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A model for designing an innovation capability in Indian Company

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Abstract

The aim of this study is to identify and rank the factors of innovation capability (IC) in Indian micro, small and medium enterprises (MSMEs). This study focuses on ascertaining the important factors that help in enhancing the IC with an emblematic focus on the MSME sector of India. This paper proposes a multicriteria decision-making methodology, which is based on fuzzy analytic hierarchical process to prioritize the factors that enhance the IC of MSMEs. Finally, sensitivity analysis is conducted to examine the ranking stability. Knowledge management is the most important enabler, followed by creativity and idea management and organizational culture. Several organizations promote the strategic measures for enhancing the IC. To increase their capability to innovate, there is a need to identify, acknowledge and implement the drivers of IC into practice. Prioritization done in the study facilitates the entrepreneurs to determine the most important factors that need crucial attention in dealing with sensitive issues of IC. Entrepreneurs can take several steps to implement the most important factors for enhancing the IC into practices for meeting the needs of the consumers, generating profits and enhancing the competitiveness.

Keywords: innovation, Indian Company, capability, medium enterprises.

Introduction:

Innovation is an attractive, yet ambiguous goal for several organizations. It promises to enhance the profits, satisfy the needs of the customers, increase market exposure, gain the competitive advantage, provide sustainable development and give better performance (Chen et al., 2018; Srivastava et al., 2017; Swann, 2018; Gunday et al., 2011; Kuratko et al., 2005; Teece, 2007; Stock et al., 2002). The reason innovation is so valuable is that it is rare. The present scenario of globalization, multifaceted business environment, smaller product life cycle and vertical integration has elevated the significance of innovation for all organizations and particularly for micro, small and medium enterprises (MSMEs). Disruptions are unpredictable in a dynamic business environment. For enhancing the sustainability and competitiveness of a business, the process of innovation capability (IC) must be intended in such a way that it will produce effective and efficient innovations, thereby making it capable of generating higher returns and increased market exposure (Stock et al., 2002). The process of IC is multidimensional and aims at developing more and more innovations for reducing vulnerability. The potential to generate the innovation is called IC (Neely et al., 2001). It can be enhanced by enhancing the capability to innovate (Fruhling and Siau, 2007; Saunila and Ukko, 2012).

In a turbulent business environment, an enterprise must possess the ability to reconstruct, renew and recreate the available resources to develop the IC. The IC of enterprises can be described in several perspectives. Thus, according to Bergendahl et al. (2008), IC includes the ability to adapt to the new environment, technical learning and organizational learning and work procedures. Lawson and Samson (2001) identify seven constructs ("vision and strategy, harnessing the competence base, organizational intelligence, creativity and idea management, organizational structure and systems, culture and climate, and the management of technology") of IC and claim that organizations that explicitly generate and invest in these seven constructs are able to achieve sustainable innovation outcomes. Whereas, Olsson et al. (2009) identified six elements of an innovative organization. These elements explain the benefits as well as challenges attached while approaching IC.

The key to enhance IC is the identification of all the possible factors that may help in generating the capability to innovate. Proactive application of the strategies to enhance the probability of developing the IC (even in uncertainty) and effective planning for enhancing IC

provide deep insights for an effective decision-making process. Factors enhancing the IC should be primarily addressed for enabling innovation in an organization.

Factors of IC are somewhat interlinked. One driver of IC may have a direct positive influence over the other driver. To identify the factors of IC, they must be prioritized based on their overall influence over the other driver. The primary objective of the study is to prioritize the enablers of IC in the MSME sector of India.

The original contribution of this study is the application of the technique and its managerial implications. The fuzzy analytic hierarchical process (AHP) technique has been applied in this study to determine the rank of the factors of IC in the MSME sector. As the drivers of IC are interlinked, entrepreneurs must rank their selection, application, review and maintenance on those drivers that are extremely important. The rationale of the study is to provide a better understanding on enablers of innovation, especially for MSMEs, on one platform by providing the ranking of the enablers and to provide the future scope related to this area, which will help scholars, entrepreneurs, managers and policymakers. Author claims that this study will provide a path for future research in generating IC with the proper application of appropriate factors of IC. Finally, to ensure the robustness of the findings, sensitivity analysis was also performed.

This study is organized into six sections. Section 1 describes the introduction of the study. Section 2 explains the factors of IC and its related literature, followed by MSMEs in India. In Section 3, methodology used in the study is explained. Section 4 provides the results of this study, followed by Section 5, which deals with sensitivity analysis and managerial implication. This paper will end with conclusion and future scope in Section 6.

2. Literature review

2.1 Existing literature related to innovation capability

As mentioned earlier, IC is one area on which significant research has been carried out. Studies have examined the relationship that IC shares with various organizational variables in different contexts. Organizations with well-defined constructs of IC perform better because knowledge of such constructs makes it easier to identify which areas need attention to develop IC; organizations without such knowledge would not know where to invest in the first place (Lawson and Samson, 2001; Olsson et al., 2009). The authors in this study have identified

seven enablers of IC from available literature. Majority of these drivers are those that have been mentioned most frequently by researchers.

