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Enhancing linkage between Knowledge Sharing and Innovation in Public Higher Education Institutions: Moderating role of Technological Capability

Abstract

Innovation is a key factor that makes higher education institutions compatible with the ever-changing higher education landscape. Therefore, innovation is important for both private and public higher education institutions however, its importance for public higher education institutions (PHEIs) is even more due to its outreach. Thus, current study empirically examines technological capability as a moderator between knowledge sharing and innovation in PHEIs. The structured close ended questionnaire was distributed among educational leaders of PHEIs to collect the data. 216 questionnaires were received in a fully completed form hence, utilised for the final analysis. Partial least square structural equation modelling (PLS-SEM) technique was employed which is variance based and non-parametric technique to examine the research model. The current study reveals mixed findings as linkage between knowledge sharing and innovation found to be positive in PHEIs of Pakistan. However, technological capability as a moderator showed insignificant effect between knowledge sharing and innovation in PHEIs of Pakistan.

Keywords: knowledge sharing, innovation, technological capability, Pakistan

1. Introduction

Past fifteen years has witnessed the remarkable growth of research work on innovation after complaint of Kuznets (1962) on the paucity of research. Throughout these years, one question has been fundamental, why or why not companies innovate (Demircioglu and Audretsch, 2017). Nevertheless, Bugge and Bloch (2016, p. 1467) rightly asserted that “Innovation has traditionally been studied in the private sector”. Despite the significance and importance of this research gap highlighted by the various authors (i.e Demircioglu and Audretsch, 2017; Lašáková et al., 2017; Osborne and Brown, 2013), empirical research found to be scant in the context of public sector organizations. This lack of research is quite surprising as prior literature intensively indicates the dearth of empirical research about the importance, role and dynamics of innovation in the public sector organizations (Kuhlmann and Rip, 2014). This paucity of research is even more evident in the context of public higher education institutions (PHEIs).

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Furthermore, Knowledge management (KM) like innovation, typically discussed and examined in the profit seeking organizations, but it is equally an important area that contributes to the higher education institutions (HEIs) (Prahalad et al., 1990; Demircioglu and Audretsch, 2017). Various previous studies indicated that HEIs are in the business of knowledge that aims to create, share and disseminate the new knowledge (Akram and Hilman, 2017; Cheng et al., 2009a; Omerzel et al., 2011). Prior literature also identified several KM processes like knowledge acquiring, integration, creation, sharing, dissemination, codification. Nevertheless, one of the key knowledge management processes that makes KM programs successful is sharing of knowledge (Ramayah, 2013; Fullwood et al., 2013), that consequently lead towards organizational innovation.

In this way, HEIs play an important role to produce and reuse the existing knowledge through research and teaching that further open new horizons of issues and debates (Kim and Ju, 2008). Resultantly, knowledge sharing, resources and expertise are inevitable to the long run success of HEIs (Ramayah et al., 2013). Interestingly, prior literature unfolds the fact that empirical research is elusive on determining the role of knowledge sharing in HEIs (Howell and Annansingh, 2013). In addition, due to emergence of globalization and technological advancement universities are also compelled to be adaptive and dynamic to acclimatize themselves with the ever- changing external environment. A technological perspective postulates that innovation is a process to build a unique idea that utilise to produce distinctive products and services (Jakobson, 2007). Innovation based on modern technology provides a long-lasting competitive advantage in a competitive market (Schilling, 2005). Similarly, technological capability is equally important for HEIs to offer unique courses, programs and syllabus to their ultimate customers (students) by developing effective knowledge sharing channels. However, this area is largely neglected in the context of PHEIs by the academia. Therefore, current study examined the role of technological capability as a moderator between knowledge sharing and innovation in PHEIs of Pakistan.

