Abhar Branch, Islamic Azad University, Abhar, Iran
[2,3] Department of Industrial management, Qazvin Branch, Islamic Azad University, Qazvin, Iran

Abstract: In this paper, we propose a research framework to discuss the relationships between technology and organizational performance (OP) in Iran. A lot of researchers have in the past focused on technology transfer, technology acquisition, and technology management in this region. Though some researchers have discussed the relationships between information and communication technology (ICT) and economic growth in developed countries, seldom have studies been conducted to consider the issue of the influences of T on OP in developing and less-developed countries. In this study, a cluster analysis on T achievements is used to distinguish the different patterns of such influences in the Iran.

[Taheri A, Jamali M, Gharakhani D. **Improvement of organizational Performance through the Technology.** *World Rural Observ* 2014;6(1):99-106]. ISSN: 1944-6543 (Print); ISSN: 1944-6551 (Online). http://www.sciencepub.net/rural. 18

Keywords: Technology development; organizational performance; technology transfer

1. Introduction

Research on technological innovation, broadly defined, forms a huge body of research focused on problems of technology-based change in organizational and social settings (e.g. Rogers, 1995; Drazin and Schoonhoven, 1996; Wolfe, 1994; Tornatzky and Klein, 1982). The popularity of the technological innovation approach in IS research testifies to its usefulness. Theories of innovation have been used to explain the adoption patterns of information technologies ranging from personal computers (e.g. Bretschneider and Wittmer, 1993) and spreadsheets (e.g. Brancheau and Wetherbe, 1990) to business computing (e.g. Attewell, 1992) and inter-organizational systems such as electronic data interchange (e.g. Bouchard, 1993; Neo et al., 1994; Iacovou et al., 1995). A body of research devoted specifically to IS adoption and implementation has developed (e.g. Kwon and Zmud, 1987; Swanson, 1994), using this literature as a base. It is fair to say that research on technological innovation, particularly on the adoption and diffusion of innovations, has become the dominant approach to adoption, implementation, and use issues in IS research.

About 10 years mobile data services have been waited to soar and become a huge, life changing industry, but technology maturity, capacity, service availability and usability problems have moved the prospects further and further, time after another. This paper investigates the current technical and market parameters relating to wideband and broadband mobile data service diffusion in the European context.

According to the general theory of technological innovation, diffusion will follow an S-shaped adoption curve. The adoption starts slowly, and then rises quickly as more and more users adopt the innovation, and finally levels off (Rogers, 1995).

Diffusion model of Bass is very commonly used (Bass, 1969). There different country specific characteristics, like GDP, educational level and e.g., competitive or regulatory conditions, introduce different values for the diffusion parameters. Especially concerning communication related innovations, the network externalities have been considered important. General diffusion modeling has mostly concentrated on the user behavior, macro-economic and policy aspects, but business actors and modeling their decision-making in the micro-economical level has not been focused in the analyses. Some studies, however, combine various aspects, discussing different stakeholders that contribute to the diffusion process.

2. Literature review

2.1. Technology selection

Technology as a major source of competitive advantage for manufacturing industries is widely accepted by practitioners, governments and academics. An enterprise can waste its competitive advantages by investing in wrong alternatives at the wrong time or by investing too much in the right ones (Torkkeli & Tuominen, 2002). A country can obtain its competitive advantages by investing in emerging technologies with comparative advantages (Lee & Song, 2007; Yu et al., 1998). In order to realize this competitive advantage, it is vital to understand both the specific technologies, and the ways in which organizations can best manage technology. Gregory (1995) has proposed that management of technology is comprised of five generic processes: identification, selection, acquisition, exploitation, and protection.