Resources are defined as the available assets in an organization that include knowledge, organizational features, skills, potential, etc. These are controlled by the organizations, as it enables them to conceive and execute and implement the strategies that help in enhancing the efficiency and effectiveness of innovation in the market (Barney and Clark, 2007). Resources are divided in two groups: operant resources and operand resources (Constantin and Lusch, 1994). Hunt (2004) defined the operant resources as human skills, knowledge and information, be it about the technologies, customers, competitors, etc., as well as the relational and organizational knowledge, like routines and control mechanism, whereas the operand resources are physical (tangible) resources. It is reported that the operant resources are more vital for IC than the operand resources (Lin, 2007; Du Plessis, 2007; Camps and Marques, 2014). According to Kamath et al. (2016), knowledge management (KM) has also been identified as the most important enabler of IC. Capabilities constitute knowledge that acts as a tool to enhance skills where the skills refer to the ability to do things with expertise. According to Wood et al. (1976), skills can be defined as operant's capabilities, whereas knowledge is a mental frame. Lin (2007) has identified a positive relationship between knowledge sharing and IC of an organization.

Fang et al. (2014) claimed that not only internal resources but also inter-firm innovation networks play a crucial role in attaining the competitive advantage. Moreover, collaboration that assists in enhancing the firm's IC is important. It was found that networking capabilities have four antecedents: openness of the culture, experience with network capabilities, IT maturity and the management system involved (Fang et al., 2014), which have been empirically validated. Romijn and Albaladejo (2002) and Kallio et al. (2012) posit the importance of collaboration for enhancing IC. Camps and Marques (2014), Yang (2012) and Saleh and Wang (1993) claimed that the propensity to take risk was one of the drivers that increased the IC of an organization. It is very important for every organization to develop openness to criticism and failure and the ability to tolerate ambiguity. Song and Di Benedetto (2006), Wagner and Hoegl (2006) and Hartley et al. (1997) cited supplier involvement as one of the important drivers of IC.

Involving customers and the suppliers in the process of production helps in enhancing the capability to innovate. To build customer loyalty, maximize profits and attract new customers,

customer involvement in the process of innovation is important (Feng et al., 2010). Morrison et al. (2000) also concluded that in developed economies, majority of technological innovations had been generated through involvement of customers in the innovation processes. Several previous research works claimed that involvement of the supplier is important for the development of innovations. Song and Di Benedetto (2008) identified a positive relationship between supplier participation and radical innovation. Wagner and Hoegl (2006) also posit that supplier involvement in new product development is vital and even inevitable in some organizations. But, several issues must be taken care of. First, the criteria for selecting suppliers (Wagner and Hoegl, 2006; Wynstra et al., 2003) is an important issue in the case of supplier involvement. The appropriate time for involving the supplier is another crucial issue that must be taken into account. McGinnis and Vallopra (1999, p. 14) suggested that organizations must engage suppliers only at the time of need and for developmental aspects. Hartley et al. (1997) stressed on the participation of suppliers in the initial stage of the product development process, whereas Eisenhardt and Tabrizi (1995) pointed out that it depends on the situation.

Technology management is vital for every organization in the current business environment. Lawson and Samson (2001) claimed that innovative organizations were those that were able to link their innovation and business strategies with technological strategy. Adoption of new technology helps in developing the capability to innovate by maintaining a database of suppliers and customers along with their preferences. Yang (2012) and Castro et al. (2013) also asserted that investment in appropriate technologies helped in enhancing IC. Other research work conducted by Tarafdar and Gordon (2007) and Khosrow-Pour (2006) identified the positive relationship between technology management and IC. Beliefs, norms, values and assumptions determine the climate of an organization. Martensen et al. (2007) and Neely et al. (2001) claimed that the organizational climate (OC) facilitated the culture of innovation in an organization and helped in increasing the number of innovations. Smith et al. (2008); Wan et al. (2005) and Lawson and Samson (2001) emphasized the importance of the OC in facilitating proper communication in organizations, supporting that OC enhanced collaboration with other organizations (Smith et al., 2000), which in turn helped in developing the IC of an organization. Several other authors, such as Slater et al. (2014); Saunila and Ukko (2013); Sharifirad and Ataei (2012); Kallio et al. (2012); Rujirawanich et al. (2011);

Skarzynski and Gibson (2008); Leskovar-Spacapan and Bastic (2007) and Lawson and Samson (2001), have also stressed the importance of the OC in developing IC.

Creativity, defined as a process of generating novel ideas (Amabile et al., 1996), is an important construct of IC (Lawson and Samson, 2001; Ahlin et al., 2014; Camps and Marques, 2014). Every organization must explicitly encourage creativity because only through enhancement of creativity, the organization will have better chances of achieving sustainable innovation. It was also concluded that knowledge sharing within the organization influences IC by supporting creativity (Perry-Smith and Shalley, 2003) and encouraging novel ideas and knowledge (Aragón-Correa et al., 2007).

2.2 Micro, small and medium enterprises in India

In India, there are approximately 46 million MSMEs across the several industries employing more than 106 million people. Maximum numbers (94 per cent) of enterprises in this sector are unregistered. In India, after agriculture, this sector provides employment to the maximum number of people and plays a very crucial role in the industrialization of rural as well as urban areas. The MSME sector complements the larger organizations and significantly contributes to the economic and social prosperity of the country. The contribution of this sector was very significant in the past decades, as it stands at approximately 40 per cent of the total nation export to 45 per cent of the total manufacturing output with 8 per cent of the gross domestic product. This particular sector of the economy holds the significant potential to enhance the industrial growth of the nation. Further, this sector contributes in the development of the nation through contribution to operational flexibility, contribution toward defense production, technology-oriented industries, location-wise mobility, capacities to develop appropriate indigenous technology, import substitution, low-investment requirements, low-intensive imports, domestic production, significant export earnings and competitiveness in national and international markets, thereby creating new entrepreneurs by providing training and knowledge.