2.1 Linkage between Knowledge Sharing and Innovation

Knowledge management and its sharing is considered as fundamental weapon and resource to bring innovation within every organization including universities. Knowledge management has progressed from more technocentric management form (McAdam and McCreedy, 1999) to a greater and holistic social process to cope up with ever changing and emerging demand for new and unique knowledge, learning and innovation (Brayton, 2016; Hohl, 2015; Jones and Sallis, 2013). It is therefore, knowledge as an important determinant plays its important role in HEIs to enhance their innovation capability which is critical building block of performance in education environment. Furthermore, nexus between knowledge sharing and innovation has been empirically examined by the prior studies. For instance, Al-husseini and Elbeltagi (2013, 2015a, 2015b) found knowledge sharing as an important predictor of innovation. Therefore, following hypothesis is presented

H1: knowledge sharing has a positive linkage with Innovation

2.2 Technological capability as moderator

Technological advancement has played significant role in shaping and effecting different industries to formulate and implement their strategies including higher education institutions. In this regard, Usman and yefolahan (2014a) stressed that universities should promote such tools that lead towards knowledge sharing among students like education institutions may explore various unique ways to share knowledge with students like Web 2.0 tools. Usman and Oyefolahan (2014a) also unfolds that technological support and availability significantly affect the knowledge sharing. Additionally, Usman and Oyefolahan (2014b) also support the arguments to encourage technological capability to enhance the knowledge sharing within universities that might lead to innovation within universities. They have also suggested that different ways to implement the technology to share knowledge within universities such as collaboration, communication, awareness, training and development, motivation, learning facility and knowledge. Various universities are implementing latest technology to enhance knowledge sharing that consequently increase innovation like Web 2.0 tools and portals. The fundamental aim of the portal development is to enhance the communication and collaboration among teachers, students and university management (Li et al., 2015; Toro and Joshi, 2015) that may lead to innovation within higher education institutions. Technological capability plays its important role in providing quality education to the students distinctively (Navimipour and Fouladi, 2017). Thus, a hypothesis may be drawn

H2: Technological capability moderates the relationship between knowledge sharing and Innovation

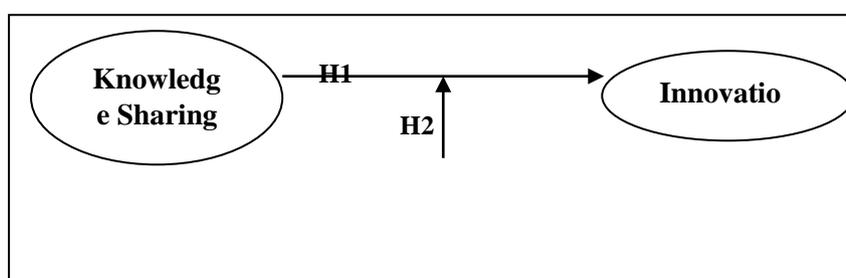




Figure 1
Conceptual Model

3. Methodology

Higher education is a knowledge intensive industry where innovation is an integral factor. Therefore, to attain research objectives the structured questionnaire was distributed among the top academic leaders of PHEIs of Pakistan including Vice Chancellors, Deans, Head of departments and full Professors as they are indulge in the strategic decision making about taking initiatives to enhance innovation. Total 216 questionnaire were received fully completed form to use for the final data analysis. Partial Least Square Structural Equation Modelling (PLS-SEM) was employed to examine measurement and structural model of the current study. PLS-SEM is a second generation of SEM that is variance-based technique to analyse the prediction based models.

3.1 Measurements

The current study adapted scales from the previous studies and modified in the context of the study. Innovation measured through two dimensions namely product development capability (PDC) and innovativeness. The measurement of PDC was derived from the work of Zou et al., (2003). The measurement scale of innovativeness was taken from Calantone et al., (2002). Furthermore, knowledge sharing was measured through the scale of Andreeva and Kianto (2011). Finally, to measure TC the scale of Kyläheiko et al., (2011) was used. All scales were measured on 5-point Likert scale where 1 shows strongly disagree and 5 denotes strongly agree.

4. Results and Interpretation

4.1 Results of Measurement Model

Table 4.1 and figure 1 is showing the results of the measurement model of the current study. Prior to examine the structural model, ensuring validity and reliability through measurement model is mandatory. The measurement model depicts values of factor loadings, composite reliability (CR) and average variance extract (AVE). To determine the internal reliability, internal item loadings and CR for all constructs are showing value greater than 0.7, thus establishing the adequate internal reliability (Hair et al., 2019). However, items with less than 0.70 factor loadings were deleted (i.e KS1, KS2) as recommended by Hair et al., (2019). Furthermore, AVE is used to determine the convergent validity, which is also showing greater than the recommended value of 0.50 (Hair et al., 2019). Therefore, the model achieved sufficient internal reliability and convergent validity.