Among these processes, technology selection is defined as involving the choice of technologies that should be supported and promoted (Gregory, 1995). In the phase of technology selection, decision makers have to gather information from various sources about the alternatives, and evaluate these alternatives against each other or some set of criteria (Lamb & Gregory, 1997). Accordingly, Gregory (1995) separates the ‘‘identification” and ‘‘selection” phases where the former is concerned with gathering alternatives and the latter is concerned with the action to decide on an alternative. In contrast, Dussauge, Hart, and Ramanatsoa (1992) define the technology selection process as identification and selection of new or additional technologies which the firm seeks to master. In sum, a key theme in these definitions is that technology selection is a ‘‘process” that is closely linked to organizational objectives and is associated with the broader technological and market environment. However, it is becoming more difficult to identify the right technologies because the number of technologies is increasing and the technologies are becoming more and more complex (Torkkeli & Tuominen, 2002). Additionally, decision makers need to face other challenges such the rising cost of technological development, abundance of technological options, and rapid diffusion of technologies (Berry & Taggart, 1994). For example, technology accounts on average for more than one-third of all business capital spending. The abundance and complexity of technological options makes the task of accessing suitable technologies and selection of the most suitable option more difficult.

Ronde (2001) selects 98 specific technologies of future possibilities in the field of biotechnology in France. Using the same foresight technique, Ronde (2003) respectively introduces 40, 51, 39 and 50 potential areas in the fields of elementary particles, energy, natural resources and environment for Germany and France. Lee and Song (2007) also provide 56 research areas in nano-technology field for South Korea. Besides the increasing cost of technological development and the abundance of technology options, many studies have shown that companies fail to assess new technologies. Hackett (1990)point out that projects to incorporate new technology in a majority of companies are failing or are not fulfilling expectations. Huang and Mak (1999) argue that the failure of a chosen technology often results from poor management and assessment. Some of the causes have been attributed to the inability to consider the wider relationship of technology to the industrial context and the technology investments. These studies demonstrate the necessity for a careful assessment to overcome the difficulties of technology selection before introducing a new technology.

2.2. The technological innovation process: alternative assumptions

The technological innovation process: alternative assumptions much of the research mentioned above focuses on the process of technological Innovation. These literatures are developing arguments about the technological innovation process that challenge traditional adoption and diffusion theory.

While it would be naive to suggest that one set of assumptions about innovation is ``right'' or ``wrong'' for all possible research projects, enough work has been done to suggest that the traditional approach to innovation research should not automatically be seen as the source of correct assumptions. Other claims about the technological innovation process are worth explicitly considering, particularly for IS research. Three of the more significant claims are described below:

(1) Technological innovation is fundamentally competitive and conflictual.

Management researchers, sociologists, and economists all agree that, despite the need for cooperation in technology development and diffusion, technological innovation fundamentally takes place within a competitive and conflictual atmosphere. For the social shaping of technology theorists, different social groups are inevitably involved in technological innovation (Bijker et al., 1987), each with their own interpretation of what the technology is, and what problem it is trying to solve. For technological innovation to happen, networks of interest groups must be attracted into a new technological system, and their commitment to it preserved (Bijker and Law, 1992). For the economists of innovation, technological innovations compete for scarce resources and have uncertain returns (Rosenberg, 1994). Within the firm, each stage of the innovation process ± expressing the idea, exploring the feasibility, building prototypes can be seen as a separate hurdle where a number of ideas are in fierce competition with each other (Jolly, 1997). Between firms, the rapidity of technological innovation puts Information systems as organizations under severe pressure to innovate effectively (Brown and Eisenhardt, 1997), and to maneuver strategically within their industries to establish commercially lucrative positions for themselves in the face of technological change (Utterback, 1994).

(2) Technological innovation is underdetermined there is no single ``best solution''. To say that technological innovation is underdetermined is to say that ``technical principles are insufficient by themselves to determine design’’. The research traditions mentioned above subscribe to the view that the ``natural attributes'' of technology are not sufficient to explain technological innovation, though they differ in the importance they attach to this belief.

For the social shaping of technology theorists, the belief that technological innovation does not unfold according to some predetermined technical logic is critical The particular path that technological innovation takes is something to be explained, rather than simply adjusted to. Studies of the management of innovation, and innovation adoption, acknowledge that the seemingly ``best'' technology does not always become the most widely accepted (Utterback, 1994). While the economists of innovation believe that technological ``trajectories'' make some innovation paths more likely than others (e.g. Dosi, 1982), the complex interplay between technological supply and market demand cannot be captured strictly with reference to the characteristics of technology. Even in the literature on technology and organization structure, which has argued for the strongest links between the nature of technology and organizational forms, there is a recognition that technological change serves as an occasion for restructuring (e.g. Barley, 1990), and the same technology can occasion quite different organizational outcomes.