But on the other hand, the Indian MSME sector faces numerous challenges, such as insufficient skilled manpower, technological obsolescence, working capital shortages, not getting trade receivables from large and multinational companies on time, turbulent and uncertain market scenario, sub-optimal scale of operation, change in manufacturing strategies, supply chain inefficiencies and increasing domestic and global competition. Owing to these

challenges, there is a need for MSMEs to adopt innovative approaches in their day-to-day operation. MSMEs that are inventive, creative, global in their business point of view and innovative and have a robust technological base, competitive strength or a willingness and ability to reconstruct, recreate or restructure themselves can only survive in the present dynamic business environment and come out successfully to contribute more in the nation's gross domestic product.

2.3 Definition of micro, small and medium enterprises in India

Every economy has their own criteria for defining MSMEs. Some defined MSMEs in terms of number of employees; some defined it in terms of annual sales and turnover, whereas some defined it in terms of investment in plant and machinery. In India, MSMEs are defined in terms of investment in plant and machinery by MSMED Act 2006. This act classified enterprises in two categories: one is manufacturing enterprises and the other is service enterprises (Table II).

3. Research methodology

In this paper, given methodology has been applied for evaluation and ranking the innovation enablers. This paper used the fuzzy analytical hierarchical process to get weights of criteria and prioritize to find the final rank. Fuzzy analytical hierarchical process (FAHP) is a multicriteria decision-making (MCDM) tool. By using the fuzzy concept, vagueness and uncertainty can be managed. This method is suitable in such a complex multicriteria decision environment. Figure 1 shows a graphic map of the proposed research methodology.

The proposed outline of this research work is illustrated through Figure 1. Initially, identification of IC factors was done through an in-depth literature analysis and followed by discussions with industrial experts. After that, pairwise comparison through a questionnaire are obtained for listed factors. Hereafter, specific factors are evaluated and respective weights of the factors are determined by using FAHP. If the weights are consistent, then they are approved, as shown through the symbol Y, where "Y" stands for yes. Otherwise, they are revised, as shown through the symbol N, where "N" stands for no. After that, factors are prioritized and analyzed further, as highlighted through the figure.

3.1 Fuzzy AHP

The AHP approach pioneered by Saaty (1980) is a mathematical approach of MCDM. AHP has some limitations in usability because of certainty and the subjective nature of the used scale. This problem can be minimized if AHP is integrated with the fuzzy concept (Garg, 2016; Prakash and Barua, 2016a, 2016b, 2016c, Prakash and Barua, 2015a, Prakash et al., 2015b). The fuzzy AHP methodology includes uncertainty and vagueness of the expert's judgments through linguistic variables. Various researchers have used this approach in different areas like urban planning, education, finance, transportation, politics, economics, marketing, logistics and reverse supply chain (Garg et al., 2017; Kumar and Garg, 2017; Prakash and Barua, 2015c; Prakash et al., 2015a, 2015b, 2014). Chang's extent analysis (1992) presented the fuzzy AHP process; according to this approach, the values of extent method for each criterion are derived. The steps of Chang's analysis have been used. This approach was also used by Prakash et al. (2015a, 2015b, 2015c) and Prakash and Barua (2016b).

4. Results and discussions

Our results show the ranking of various innovation enablers by using fuzzy AHP. The prioritization of the IC factors has been done by observing the highest weightage value, which shows that KM with the weightage value of 0.25751 is the most important factor that helps in enhancing the IC of the MSME sector. In the current business scenario, organizations, especially MSMEs, are fighting for their survival. To be innovative at local, national and global markets, there is a need to develop and enhance organizations' capabilities. For that, KM must be an integral part of developing and enhancing the ICs of MSMEs, as KM includes the improvement of knowledge generation or transfer through knowledge acquisition, assimilation and dissemination. Knowledge can be enhanced by sharing it within and outside an organization. Knowledge sharing means collecting and donating knowledge, which can be done by capturing, managing and transferring based on experience that exists within an organization (Lin, 2007). The second important factor for developing IC in MSMEs is creativity and idea management (CIM). In MSMEs, there is a need to drive some combination of creative ideas and the ability for their execution. No doubt, the present business environment is dynamic and multifaceted. This scenario demands improved dynamism of approach. Only the organizations that are discerning are able to handle and manage the