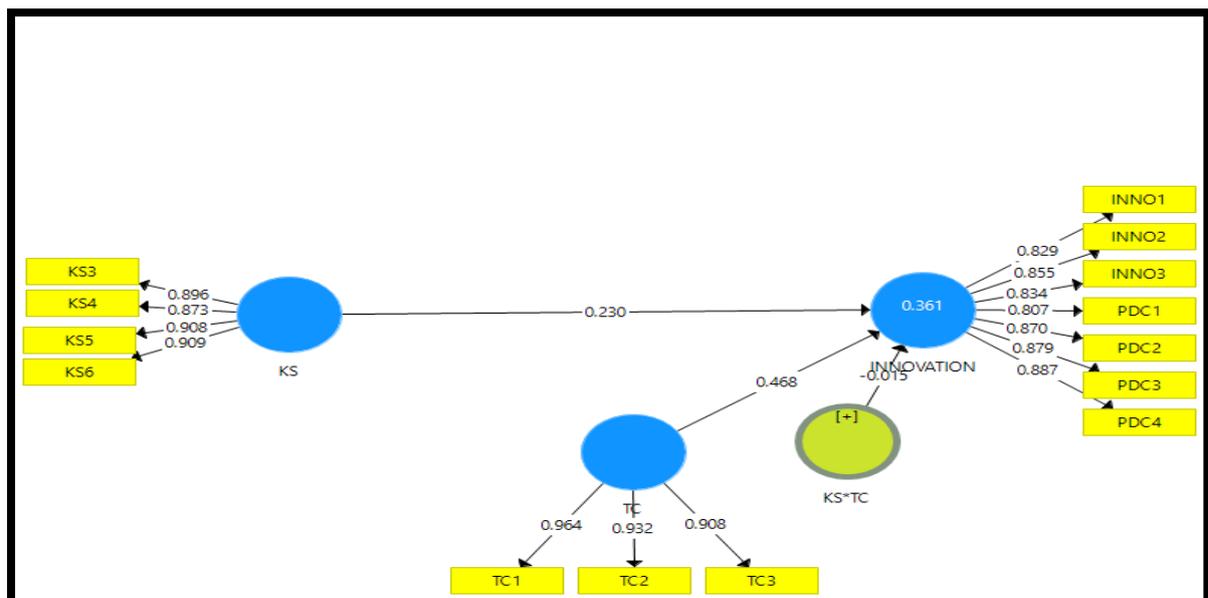


Figure 2
Measurement Model

Table 4.1
Internal Reliability and Convergent Validity

Latent Constructs	Items	Item Loadings	CR	AVE
Innovation	INNO1	0.829	0.941	0.726
	INNO2	0.855		
	INNO3	0.834		
	PDC1	0.807		
	PDC2	0.870		
	PDC3	0.879		
	PDC4	0.887		
Knowledge Sharing	KS3	0.896	0.930	0.804
	KS4	0.873		
	KS5	0.908		
	KS6	0.909		
	TC1	0.964		
	TC2	0.932		
Technological Capability	TC3	0.908	0.931	0.874

4.1.1 Discriminant Validity

Discriminant validity determines how much reflective constructs in the model are distinctive than each other (Hair et al., 2017). The current study used Heterotrait-Monotrait Ratio (HTMT) to establish the discriminant validity in the model. Table 4.2 shows the values for all reflective constructs that are below than conservative threshold value 0.85 suggested by (Henseler et al., 2015). Therefore, current model ensuring the discriminant validity.

Table 4.2
Heterotrait-Monotrait Ratio (HTMT)

	INNOVATION	KS
KS	0.402	
TC	0.590	0.314

4.2 Measuring the Structural Model

Table 4.3 shows the results of the hypothesized path model. The result of the first hypothesis shows that knowledge sharing has positive linkage with ($\beta = 0.230, P < 0.01$) innovation in the PHEIs of Pakistan.