(3) Technological innovation cycles between periods of stability and change. A wide range of technological innovation research suggests that the innovation process fluctuates between periods of relative stability and periods of relative change. Research on innovation and business strategy in particular has argued that the nature of innovation changes over time. Periods of more incremental innovation, in which technology appears to develop along well understood paths, are then abruptly followed by periods of more radical innovation, in which the certainties of the past era are abandoned (Utterback, 1994; Tushman and Rosenkopf, 1992). Eventually, a radical innovation becomes more widely accepted, and settles back into relatively well understood incremental innovation. The economists of innovation refer to waves of change, in which the nature of technological innovation changes over the ``lifecycle'' of a technology (e.g. Freeman, 1990). The social shaping of technology theorists see the ``firming up'' of technology the process of stabilizing interpretations and relationships around a technology ± as one of the key processes to be explained (e.g. Bijker et al., 1987). While technology can become more ``closed'' over time for the social shaping theorists, the contingency of social life ultimately works to reopen previous controversies and pursue new opportunities. Each of these three claims offers an alternative starting point for the investigation of information systems as technological innovation.

2.3. Technology Transfer

The current TT issue in IJVs revolves around the extent of degree of technologies that are transferred (TTDEG) by the suppliers to recipient partners (Pak and Park, 2004). The question is no longer whether or not the MNCs are transferring technology to local firms instead the focus in the literature has shifted to questions on 1) the level (sophistication) of the transferred technology, and 2) the stage where the transfer process has reached (Lai and Narayanan, 1997). Except for Pak and Park (2004) and Minbaeva (2007), not many studies in both intra and inter-firm TT have focused on TTDEG as independent or dependent variable. In general, majority of the studies have focused more on technological knowledge and knowledge acquisition 'per se' as the outcomes (dependant variables). For example, the technology transfer, knowledge transfer (KT) and strategic alliance literature have extensively examined the relationships between 1) knowledge attributes, source and recipient and KT success (Cummings et al., 2003), 2) knowledge seekers, knowledge holder and contextual factors and know-how acquisition (Hau and Evangelista, 2007), 3) IJVs characteristics and knowledge acquisition (Lyles and Salk, 1996), 4) knowledge actors' interaction and KT (Bresman et al., 1999), 5) organization motivation, learning capacity, learning hindrance and KT (Simonin, 2004), 6) absorptive capacity and knowledge learned from foreign firm (Lane et al., 2001), 7) the IJV characteristics and knowledge acquisition (Tsang et al., 2004), 8) knowledge antecedents, ambiguity and knowledge transfer (Simonin, 1999a), 9) learning intent, management control and managerial knowledge acquisition (Lin, 2005), 10) relational embeddedness and tacit/explicit knowledge acquisition (Dhanaraj et al., 2004), 11) overseeing effort, management involvement and knowledge acquisition (Tsang et al., 2002), 12) the supplier and recipient factors and tacit knowledge acquisition (Yin and Bao, 2006), and 13) relation-specific determinants, knowledge specific determinants and degree of knowledge transfer (Pak and Park, 2004).

Although the previous researchers have not specifically dealt with TTDEG as a variable, however, a number of studies have operationalized degree (amount) of technology transferred to the recipient firm in terms of the extent of type of technology and knowledge that are transferred or acquired for example 1) the tacit and explicit marketing knowledge (Hau and Evangalista, 2007), 2) the tacit and explicit knowledge (Dhanaraj et al., 2004; Yin and Bao, 2006), 3) the marketing know-how (Simonin, 1999b; Wong et al., 2002), 4) the technology in service industries (Grosse, 1996), 5) the knowledge on product development and foreign cultures (Lyles and Salk, 1996), 7) the technological learning (Lin, 2007), 8) the managerial knowledge (Si and Bruton, 1999; Tsang 2001; Luo and Peng, 1999; Liu and Vince, 1999; Lin, 2005), 9) managerial skills (Wong et al.,

2002), 10) the technology or manufacturing know how (Lam, 1997; Bresman et al., 1999), 11) the business environment and product market knowledge (Geppert and Clark, 2003), and 12) the research and development (Cummings and Teng, 2003; Minbaeva, 2007). In the context of inter-firm technological knowledge transfer in IJVs, only Pak and Park (2004) have directly dealt with degree of knowledge transfer as the outcome (dependent variable) with respect to the transfer of new product development and manufacturing skills/techniques.