changes that are inherent in the current business environment. So, it is very important to manage the ideas effectively and efficiently in the MSME sector. Based on the weightage value, OC is the third most important factor that helps in generating and developing ICs. Martinez-Roman et al. (2011) claim cross-functional communication and hierarchical power and reward system, whereas Smith et al. (2008) highlight the importance of level of decentralization as the determinants of IC, which constitutes OC. At the fourth place, risk-taking (RT) with the weightage value of 0.109246 plays an important role in the process of innovation. Generally, RT is considered as a negative concept. No doubt, some risks are not fruitful but some are well paid off. RT ability leads to learning about new things, approaches, attitude and thinking. RT does not mean doing things without planning; the chances of success will be more if an entrepreneur takes calculated risk. Innovation means developing new things, and RT is also associated with newness and unexplored things, which means without risk, an organization will not generate innovations. Information and technology management (ITM) is at the fifth place with the weightage value of 0.073473. Participation of the actors (customer, suppliers and employees), which stood at sixth rank, is another important factor for enhancing the ICs in the MSME sector. The last factor identified for enhancing the IC of MSMEs is collaboration (CO). Collaboration means working together for the benefit of the team or organization. In a healthy team, every entity is connected and shares a relationship of cooperation. Innovation is a result of sharing of organizational resources, knowledge and time. In many research and development activities, enterprises have to be involved with other organizations and go for interorganizational agreement in the field of research. Only those industries that are active in collaborating with the universities, research institutes and other industries can easily achieve innovation. Other factors for innovation like RT and knowledge enhancement require the ability to change according to different situations. This factor prepares entrepreneurs to perform in a highly dynamic environment with the support of other entities as well. Generally, innovation is considered to be a solution to a problem that requires quick thinking, shifting priorities and going for an alternative course of action.

5. Sensitivity analysis and managerial implications

Among all categories of enablers, the creative environment enabler receives the highest priority weight. This enabler ranked as the highest among the other enablers carries the potential to influence other enablers. Hence, it is recommended to test the final ranking by varying the weights of all enablers (Vishwakarma et al., 2015, 2016a, 2016b; Prakash and Barua, 2016a). To illustrate the sensitivity analysis, the effect of an incremental change in value from 0.1 to 0.9, to KM, was determined, as shown in Table VII. The results of the sensitivity analysis indicate that the maximum relative change happened in KM (for details, please see Table VII and Figure 2). Further, owing to variation in the enabler weights, the specific enabler weights and their final ranking also varied. In sensitivity analysis, when creative environment enabler value is 0.1, the first rank is acquired by KM, whereas CO holds the last rank. Facto KM holds highest rank until the value of KM reaches to the value (i.e. 0.200). At normalized level, when KM value is 0.2751, then same enabler KM gets first rank and factor CO continues to obtain the last rank. From this point, KM values varied from 0.3 to 0.9, the first rank is acquired by knowledge management, however first rank is obtained by itself and the ranks of other enablers vary in the same manner (for details, please see Table VI and Figure 3). At this instance, it may be concluded that KM is very important in adopting and managing and enhancing the IC of MSMEs and, so, needs greater managerial concentration. If the managers are able to manage the KM factor and its related concerns in an effective manner, it will be quite useful in maintaining and implementing the innovation in MSMEs.

Implications of our study rest on understanding the importance of various enablers of IC in MSMEs and the manner in which enablers influence the capability to innovate. For entrepreneurs, enhancing the innovation begins with a clear and specific definition of the strategy of the firm. Entrepreneurs and policymakers should consider the various opportunities to develop the innovation to achieve the desired results. This finding highlights the fact that MSME entrepreneurs in India must possess necessary knowledge and skills with the help of which they acquire essential resources, including being able to take calculated and informed risk and to develop innovative and creative solutions, remain aware of government initiatives and must possess the ability to sense future changes in the market. The importance of KM for developing IC is also highlighted by Al-Ahbab et al. (2017) and Hussein et al. (2016).

6. Conclusions

Enhancing the IC of MSMEs is a very complex and crucial process. In this study, we have explored the factors that act as a catalyst for ICs in MSMEs. In today's dynamic and multifaceted business environment, it is very imperative to enhance the performance of MSMEs so that they can offer a more innovative product and service that can compete with that offered by its global competitor. However, the question is how MSMEs can identify which factor is important for developing their capability to innovate. For that, it is very imperative to prioritize the factors influencing the IC of an organization. This study presents prioritization of the IC factors by identifying the enablers based on literature, industry experts and industry associates. Our study has confirmed the complexity and importance by prioritizing the various enablers of IC, especially in MSMEs. In addition to the identification of various factors enhancing IC, our results give the ranking to all the enablers. The priority-wise concern for the results of our study highlights several factors that would help entrepreneurs and policymakers to enhance innovation and researchers/scholars to better channelize their efforts to understand and study the phenomena.

6.1 Limitations and scope of future work

We have used the fuzzy AHP approach for prioritizing the factors influencing IC to improve the performance of Indian MSMEs. All pair comparisons in fuzzy AHP have been assigned by experts. From the relevant literature and experts' views in detail, other IC enablers can be identified and ranked. As it is natural, views of decision-makers may be subjective and vary. Different MCDM approaches may be applied using several approaches such as analytic network process, interpretative structure modeling, interpretative ranking process, decision-making trial and evaluation laboratory and multiple attribute utility theory for the similar problem and outcomes/results can be matched in the further studies.

References:

1. Ahlin, B., Drnovšek, M. and Hisrich, R.D. (2014), "Entrepreneurs' creativity and firm innovation: the moderating role of entrepreneurial self-efficacy", *Small Business Economics*, Vol. 43 No. 1, pp. 101-117.
2. Akman, G. and Yilmaz, C. (2008), "Innovative capability, innovation strategy and market orientation: an empirical analysis in Turkish software industry", *International Journal of Innovation Management*, Vol. 12 No. 1, pp. 69-111.