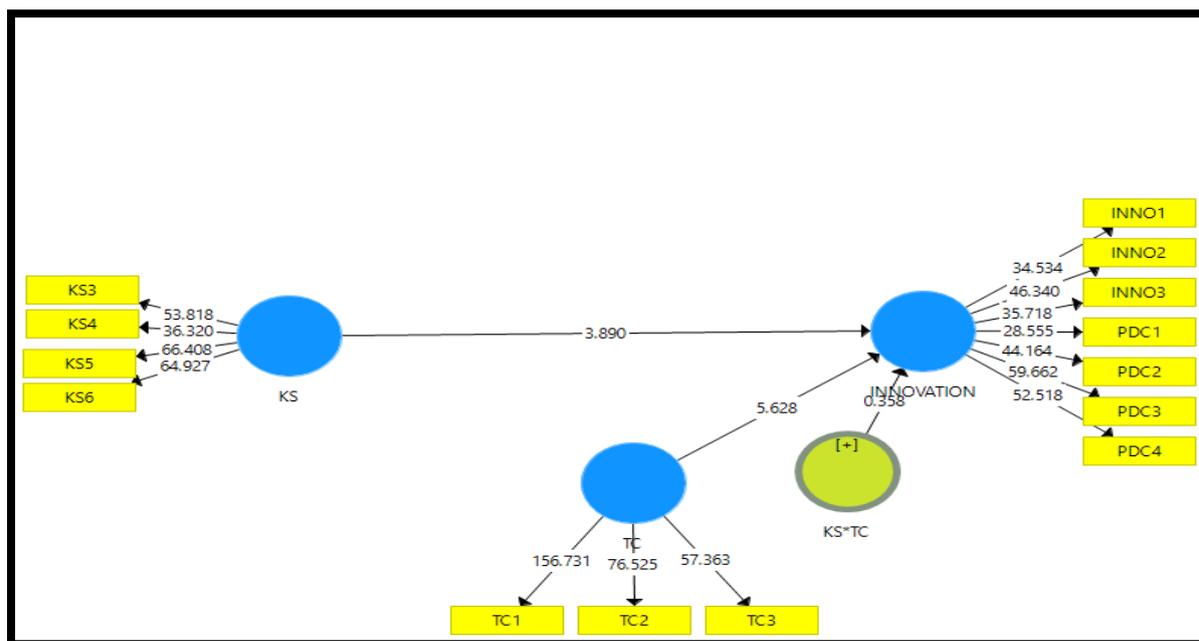


Figure 3
Structural Model

Therefore, the result of first hypothesis is supported and accepted. Whereas, the result of second hypothesis about technological capability as a moderator between knowledge sharing and innovation in PHEIs of Pakistan in not supported ($\beta = -0.015, P > 0.01$) thus, rejected.

Table 4.3
Results of Structural Model

Paths	B	T Statistics	P Values	Decision
KS -> INNOVATION	0.230	3.890	0.000	Supported
KS*TC -> INNOVATION	-0.015	0.358	0.721	Not Supported

5. Discussion and Implications

The basic objective of the current research is to examine the technological capability as a moderator between knowledge sharing and innovation in PHEIs of Pakistan. To attain the research objectives, research was conducted in the PHEIs of Pakistan. The first hypothesis was drawn as knowledge sharing has a positive linkage with innovation in PHEIs of Pakistan. The result confirms and establish the positive linkage of knowledge sharing with innovation in PHEIs of Pakistan. The result is coherent with the various previous studies that unfold the importance of knowledge sharing to boost innovation within organizations. For instance, Zobel (2017) argued that organizational retrieving process are crucial as it may be eased by internal knowledge sharing that results in favourable combination of organizational internal and external knowledge and most importantly, this effective combination of internal and external organizational knowledge can enhance product innovation within organization. Moreover, knowledge sharing is a social process that aspires the employees to share their knowledge with other people in the organization to bring innovation (Bhatt, 2001; Szulanski, 1996). In addition, Nonaka (Nonaka, 1991) presented the knowledge creation model for organizations in which he identifies and discussed knowledge sharing as an important factor of overall model as two of four components are related to the knowledge sharing including socialization which deals with intense knowledge sharing with colleagues and with close social circle and combination which deals explicit with knowledge sharing on broader level of the organization (Andreeva and Kianto, 2011). Cohen and Levinthal (1990) further added about the crucial role of knowledge sharing that underpins organization to respond swiftly to environmental changes and innovation. Kogut and Zander (1996) argued that knowledge sharing depends on the ability of organizational employees to combine the information and knowledge. It also positively affects the innovation capability of organization (Taminiau et al., 2009). Therefore, current research further established the importance of knowledge sharing as determinant of innovation in PHEIs settings. The implications of current research for PHEIs manifold as PHEIs should encourage and provide ways that may increase interaction among organizational employees to share their