2.4. Organizational performance

A number of studies have applied different ways to measure OP (Wong and Wong, 2007; Prajogo et al., 2007; Prajogo, 2007; Moneva et al., 2007). In particularly, Steer (1975) reviewed 17 models of organizational effectiveness and integrated the contents of these various studies concerning the measurement of OP. Vankatarmanan and Raman jam (1986) argue that OP is an indicator which can measure how well an enterprise achieves their own objectives. After reviewing ten different types of measurement, they generalized the results into three dimensions: financial performance, business performance and organization effectiveness. Delaney and Huselid (1996) developed a structure with two factors for measuring market performance: market share and profit ratio. Huselid et al. (1997) also proposed a more complete set of dimensions for human resource performance.

Recently, Andersen (2006) states that the concept of effectiveness is a ratio, implying that two entities are required when defining and measuring effectiveness(e.g. return on assets). He also argues that when effectiveness is conceptualized as a degree of goal attainment, that is, the achievement of profitability goals, comparisons between business enterprises become meaningless. Lee and Lee (2007) find that OP measures strongly influence the behavior of managers and employees, and that methods of OP measurement in KM can be categorized into four sections: financial measures, intellectual capital, tangible and intangible benefits, and a balance scorecard. Hanvanich et al. (2006) have developed an OP measurement model integrating overall firm performance and innovativeness to assess overall OP. In the present study, we focus on market performance and HRM performance, and adopt these two factors for the OP dimension.

Typically, firm business performance is measured using financial metrics. Venkatraman (1990) advocated measures of business performance by return on assets (ROA), operating income, cost per sales, and sales per number of employees. Jahera and Lloyd (1992) proposed that return on investment (ROI) is a valid performance measure for midsize firms. Morash et al. (1996) measured firm performance relative to competitors using ROA, ROI, return on sales (ROS), ROI growth, ROS growth, and sales growth. Tan et al. (1999) linked certain SCM practices with firm performance. Performance in their study was measured by senior management's perceptions of a firm's performance in comparison to that of a major competitor's.

In summary, various key measures of business performance have been used in the literature to assess the impact of business environment, strategic decisions, and supply chain practices on firm performance. Based on prior research, in this study, business performance is measured using the respondent's perception of performance in relation to competitors. The measurement variables are comprised of market share, sales growth, profit margin, ROI and ROA, which are summarized in Table IV. It has been broadly embraced that an important effect of achieving alignment is presumed to enhance the business performance of a firm, just as misalignment is expected to undermine its performance (e.g. Tarigan, 2005). Therefore, in order to statistically determine how the alignment affects firm business performance, H4 is proposed to test the effect of alignment between BEC, competitive priorities, and SCS on firm business performance.

3. Technology and organizational Performance

A review of the literature indicates that previous researchers have broadly categorized technology in terms of its 'tacit' and 'explicit' nature (Polanyi, 1962). These two forms of technology are also referred to as 'hardware' and 'software' technology. The technology term has been extensively debated by both hardware and software schools. Based on the definitions given, the researchers from the hardware school define technology as "the construction and use of machines, systems, processes or engineering" (Strassman, 1968; Jones, 1970; Hawthorne, 1971; Galbraith, 1972; Goulet, 1989; Lovell, 1998; Reisman, 2005). Generally, hardware technology corresponds with explicit knowledge; which refers to knowledge which underlies technology that can easily be codified, shared, transmitted, retrieved, reused, transferable in formal or systematic language i.e. production manuals, academic papers, books, technical specifications, and designs, and is only useful when tacit knowledge enables individuals and organizations to use it (Techakanont and Terdudomtham, 2004). Software technology, on the other hand, corresponds with implicit/tacit knowledge underlying technology that is difficult to codify, communicate, transfer, and is generally exchanged through action, commitments and direct involvement such as face-to-face communication or on-the-

job/apprenticeship type of training (Ernst and Kim, 2002).