3. Al-Ahbabi, S., Singh, S.K., Gaur, S.S. and Balasubramanian, S. (2017), "A knowledge management framework for enhancing public sector performance", *International Journal of Knowledge Management Studies*, Vol. 8 Nos 3/4, pp. 329-350.
4. Alessi, M., Camillò, A., Chetta, V., Giangreco, E., Soufivand, M. and Storelli, D. (2015), "Applying idea management system (IMS) approach to design and implement a collaborative environment in public service related open innovation processes", *Complex Systems Informatics and Modeling Quarterly*, No. 5, pp. 26-38.
5. Amabile, T.M., Conti, R., Coon, H., Lazenby, J. and Herron, M. (1996), "Assessing the work environment for creativity", *Academy of Management Journal*, Vol. 39 No. 5, pp. 1154-1184.
6. Aragón-Correa, J.A., García-Morales, V.J. and Cordon-Pozo, E. (2007), "Leadership and organizational learning's role on innovation and performance: lessons from Spain", *Industrial Marketing Management*, Vol. 36 No. 3, pp. 349-359.
7. Barney, J.B. and Clark, D.N. (2007), *Resource-Based Theory: Creating and Sustaining Competitive Advantage*, Oxford University Press, Oxford.
8. Bergendahl, M.N., Blomé, M., Guve, B., Kaulio, M., Odenrick, P. and Olsson, A. (2008), "How to shape an innovative company", *Innovation Capability*, pp. 18-39.
9. Brockman, B.K. and Morgan, R.M. (2003), "The role of existing knowledge in new product innovativeness and performance", *Decision Sciences*, Vol. 34 No. 2, pp. 385-419.
10. Calantone, R.J., Cavusgil, S.T. and Zhao, Y. (2002), "Learning orientation, firm innovation capability, and firm performance", *Industrial Marketing Management*, Vol. 31 No. 6, pp. 515-524.
11. Camps, S. and Marques, P. (2014), "Exploring how social capital facilitates innovation: the role of innovation enablers", *Technological Forecasting and Social Change*, Vol. 88, pp. 325-348.
12. Castro, G.M.D., Delgado-Verde, M., Amores-Salvadó, J. and Navas-López, J.E. (2013), "Linking human, technological, and relational assets to technological innovation: exploring a new approach", *Knowledge Management Research and Practice*, Vol. 11 No. 2, pp. 123-132.
13. Chang, D.Y. (1992), "Extent analysis and synthetic decision", *Optimization Techniques and Applications*, Vol. 1 No. 1, pp. 352-355.
14. Chen, T. Cheng, H.K. Jin, Y. Li, S. and Qiu, L. (2018), "To trump or not to trump? Impact of competition on innovations of IT industry".
15. Cohen, W.M. and Levinthal, D.A. (1989), "Innovation and learning: the two faces of R & D", *The Economic Journal*, Vol. 99 No. 397, pp. 569-596.
16. Cohen, W.M. and Levinthal, D.A. (1994), "Fortune favors the prepared firm", *Management Science*, Vol. 40 No. 2, pp. 227-251.

17. Constantin, J.A. and Lusch, R.F. (1994), "Understanding resource management: how to deploy your people, products, and processes for maximum productivity", Planning Forum, Consulting Group (accessed 13 August 2008).
18. Damanpour, F. (1991), "Organizational innovation: a meta-analysis of effects of determinants and moderators", *Academy of Management Journal*, Vol. 34 No. 3, pp. 555-590.
19. Donkor, J., Donkor, G.N.A., Kankam-Kwarteng, C. and Aidoo, E. (2018), "Innovative capability, strategic goals and financial performance of SMEs in Ghana", *Asia Pacific Journal of Innovation and Entrepreneurship*, Vol. 12 No. 2, pp. 238-254, available at: <https://doi.org/10.1108/APJIE-10-2017-0033>
20. Du Plessis, M. (2007), "The role of knowledge management in innovation", *Journal of Knowledge Management*, Vol. 11 No. 4, pp. 20-29.
21. Eisenhardt, K.M. and Tabrizi, B.N. (1995), "Accelerating adaptive processes: product innovation in the global computer industry", *Administrative Science Quarterly*, Vol. 40 No. 1, pp. 84-110.
22. Fang, G., Ma, X., Ren, L. and Zhou, Q. (2014), "Antecedents of network capability and their effects on innovation performance: an empirical test of hi-tech firms in China", *Creativity and Innovation Management*, Vol. 23 No. 4, pp. 436-452.
23. Feng, T., Sun, L. and Zhang, Y. (2010), "The effects of customer and supplier involvement on competitive advantage: an empirical study in China", *Industrial Marketing Management*, Vol. 39 No. 8, pp. 1384-1394.
24. Flynn, M., Dooley, L., O'sullivan, D. and Cormican, K. (2003), "Idea management for organisational innovation", *International Journal of Innovation Management*, Vol. 7 No. 4, pp. 417-442.
25. Forsman, H. (2011), "Innovation capacity and innovation development in small enterprises. a comparison between the manufacturing and service sectors", *Research Policy*, Vol. 40 No. 5, pp. 739-750.
26. Fruhling, A.L. and Siau, K. (2007), "Assessing organizational innovation capability and its effect on e-commerce initiatives", *Journal of Computer Information Systems*, Vol. 47 No. 4, pp. 91-103.
27. Garg, C.P. (2016), "A robust hybrid decision model for evaluation and selection of the strategic alliance partner in the airline industry", *Journal of Air Transport Management*, Vol. 52, pp. 55-66.
28. Garg, C., Sharma, A. and Goyal, G. (2017), "A hybrid decision model to evaluate critical factors for successful adoption of GSCM practices under fuzzy environment", *Uncertain Supply Chain Management*, Vol. 5 No. 1, pp. 59-70.
29. Gibbert, M., Leibold, M. and Probst, G. (2002), "Five styles of customer knowledge management, and how smart companies use them to create value", *European Management Journal*, Vol. 20 No. 5, pp. 459-469.