knowledge about academic activities, research output, curriculum development, teaching methodologies and other important aspects of academia. Moreover, the second hypothesis was formulated to examine the technological capability as a moderator between knowledge sharing and innovation in PHEIs of Pakistan. Surprisingly, the result shows insignificant role technological capability as a moderator. The rationale may be given that, although technological shift has affected the higher education system in the developed world, however developing countries lagging far behind to glean benefits of technological advancements in higher education settings. For instance, technology has become a key factor in development of a university as now university focus of education also diverted from conventional education to the distance education (Thomas, 2009). Higher education leadership that propagate the benefits of MOOCs are more eager to glean benefits of innovation than those who believe in conventional face to face interactive way of learning (What's AHEAD, 2014). Although there are various latest tools available for PHEIs like virtual learning environment, PHEIs in Pakistan have failed to adopt these tools (Shields, 2013). Thus, this minimal technological adoption and effect undermine the association between knowledge sharing and innovation in the PHEIs setting in Pakistan. Furthermore, like other countries, in Pakistan education sector generally and public higher education particularly facing severe budget constraints that creating hindrances to increase technological capability. Consequently, it undermines the association of knowledge sharing and innovation.

6. Theoretical contribution

The current study contributing to the existing literature by extending the debate on importance of knowledge sharing to bring innovation in the context of PHEIs especially in the developing countries like Pakistan. The current research further supports the arguments and results pertinent to the relationship of knowledge sharing and innovation in PHEIs. The study also enriches the existing literature on the technological capability factor as a moderator that previous researched neglected to examine the relationship of knowledge sharing and innovation. The insignificant result of technological capability as a moderator in PHEIs has opened up further horizons of debate on the role and importance of technological capability in PHEIs especially in Pakistan which was previously scant in the literature.

7. Practical contribution

The prior literature reveals the important role of knowledge sharing in various industries including PHEIs. Therefore, top management and decision makers at PHEIs should consider it seriously and has to understand its crucial role in enhancing innovation. Furthermore, top management and decision makers at PHEIs should take initiatives to promote culture and values based on knowledge sharing as it has deep roots in social interaction among people. Top Management and decision makers also formulate and implement such policies and procedures that may give confidence and urge people to share their knowledge by eradicating their fear of losing power after sharing their valuable knowledge.

8. Conclusion and Recommendations

Importance of innovation has extended from manufacturing to services and now, to higher education sector. HEIs in general and PHEIs in particular converging themselves from conventional education provider to the technology adapting institutions due to fierce competition facing from private and international HEIs. Therefore, the fundamental objective of this research was to empirically examine technological capability as a moderator between knowledge sharing and innovation in PHEIs of Pakistan. The empirical results show the mix findings. The first hypothesis pertinent to the linkage of knowledge sharing and innovation is found to be significant and positive. Whereas, technological capability as a moderator between knowledge sharing and innovation reveals insignificant effect. Based on the empirical findings of the current study various recommendations may be put forward to the decision makers of the PHEIs of Pakistan. The first result about linkage between knowledge sharing and innovation is confirmed therefore, PHEIs should find and promote various ways through which knowledge can be shared within PHEIs. In this regard, PHEIs should encourage formal and informal meetings and gathering in which faculty and other staff share their knowledge to being innovation in the various fields of education like curriculum, teaching methodology, starting different programs, accreditations and research activities. In addition, although technological capability as moderator was not confirmed in the context of PHEIs but still its crucial role cannot be neglected. Unfortunately, PHEIs of Pakistan are lagging far behind compared to their rivals (Private and international HEIs) in terms of adopting and implementing strategic initiatives based on enhancing technological capability. It consequently undermining the strategic role of PHEIs of Pakistan as these institutions have greater outreach and having larger number of students, faculty and other supporting infrastructure. Therefore, enhancing technological capability by adopting and embracing new tools and techniques is imperative for PHEIs of Pakistan to glean optimum benefits out of students, faculty and supporting staff and to create greater impact on society.