The KBV studies have argued that tacit knowledge, which includes insights, intuitions, hunches, rule of thumb, gut feeling, personal and organizational skills, and managerial and marketing expertise, is difficult to codify; where it can only be observed through its application and acquired through practice (Nonaka, 1994; Lane et al., 2001). Thus, tacit knowledge transfer between individuals is slow, costly and uncertain (Kogut and Zander, 1992). Acquiring tacit knowledge is subject to time-compression diseconomies; which means to accelerate tacit knowledge learning is very difficult or perhaps not even possible no matter how much efforts or resources are invested to acquire them within a short period of time (Dierickx and Cool, 1989; Lin, 2003). This is because tacit knowledge is unique to the knowledge owner and not codifiable in formulas or manuals, and cannot be easily reverse-engineered (Zander and Kogut, 1995). On the other hand, explicit knowledge such as product technologies, physical distribution methods, and promotion techniques, lies in the organization's policies, systems, guidelines and standardized procedures, and could be acquired, exploited and transferred inter-organizationally in a formal and systematic language (Polanyi, 1967; Nelson and Winter, 1982; Martin and Solomon, 2003). Explicit knowledge is referred to as "knowledge that could be articulated, codified, shared and transferred in the form of data, formulae and principles, accessed using verbal communication and written documents through words and numbers, and is less likely to act as a firm's competitive advantage" (Kogut and Zander, 1992; Winter, 1987).

Other theoretical studies have argued that tacit knowledge is hard to formalize, often sticky, not easily visible, and difficult to communicate, transfer and share between the alliance partners as it involves 1) intangible factors embedded in the personal beliefs, experiences, and values in an organization (Inkpen, 1998a, 2000), 2) internal individual processes like experience, reflection, internalization or individual talents (Nonaka, 1994), and 3) high incremental cost of transferring knowledge to a specified location in a form usable by a given party (von Hippel, 1994). The OL literature theoretically deals with organization tacit knowledge from several dimensions for instance: 1) tacit knowledge as an important key in building the organization's competitiveness (Inkpen, 1998a), 2) organizational learning mainly occurs through transfer of tacit knowledge (Glaister et al. 2003), 3) organization capabilities often involve the acquisition of tacit knowledge (Makhija and Ganesh, 1997), 4) learning in JV is concentrated on the acquisition of tacit knowledge such as management skills and marketing know-how knowledge (Lane et al. 2001), and 5) knowledge tacitness determines the accessibility of alliance knowledge acquisition by partners (Inkpen, 2000).

The TT and KT literature have also acknowledge that a substantial transfer of technology regardless whether tacit or explicit technology will positively 1) lead to a higher potentials of innovation performance/capabilities (Guan et al., 2006; Kotabe et al., 2007)), 2) increase in technological capabilities (Madanmohan et al., 2004), 3) enhance the competitive advantage (Liao and Hu, 2007; Rodriguez and Rodriguez, 2005), 4) enhance the organizational learning effectiveness (Inkpen, 2000; Inkpen and Dinur, 1998), 5) effect the productivity (Caves, 1974; Xu, 2000; Liu and Wang, 2003), 6) increase the technological development of local industry (Markusen and Venables, 1999), and 7) improve the economic growth of the host country (Blomstrom, 1990). Most of the studies on strategic alliance operationalize performance as either the JV's or MNCs' subsidiary performance. A review of literature reveals that most of the empirical studies on inter-firm technology and knowledge transfer in strategic alliance, particularly on IJVs, are limiting their focus on the performance of the IJVs (Lyles and Salk, 1996; Lane et al., 2001; Tsang et al., 2004; Dhanaraj et al., 2004; Steensma and Lyles, 2000). In the context of intra-firm knowledge transfer many studies concentrate on the performance of the MNCs' subsidiary in the host countries (Ofer & Potterovich, 2000). Intra and inter-firm empirical studies on knowledge transfer and acquisition have established that knowledge transfer and acquisition have a significant positive effect on human resource, business and general performance (Lyles and Salk, 1996), operational cost, operational efficiency, employee productivity, business volume, market share, market penetration, product quality, customer service, and customer satisfaction (Lane et al., 2001; Tsang et al., 2004; Dhanaraj et al., 2004; Cui et al., 2006). On the local firms' performance (LFP), tacit knowledge acquisition is found to have a significant positive effect on the recipient firms' performance in terms of increasing their productivity, revenue and market share (Yin and Bao, 2006).