30. Gordon, S.R. and Tarafdar, M. (2007), "How do a company's information technology competences influence its ability to innovate?", *Journal of Enterprise Information Management*, Vol. 20 No. 3, pp. 271-290.
31. Guan, J. and Ma, N. (2003), "Innovative capability and export performance of Chinese firms", *Technovation*, Vol. 23 No. 9, pp. 737-747.
32. Gunday, G., Ulusoy, G., Kilic, K. and Alpkan, L. (2011), "Effects of innovation types on firm performance", *International Journal of Production Economics*, Vol. 133 No. 2, pp. 662-676.
33. Hartley, J.L., Meredith, J.R., McCutcheon, D. and Kamath, E.R. (1997), "Suppliers' contributions to product development: an exploratory study", *IEEE Transactions on Engineering Management*, Vol. 44 No. 3, pp. 258-267.
34. Hull, C.E. and Covin, J.G. (2010), "Learning capability, technological parity, and innovation mode use", *Journal of Product Innovation Management*, Vol. 27 No. 1, pp. 97-114.
35. Hunt, S.D. (2004), "On the service-centered dominant logic for marketing: invite commentaries", *On Evolving to a New Dominant Logic for Marketing Journal of Marketing*, Vol. 68 No. 1, pp. 21-22.
36. Hurley, R.F. and Hult, G.T.M. (1998), "Innovation, market orientation, and organizational learning: an integration and empirical examination", *The Journal of Marketing*, Vol. 62 No. 3, pp. 42-54.
37. Hussein, A.T.T., Singh, S.K., Farouk, S. and Sohal, A.S. (2016), "Knowledge sharing enablers, processes and firm innovation capability", *Journal of Workplace Learning*, Vol. 28 No. 8, pp. 484-495.
38. Jaworski, B.J. and Kohli, A.K. (1993), "Market orientation: antecedents and consequences", *The Journal of Marketing*, Vol. 57 No. 3, pp. 53-70.
39. Jeng, D.J.F. and Pak, A. (2014), "The variable effects of dynamic capability by firm size: the interaction of innovation and marketing capabilities in competitive industries", *International Entrepreneurship and Management Journal*, pp. 1-16.
40. Kallio, A., Kujansivu, P. and Parjanen, S. (2012), "Locating the weak points of innovation capability before launching a development project", *Interdisciplinary Journal of Information, Knowledge and Management*, Vol. 7.
41. Khosrow-Pour, M. (Ed.) (2006), *Cases on Information Technology and Business Process Reengineering*, IGI Global.
42. Kamath, V., Rodrigues, L.L. and Desai, P.V. (2016), "The significance of knowledge management, innovation on firm performance in the Indian manufacturing sectors: an empirical analysis", *International Journal of Business Excellence*, Vol. 9 No. 2, pp. 178-191.
43. Kumar, D. and Garg, C.P. (2017), "Evaluating sustainable supply chain indicators using fuzzy AHP: case of Indian automotive industry", *Benchmarking: An International Journal*, Vol. 24 No. 6, pp. 1742-1766.

44. Kumar, N. and Che Rose, R. (2012), "The impact of knowledge sharing and Islamic work ethic on innovation capability", *Cross Cultural Management: An International Journal*, Vol. 19 No. 2, pp. 142-165.
45. Kuratko, D.F., Ireland, R.D., Covin, J.G. and Hornsby, J.S. (2005), "A model of middle-level managers' entrepreneurial behavior", *Entrepreneurship Theory and Practice*, Vol. 29 No. 6, pp. 699-716.
46. Lawson, B. and Samson, D. (2001), "Developing innovation capability in organisations: a dynamic capabilities approach", *International Journal of Innovation Management*, Vol. 5 No. 3, pp. 377-400.
47. Leskovar-Spacapan, G. and Bastic, M. (2007), "Differences in organizations' innovation capability in transition economy: internal aspect of the organizations' strategic orientation", *Technovation*, Vol. 27 No. 9, pp. 533-546.
48. Levi-Jakšić, M., Radovanović, N. and Radojičić, Z. (2013), "Absorptive capacity constituents in knowledge-intensive industries in Serbia", *Zbornik Radova Ekonomskog Fakulteta u Rijeci: časopis za Ekonomsku Teoriju i Praksu*, Vol. 31 No. 2, pp. 253-278.
49. Li, J. and Kozhikode, R.K. (2009), "Developing new innovation models: shifts in the innovation landscapes in emerging economies and implications for global R&D management", *Journal of International Management*, Vol. 15 No. 3, pp. 328-339.
50. Lin, H.F. (2007), "Knowledge sharing and firm innovation capability: an empirical study", *International Journal of Manpower*, Vol. 28 Nos 3/4, pp. 315-332.
51. López-Nicolás, C. and Meroño-Cerdán, Á.L. (2011), "Strategic knowledge management, innovation and performance", *International Journal of Information Management*, Vol. 31 No. 6, pp. 502-509.
52. McGinnis, M.A. and Vallopra, R.M. (1999), "Purchasing and supplier involvement in process improvement: a source of competitive advantage", *The Journal of Supply Chain Management*, Vol. 35 No. 4, pp. 42-50.
53. Martensen, A., Dahlgard, J.J., Mi Park-Dahlgard, S. and Grønholdt, L. (2007), "Measuring and diagnosing innovation excellence—simple contra advanced approaches: a danish study", *Measuring Business Excellence*, Vol. 11 No. 4, pp. 51-65.
54. Martinez-Roman, J.A., Gamero, J. and Tamayo, J.A. (2011), "Analysis of innovation in SMEs using an innovative capability-based non-linear model: a study in the province of Seville (Spain)", *Technovation*, Vol. 31 No. 9, pp. 459-475.
55. Miller, D.J., Fern, M.J. and Cardinal, L.B. (2007), "The use of knowledge for technological innovation within diversified firms", *Academy of Management Journal*, Vol. 50 No. 2, pp. 307-325.
56. Morrison, P.D., Roberts, J.H. and Von Hippel, E. (2000), "Determinants of user innovation and innovation sharing in a local market", *Management Science*, Vol. 46 No. 12, pp. 1513-1527.