References

- Akram, K., & Hilman, H. (2017). Is dynamic capability view relevant to the higher education institutions for innovation capability?. *Developing Country Studies*, 7(9), 1-9.
- Alavi, M., & Leidner, D. E. (2001). Knowledge management and knowledge management systems: Conceptual foundations and research issues. *MIS quarterly*, 107-136.
- Al-Husseini, S. J., Elbeltagi, I. M., & Dosa, T. A. (2015). Knowledge sharing processes as critical enablers for process innovation. *International Journal of Culture and History (Ejournal)*, 1(1), 33-38.
- Al-husseini, S., & Elbeltagi, I. (2013, October). Knowledge sharing and innovation: An empirical study in Iraqi private higher education institutions. In *International Conference on Intellectual Capital and Knowledge Management and Organisational Learning* (p. 129). Academic Conferences International Limited.
- Al-Husseini, S., & Elbeltagi, I. (2015). Knowledge sharing practices as a basis of product innovation: A case of higher education in Iraq. *International Journal of Social Science and Humanity*, 5(2), 182.
- Andreeva, T., & Kianto, A. (2011). Knowledge processes, knowledge-intensity and innovation: a moderated mediation analysis. *Journal of Knowledge Management*, 15(6), 1016-1034
- Bhatt, G. D. (2001). Knowledge management in organizations: examining the interaction between technologies, techniques, and people. *Journal of knowledge management*.
- Brayton, S. W. (2016). Participant Perceptions of Knowledge Sharing in a Higher Education Community of Practice.
- Brown, K., & Osborne, S. P. (2012). *Managing change and innovation in public service organizations*. Routledge.
- Bugge, M. M., & Bloch, C. W. (2016). Between bricolage and breakthroughs—framing the many faces of public sector innovation. *Public Money & Management*, 36(4), 281-288.
- Calantone, R.J., Cavusgil, S.T. and Zhao, Y. (2002). Learning orientation, firm innovation capability, and firm performance. *Industrial Marketing Management*, 31(6), 515-524
- Carrillo, F. J., Brachos, D., Kostopoulos, K., Soderquist, K. E., & Prastacos, G. (2007). Knowledge effectiveness, social context and innovation. *Journal of knowledge management*.
- Cheng, M. Y., Ho, J. S. Y., & Lau, P. M. (2009). Knowledge sharing in academic institutions: A study of Multimedia University Malaysia. *Electronic Journal of Knowledge Management*, 7(3).
- Cohen, W. M., & Levinthal, D. A. (1990). Absorptive capacity: A new perspective on learning and innovation. *Administrative science quarterly*, 128-152.
- Demircioglu, M. A., & Audretsch, D. B. (2017). Conditions for innovation in public sector organizations. *Research policy*, 46(9), 1681-1691.
- Dosi, G. (1988). Sources, procedures, and microeconomic effects of innovation. *Journal of economic literature*, 1120-1171.
- Fouladi, P., & Navimipour, N. J. (2017). Human resources ranking in a cloud-based knowledge sharing framework using the quality control criteria. *Kybernetes*.
- Fullwood, R., Rowley, J., & Delbridge, R. (2013). Knowledge sharing amongst academics in UK universities. *Journal of knowledge management*.
- Hair Jr, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). *Advanced issues in partial least squares structural equation modeling*. saGe publications.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*.
- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the academy of marketing science*, 43(1), 115-135.
- Hohl, M. (2015). Living in cybernetics: Polynesian voyaging and ecological literacy as models for design education. *Kybernetes*, 44(8/9), 1262.
- Howell, K. E., & Annansingh, F. (2013). Knowledge generation and sharing in UK universities: A tale of two cultures?. *International Journal of Information Management*, 33(1), 32-39.
- Jakobson, L. (Ed.). (2007). *Innovation with Chinese characteristics: high-tech research in China*. Springer.
- Jones, G., & Sallis, E. (2013). *Knowledge management in education: Enhancing learning & education*. Routledge.