4. Discussion and Conclusion

Building on the underlying KBV and OL perspectives, this study has bridged the literature gaps by providing empirical evidence on the effects of two distinct degrees of technology transfer: degrees of tacit and explicit knowledge on two dimensions of performance: corporate and human resource performances using the Malaysia sample. The results suggest that the higher the degree of technology

transfer (both tacit and explicit knowledge) the greater the corporate and human resource performance of local recipient firms. The results are consistent with the findings in the previous literature which found that both tacit (TCTDEG) and explicit (EXPDEG) knowledge are highly capable in increasing both performances (Lane et al., 2001; Lyles and Salk, 1996; Yin and Bao, 2006; Tsang et al., 2004) suggesting that a higher degree of TCTDEG and EXPDEG contributes to high improvement and increment of 1) the local firms' business volume, market share, planned goals, and profit, and 2) the local firms' product/service quality, employees' productivity, managerial techniques/skills, and operational efficiency (Dhanaraj et al., 2004). Interestingly, the results for significant effect of TCTDEG on CPERF have indeed supported the theoretical argument which argued that since tacit knowledge (new product/service development, managerial systems and practice, process designs and new marketing expertise) is organizationally embedded in the interdependent systems, expertise and complex individuals and groups' routines of the technology suppliers therefore these strategic valuable resources and competencies if transferred will lead to an increase the local firms' competitiveness, enological capabilities, organizational learning effectiveness, productivity and create potentials for innovations (Inkpen, 2000; Inkpen and Dinur, 1998; Xu, 2000; Liu and Wang, 2003). The results have expanded the general findings by Dhanaraj et al. (2004); where TCTDEG had a significant effect on IJV performance. The significant role of degree of explicit knowledge (EXPDEG) on human resource performance is explained by its explicit nature (manufacturing/service techniques/skills, promotion techniques/skills, distribution know-how, and purchasing know-how); which is frequently standardized by the technology supplier in the form of standard manuals, procedures, and blueprints thus it is less 'stickier' than tacit knowledge, easier to articulate and understand, and more easy to be shared, communicated and transferred.

References

1. Andersen JA. 2006. "Leadership, personality and effectiveness", Journal of Socio-Economics, Vol. 35 No. 6, pp. 1078-91.
2. Barley SR. 1990. "the alignment of technology and structure through roles and networks", Administrative Science Quarterly, Vol. 35, pp. 61-103.
3. Bass FM. 1969. "A new product growth model for consumer durables", Marketing Science 15, 215–227.
4. Berry MM, Taggart JH. 1994. "Managing technology and innovation: A review",R&D Management, 24(4), 341–353.
5. Bijker WE, Hughes TP, Pinch TJ. (Eds). 1987. ''The Social Construction of Technological Systems", MIT Press, Cambridge, MA.
6. Bijker WE, Law J (Eds). 1992. "Shaping Technology/Building Society: Studies in Sociotechnical Change", MIT Press, Cambridge, MA.
7. Blomstrom M. 1990. "Transnational Corporations and Manufacturing Exports from Developing Countries". New York, United Nations.
8. Brancheau JC, Wetherbe JC. 1990. "The adoption of spreadsheet software: testing innovation diffusion theory in the context of end-user computing", Information Systems Research, Vol. 1, pp. 115-43.
9. Bresman H, Birkinshaw J, Nobel R. 1999. "Knowledge Transfer in International Acquisitions", Journal of International Business Studies, 30(3), p. 439–62.
10. Bretschneider S, Wittmer D. 1993. "Organizational adoption of microcomputer technology: the role of sector", Information Systems Research, Vol. 4, pp. 88-108.
11. Brown SL, Eisenhardt KM. 1997. "The art of continuous change: linking complexity theory and time-paced evolution in relentlessly shifting organizations", Administrative Science Quarterly, Vol. 42, pp. 1-34.
12. Cumming JL, Teng BS. 2003. "Transferring R&D Knowledge: The Keys Factors Affecting Knowledge Transfer Success", Journal of Engineering and Technology Management, 20, p. 39-68.
13. Dahlman C, Aubert JE. 2001. "China and the Knowledge Economy: Seizing the 21st Century", World Bank Institute, Beijing.
14. Dekimpe MG, Parker PM, Sarvary M. 2000. "Global diffusion of technological innovations: a coupled hazard approach", Journal of Marketing Research, 37 (1), 47–59.
15. Dhanaraj C, Lyles MA, Steensma HK, Tihanyi L. 2004. "Managing Tacit and Explicit Knowledge Transfer in IJVs: the Role of Relational Embeddedness and the Impact on Performance", Journal of International Business Studies, 35(5), p. 428-42.
16. Drazin R, Schoonhoven CB. 1996. "Community, population, and organization effects on innovation: a multilevel perspective", Academy of Management Journal, Vol. 39, pp. 1065- 83.