57. Neely, A., Filippini, R., Forza, C., Vinelli, A. and Hii, J. (2001), "A framework for analysing business performance, firm innovation and related contextual factors: perceptions of managers and policy makers in two European regions", *Integrated Manufacturing Systems*, Vol. 12 No. 2, pp. 114-124.
58. Nonaka, I. and Takeuchi, H. (1995), "The knowledge creation company: how Japanese companies create the dynamics of innovation".
59. Olsson, A., Blomé, M., Guve, B., Kaulio, M., Norell Bergendahl, M. and Odenrick, P. (2009), "Organizational factors affecting product innovation capability: findings from the med-tech industry." DS 58-1: Proceedings of ICED 09, the 17th International Conference on Engineering Design, Vol. 1, Design Processes, Palo Alto, CA, 24-27 08 2009.
60. Perry-Smith, J.E. and Shalley, C.E. (2003), "The social side of creativity: a static and dynamic social network perspective", *Academy of Management Review*, Vol. 28 No. 1, pp. 89-106.
61. Prakash, C. and Barua, M.K. (2015a), "Integration of AHP-TOPSIS method for prioritizing the solutions of reverse logistics adoption to overcome its barriers under fuzzy environment", *Journal of Manufacturing Systems*, Vol. 37, pp. 599-615.
62. Prakash, C. and Barua, M.K. (2016a), "A combined MCDM approach for evaluation and selection of third-party reverse logistics partner for Indian electronics industry", *Sustainable Production and Consumption*, Vol. 7, pp. 66-78.
63. Prakash, C. and Barua, M.K. (2016b), "A multi-criteria decision-making approach for prioritizing reverse logistics adoption barriers under fuzzy environment: case of Indian electronics industry", *Global Business Review*, Vol. 17 No. 5, pp. 1107-1124.
64. Prakash, C. and Barua, M.K. (2016c), "A robust multi-criteria decision-making framework for evaluation of the airport service quality enablers for ranking the airports", *Journal of Quality Assurance in Hospitality and Tourism*, Vol. 17 No. 3, pp. 351-370.
65. Prakash, C., Barua, M.K. and Balon, V. (2015a), "Prioritizing TQM enablers to improve Indian airlines performance under fuzzy environment", *Industrial Engineering Journal*, Vol. 8 No. 8, pp. 28-34.
66. Prakash, C., Barua, M.K. and Pandya, K.V. (2015b), "Barriers analysis for reverse logistics implementation in Indian electronics industry using fuzzy analytic hierarchy process", *Procedia – Social and Behavioral Sciences*, Vol. 189, pp. 91-102.
67. Prakash, C., Barua, M.K., Vishwakarma, V. and Balon, V. (2014), "A multi criteria decision making approach to overcome its barriers in green supply chain management under fuzzy environment", *Proceedings of the International Conference on Research and Sustainable Business*, pp. 8-9.
68. Rollins, M. and Halinen, A. (2005), "Customer knowledge management competence: towards a theoretical framework", *Proceedings of the 38th Annual HI International Conference on System Sciences, 2005. HICSS'05, IEEE*, pp. 240a-240a.