- Kogut, B., & Zander, U. (1996). What firms do? Coordination, identity, and learning. *Organization science*, 7(5), 502-518.
- Kuhlmann, S., & Rip, A. (2014). The challenge of addressing Grand Challenges: a think piece on how innovation can be driven towards the "Grand Challenges" as defined under the prospective European Union Framework Programme Horizon 2020.
- Kuznets, S. (1962). Inventive activity: Problems of definition and measurement. In *The rate and direction of inventive activity: Economic and social factors* (pp. 19-52). Princeton University Press.
- Kyläheiko, K., Jantunen, A., Puumalainen, K., Saarenketo, S. and Tuppur, A. (2011). Innovation and internationalization as growth strategies: the role of technological capabilities and appropriability. *International Business Review*, 20(5), 508-520.
- Li, M., Yuan, M., & Xu, Y. (2015). An approach to task-oriented knowledge recommendation based on multi-granularity fuzzy linguistic method. *Kybernetes*.
- McAdam, R., & McCreedy, S. (1999). A critical review of knowledge management models. *The learning organization*.
- McElroy, M. W. (2000). Integrating complexity theory, knowledge management and organizational learning. *Journal of knowledge management*.
- Nelson, R. R., & Winter, S. G. (1982). The Schumpeterian tradeoff revisited. *The American Economic Review*, 72(1), 114-132.
- Nonaka, I. (1991). *Models of knowledge management in the West and Japan*.
- Omerzel, D. G., Biloslavo, R., Trnavčević, A., & Trnavčević, A. (2011). Knowledge management and organisational culture in higher education institutions. *Journal for East European Management Studies*, 111-139.
- Osborne, S. P. (2013). *Voluntary organizations and innovation in public services*. Routledge.
- Osborne, S. P., & Brown, L. (Eds.). (2013). *Handbook of innovation in public services*. Edward Elgar Publishing.
- Prahalad, C.K., Krishnarao, C. and Hamel, G. (1990), "The core competition of the corporation", *Harvard Business Review*, Vol. 68 No. 3, pp. 79-91.
- Ramayah, T., Yeap, J. A., & Ignatius, J. (2013). An empirical inquiry on knowledge sharing among academicians in higher learning institutions. *Minerva*, 51(2), 131-154.
- Schilling, M. A., & Shankar, R. (2019). *Strategic management of technological innovation*. McGraw-Hill Education.
- Seonghee, K., & Boryung, J. (2008). An analysis of faculty perceptions: Attitudes toward knowledge sharing and collaboration in an academic institution. *Library & Information Science Research*, 30(4), 282-290.
- Sohail, M. S., & Daud, S. (2009). Knowledge sharing in higher education institutions. *Vine*.
- Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic management journal*, 17(S2), 27-43.
- Taminiau, Y., Smit, W., & De Lange, A. (2009). Innovation in management consulting firms through informal knowledge sharing. *Journal of knowledge management*.
- Thomas, I. (2009). Critical thinking, transformative learning, sustainable education, and problem-based learning in universities. *Journal of Transformative Education*, 7(3), 245-264.
- Toro, M. U., & Joshi, M. J. (2015). Knowledge sharing in higher education-KMEduSoft. *International Journal of Scientific & Engineering Research*, 6(3), 699-702.
- Turnheim, B., & Geels, F. W. (2013). The destabilisation of existing regimes: Confronting a multi-dimensional framework with a case study of the British coal industry (1913–1967). *Research Policy*, 42(10), 1749-1767.
- Usman, S. H., & Oyefolahan, I. O. (2014). Encouraging knowledge sharing using Web 2.0 technologies in higher education: a survey. *arXiv preprint arXiv:1406.7437*.
- Zobel, A. K. (2017). Benefiting from open innovation: A multidimensional model of absorptive capacity. *Journal of Product Innovation Management*, 34(3), 269-288.
- Zou, S., Fang, E. and Zhao, S. (2003). The effect of export marketing capabilities on export performance: an investigation of Chinese exporters. *Journal of International Marketing*, 11(4), 32-55.