17. Dussauge P, Hart S, Ramanatsoa B. 1992. "Strategic technology management'', New York: Wiley.
18. Frank L. 2004. "An analysis of the effect of the economic situation on modeling and forecasting the diffusion of wireless communications in Finland", Technological Forecasting and Social Change 71 (4), 391–403.
19. Gao J Jefferson GH. 2007. "Science and technology takeoff in China? Sources of rising R&D Intensity", Asia Pacific Business Review 13 (3), 357–371.
20. Gregory MJ. 1995. "Technology management: A process approach", Proceedings of the Institution of Mechanical Engineers, 209(5), 347–355.
21. Gruber H, Verboven F. 2001. "The evolution of markets under entry and standards regulation: the case of global mobile telecommunications", International Journal of Industrial Organization 19 (7).
22. Gurbaxani V. 1990. "Diffusion in computing networks: the case of BITNET",Communications of the ACM 33 (12), 65–75.
23. Hackett PG. 1990. "Investment in technology—the service sector sinkhole?", Sloan Management Review, 31(2), 97–103.
24. Hanvanich S, Sivakumar K, Tomas G, Hult M. 2006. "The relationship of learning and memory with organizational performance: the moderating role of turbulence", Journal of the Academy of Marketing Science, Vol. 34 No. 4, pp. 600-12.
25. Hau LN, Evangelista F. 2007. "Acquiring Tacit and Explicit Marketing Knowledge from Foreign Partners in IJVs", Journal of Business Research, 60, pp. 1152-1165.
26. Huang GQ, Mak KL. 1999. "Current practices of engineering change management in UK manufacturing industries", International Journal of Operations and Production Management, 19(1), 21–37.
27. Huselid MA, Jackson SE, Schuler RS. 1997. "Technical and strategic human resource management effectiveness as determinants of firm performance", Academy of Management Journal, Vol. 40 No. 1, pp. 171-88.
28. Inkpen AC. 2000. "Learning through Joint Ventures: A Framework of Knowledge Acquisition", Journal of Management Studies, 37(7), p. 1019-1043.
29. Jefferson GH. 2005. "R&D and innovation in China: has China begun its S&T takeoff? ", Harvard China Review 5 (2) 44–50.
30. Jahera JS, Lloyd WP. 1992. "Additional evidence on the validity of ROI as a measure of business performance", The Mid-Atlantic Journal of Business, Vol. 28 No. 1, pp. 105-20.
31. Jolly VK .1997. "Commercializing New Technologies: Getting from Mind to Market", Harvard Business School Press, Boston, MA.
32. Lai YW, Narayanan S. 1997. "The Quest for Technological Competence via MNCs: A Malaysian Case Study", Asian Economic Journal, 11(4), p. 407-422.
33. Lee YG, Song YI. 2007. "Selecting the key research areas in nano-technology field using technology cluster analysis: A case study based on national R&D programs in South Korea", Tec novation, 27(1–2), 57–64.
34. Lee YC, Lee SK .2007. "Capability, processes, and performance of knowledge management: a structural approach", Human Factors and Ergonomics in Manufacturing, Vol. 17 No. 1, pp. 21-41.
35. Madanmohan TR, Kumar U, Kumar V. 2004. "Import-led Technological Capability: A Comparative Analysis of Indian and Indonesian Manufacturing Firms", Technovation, p. 979-993.
36. Makhija MV, Ganesh U. 1997. The Relationship between Control and Partner Learning–Related Joint Ventures", Organization Science, 8(5), p. 508-527.
37. Minbaeva D. 2007. Knowledge Transfer in Multinationals, Management International Review, 47(4), p. 567-593.
38. Moneva JM, Rivera-Lirio JM, Mun˜oz-Torres MJ. 2007. "The corporate stakeholder commitment and social and financial performance", Industrial Management & Data Systems, Vol. 107 No. 1, pp. 84-102.
39. Morash EA, Dro¨ge CLM, Vickery SK. 1996. "Strategic logistics capabilities for competitive advantage and firm success", Journal of Business Logistics, Vol. 17, pp. 1-22.
40. Ofer C, Polterovich V. 2000. "Modern Economics Education in TEs: Transfer Technology in Russia", Comparative Economic Studies, 42(2), p. 5-35.
41. Organization of Economic Cooperation and Development (OECD). 2002.OECD Science, Technology and Industry Outlook, OECD, Paris.
42. Pak Y, Park Y. 2004. "A Framework of Knowledge Transfer in Cross-Border Joint Ventures: An Empirical Test of the Korean Context", Management International Review, 44(4), p. 435-455.
43. Prajogo DI. 2007. "The relationship between competitive strategies and product quality", Industrial Management & Data Systems, Vol. 107 No. 1, pp. 69-83.
44. Rogers EM. 1995. "Diffusion of Innovations, fourth ed", Free Press, New York, NY.