69. Romijn, H. and Albaladejo, M. (2002), "Determinants of innovation capability in small electronics and software firms in southeast England", *Research Policy*, Vol. 31 No. 7, pp. 1053-1067.
70. Rujirawanich, P., Addison, R. and Smallman, C. (2011), "The effects of cultural factors on innovation in a Thai SME", *Management Research Review*, Vol. 34 No. 12, pp. 1264-1279.
71. Russell, R.D. (1990), "Innovation in organizations: toward an integrated model", *Review of Business*, Vol. 12 No. 2, pp. 19-28.
72. Saaty, T.L. (1980), *The Analytical Hierarchy Process, Planning, Priority. Resource Allocation*, RWS Publications.
73. Saleh, S.D. and Wang, C.K. (1993), "The management of innovation: strategy, structure, and organizational climate", *IEEE Transactions on Engineering Management*, Vol. 40 No. 1, pp. 14-21.
74. Sandstrom, C. and Bjork, J. (2010), "Idea management systems for a changing innovation landscape", *International Journal of Product Development*, Vol. 11 Nos 3/4, pp. 310-324.
75. Saunila, M. and Ukko, J. (2012), "A conceptual framework for the measurement of innovation capability and its effects", *Baltic Journal of Management*, Vol. 7 No. 4, pp. 355-375.
76. Saunila, M. and Ukko, J. (2013), "Facilitating innovation capability through performance measurement: a study of Finnish SMEs", *Management Research Review*, Vol. 36 No. 10, pp. 991-1010.
77. Saunila, M. and Ukko, J. (2014), "Intangible aspects of innovation capability in SMEs: impacts of size and industry", *Journal of Engineering and Technology Management*, Vol. 33, pp. 32-46.
78. Sharifirad, M.S. and Ataei, V. (2012), "Organizational culture and innovation culture: exploring the relationships between constructs", *Leadership and Organization Development Journal*, Vol. 33 No. 5, pp. 494-517.
79. Skarzynski, P. and Gibson, R. (2008), *Innovation to the Core: A Blueprint for Transforming the Way Your Company Innovates*, Harvard Business Press.
80. Slater, S.F., Mohr, J.J. and Sengupta, S. (2014), "Radical product innovation capability: literature review, synthesis, and illustrative research propositions", *Journal of Product Innovation Management*, Vol. 31 No. 3, pp. 552-566.
81. Smith, M., Busi, M., Ball, P. and van der Meer, R. (2008), "Factors influencing an organisation's ability to manage innovation: a structured literature review and conceptual model", *International Journal of Innovation Management*, Vol. 12 No. 4, pp.655-676.
82. Song, M. and Di Benedetto, C.A. (2008), "Supplier's involvement and success of radical new product development in new ventures", *Journal of Operations Management*, Vol. 26 No. 1, pp. 1-22.

83. Srivastava, S., Sultan, A. and Chashti, N. (2017), "Influence of innovation competence on firm level competitiveness: an exploratory study", *Asia Pacific Journal of Innovation and Entrepreneurship*, Vol. 11 No. 1, pp. 63-75, available at: <https://doi.org/10.1108/APJIE-04-2017-021>
84. Stock, G.N., Greis, N.P. and Fischer, W.A. (2002), "Firm size and dynamic technological innovation", *Technovation*, Vol. 22 No. 9, pp. 537-549.
85. Subramaniam, M. and Youndt, M.A. (2005), "The influence of intellectual capital on the types of innovative capabilities", *Academy of Management Journal*, Vol. 48 No. 3, pp. 450-463.
86. Swann, P. (Ed.) (2018), *New Technologies and the Firm: Innovation and Competition*, Routledge, Vol. 48.
87. Taherparvar, N., Esmaeilpour, R. and Dostar, M. (2014), "Customer knowledge management, innovation capability and business performance: a case study of the banking industry", *Journal of Knowledge Management*, Vol. 18 No. 3, pp. 591-610.
88. Tang, H.K. (1998), "An inventory of organizational innovativeness", *Technovation*, Vol. 19 No. 1, pp. 41-51.
89. Tarafdar, M. and Gordon, S.R. (2007), "Understanding the influence of information systems competencies on process innovation: a resource-based view", *The Journal of Strategic Information Systems*, Vol. 16 No. 4, pp. 353-392.
90. Teece, D.J. (2007), "Explicating dynamic capabilities: the nature and microfoundations of (sustainable) enterprise performance", *Strategic Management Journal*, Vol. 28 No. 13, pp. 1319-1350.
91. Vishwakarma, V., Prakash, C. and Barua, M.K. (2016a), "A fuzzy-based multi criteria decision making approach for supply chain risk assessment in Indian pharmaceutical industry", *International Journal of Logistics Systems and Management*, Vol. 25 No. 2, pp. 245-265.
92. Vishwakarma, V., Prakash, C. and Barua, M.K. (2016b), "Modeling the barriers of Indian pharmaceutical supply chain using fuzzy AHP", *International Journal of Operational Research*.
93. Wagner, S.M. and Hoegl, M. (2006), "Involving suppliers in product development: insights from R&D directors and project managers", *Industrial Marketing Management*, Vol. 35 No. 8, pp. 936-943.
94. Wan, D., Ong, C.H. and Lee, F. (2005), "Determinants of firm innovation in Singapore", *Technovation*, Vol. 25 No. 3, pp. 261-268.
95. Wood, D., Bruner, J.S. and Ross, G. (1976), "The role of tutoring in problem solving", *Journal of Child Psychology and Psychiatry*, Vol. 17 No. 2, pp. 89-100.
96. Wonglimpiyarat, J. (2010), "Innovation index and the innovative capacity of nations", *Futures*, Vol. 42 No. 3, pp. 247-253.

97. Wynstra, F., Weggeman, M. and Van Weele, A. (2003), "Exploring purchasing integration in product development", *Industrial Marketing Management*, Vol. 32 No. 1, pp. 69-83.
98. Yang, J. (2012), "Innovation capability and corporate growth: an empirical investigation in China", *Journal of Engineering and Technology Management*, Vol. 29 No. 1, pp. 34-46.
99. Yeşil, S., Koska, A. and Büyükbeşe, T. (2013), "Knowledge sharing process, innovation capability and innovation performance: an empirical study", *Procedia-Social and Behavioral Sciences*, Vol. 75, pp. 217-225.