45. Ronde P. 2001. "Technological clusters with a knowledge-based principle: Evidence from a Delphi investigation in the French case of the life sciences", Research Policy, 30(7), 1041–1057.
46. Ronde P. 2003. "Delphi analysis of national specificities in selected innovative areas in Germany and France", Technological Forecasting and Social Change, 70(5), 419–448.
47. Rosenberg N. 1994. Exploring the Black Box: Technology, Economics, and History, Cambridge University Press, Cambridge.
48. Saugstrup D, Henten A. 2006. "3G standards: the battle between WCDMA and CDMA2000. Info 8 (4), 10–20.
49. Simonin BL. 2004. "An Empirical Investigation of the Process of Knowledge Transfer in International Strategic Alliances", Journal of International Business Studies, 35(5), 407-27.
50. Strassman WP. 1968. "Technological Change and Economic Development: The Manufacturing Process of Mexico and Puerto Rico" Ithaca: Cornell University Press.
51. Tan KC, Kannan VR, Handfield RB, Ghosh S. 1999. "Supply chain management: an empirical study of its impact on performance", International Journal of Operations & Production Management, Vol. 19 No. 10, pp. 1034-52.
52. Torkkeli M, Tuominen M. 2002. "The contribution of technology selection to core competencies", International Journal of Production Economics, 77(3), 271–284.
53. Tornatzky LG, Klein RJ. 1982. "Innovation characteristics and innovation adoption lamentation: a meta-analysis of findings", IEEE Transactions on Engineering Management, Vol. EM-29 No. 1, pp. 28-45.
54. United Nations Development Program (UNDP), Human Development Report. 2001. Making New Technologies Work for Human Development, Oxford University Press, New York.
55. Utterback JM. 1994. "Mastering the Dynamics of Innovation", Harvard Business School Press, Boston, MA.
56. Venkatraman N, Ramanu V. 1986. "Measurement of business economic performance: an examination of method convergence", Journal of management Development, Vol. 13 No. 1, pp. 109-22.
57. Wong WP, Wong KY. 2007. "Supply chain performance measurement system using DEA modeling", Industrial Management & Data Systems, Vol. 107 No. 3, pp. 361-81.
58. Xu B. 2000. "Multinational Enterprises, Technology Diffusion, and Host Country Productivity Growth", Journal of Development Economics, 62, p. 477-493.
59. Yin E, Bao Y. 2006. "The Acquisition of Tacit Knowledge in China: An Empirical Analysis of the 'Supplier-side Individual Level' and 'Recipient-side' Factors", Management International Review, 46(3), p. 327-348.

3/1/2014