A SYSTEMATIC MAPPING STUDY ON TECHNOLOGY TRANSFER

[1]ESMA ERGUNER OZKOC, [2]GIZEM OGUTCU

[1,2]Dept. of Management Information Systems, [1,2]Başkent University, Ankara, Turkey
Email: [1]eeozkoc@baskent.edu.tr, [2]ogutcu@baskent.edu.tr

AbstractTechnology transfer is the demonstration and use of the technology, knowledge, and know-how developed by a developer. In economic growth and development, undoubtedly, the place and the importance of technology transfer is undisputed. As in the past, the rapid development of technology, in particular, the changes it has made in business processes, and the limited resources for knowledge creation have made technology transfer a very important issue. The purpose of this study is to determine the trends of technology transfer studies in the last five years. Systematic mapping work has been done in this way. According to the results, the study was divided into three main categories; technology transfer processes, technology transfer methods, and technology transfer efficiency. In this respect, 59 studies were obtained from the screening results. The result has encouraged us to do a systematic literature review as a future work on the subject.

Keywords: Technology Transfer, Technology Transfer Methods, Technology Transfer Process, Systematic Mapping.

INTRODUCTION

Technology has a clear role to play in economic growth, development, and sustainability. The ability to develop and produce technology depends on three sources that are closely related to each other, including national R&D activities, labor, and technology transfer. [1]

As a definition; technology transfer (TT) is the demonstration and use of the technology, knowledge, and know-how developed by a developer. [2] According to another definition, it is ensured that a new technology or process developed by an institution is successfully used and presented to one or more institutions that need it.

As far as technology transfer is concerned, transfer of only concrete production technologies should not come to mind. Considering the extraordinary development in the Internet, information and communication technologies, it is now the subject of controlled or uncontrolled transfer of many concrete and abstract phenomena such as processes, persons, workflows, management models, implicit information in this context.

The purpose of this study is to determine the trends in academic work on technology transfer within the last five years. A systematic mapping study has been done for this purpose. According to the results, in this study, technology transfer has been examined under three main headings.

The first is technology transfer processes. Accordingly, technology transfer processes are divided into four main stages, and subheadings are defined within each phase. The four main stages of technology transfer process are research (support services, R&D Activities, Research Institutions etc.), patent right declaration (Incentives, Intellectual property etc.), development (Fundings, TT Support, Patenting etc.), commercialization (Licensing, Management, Tracing) [3].

The second main topic is technology transfer methods. Accordingly, technology transfer methods are divided into two; horizontal and vertical [3]. Vertical technology transfer enables direct production of technology, while horizontal technology transfer creates external dependency.Horizontal TT methods are; R&D Projects, R&D Institutes, University Industry Collaboration, Clusters, Network structures, Patents etc. Vertical TT methods are licensing, know-how transfer, Joint venture, purchase, franchising, turnkey plants, consultancy, manufacture partnership, employment of foreign experts, strategic partnership, foreign direct investment, and outsourcing.

The final title was determined as the evaluation. The evaluation heading refers to the process of evaluating the efficiency and performance of technology transfer.

METHODS

The primary purpose of our study is to identify the gaps and trends in the area by examining the academic studies on technology transfer.

The research was conducted according to the guidelines and principles of Systematic Mapping Research Method [4].

2.1. Planning Review

The study began with establishing a research team with the authors. The team formulated research questions, designed and evaluated a review plan [5], and finally conducted the search. The research questions were as follows:

RQ 1. What are the research trends in technology transfer for last five year?

There are many academic databases that can be scanned within the scope of the research. However, as a limitation of this research, only the articles and conference reports in the three databases shown in Table 1 were included in the study.

No	Database	URL
1	Science Direct	http://www.sciencedirect.com
2	IEEE Xplore	http://ieeexplore.ieee.org/Xplore/home.jsp
3	ACM Dig. Library	http://dl.acm.org

Table 1. Digital resources

2.2 Conducting Review

A review process is a tool for reaching academic studies that will answer the research question. The primary and secondary studies to be included in the research were obtained from the databases specified by the following queries(Table 2).

Source	String
ACM Digital Library	"query": { acmdlTitle:(+technology +transfer) } "filter": {"publicationYear":{ "gte":2011 }}, {owners.owner=HOSTED}
IEEE Xplore	"technology transfer" AND refined by Content Type: Journals & Magazines Conference Publications Year: 2012-2017
ScienceDirect	pub-date> 2011 and TITLE(technology transfer) AND LIMIT-TO(contenttype, "JL,BS","Journal").

Table 2. Search strings

The Dropbox cloud service has been used to enable researchers to access research papers and exchange information. Firstly, searches that are scanned according to the keywords and found appropriate are collected in the pool in the Dropbox. Overlapping publications from the second level were removed from the pool. Then an online excel table was created. The keywords, abstracts, contributions to the field are summarized briefly in this table. Although this process is usually done during the screening or classification of the reviewed studies, we intentionally executed these recording and sorting procedures to reduce the risk of missing relevant resources.

2.2.1 Screening of Papers

Only English studies, written in the last five years, have been included in the survey. When choosing researches, it was taken into consideration how close their work responded to the research question. Accordingly, the selected researches have been examined and classified. The studies included in the scope of the research are presented in the appendix.

2.2.2 Keywording and Classification

Firstly, the authors indexed the keywords and abstracts of the papers obtained as a result of the screening through the tables. The set of keywords from different papers were also combined to develop a high-level understanding of papers' contribution. At the end of this study, the introduction and conclusion sections of the relevant publication were also examined for keywords and abstracts for studies that did not allow the subject to be understood. The final sets of keywords were classified to form the categories for the map.

2.3 Reliability and Validity

The study may be affected by different factors and therefore several measures have been taken to minimize the impact of probable threats to the reliability and validity of the research (internal, external and constructive). For example: (i) team members applied a systematic voting procedure for study selection to decide whether to include a paper in the paper pool; (ii) each team member evaluated the articles independently; (iii) a paper was added to the pool when it approved the majority of the members, otherwise excluded. (iv) Contradictions related to the selection or classification of notifications has been resolved through online communication and debate. As a result, these measures provided systematic data extraction and recording methods and team-based voting procedures, as well as the reliability and validity of the study.

RESULTS AND DISCUSSION

As a result of the research, it was seen that the articles found could be grouped under three main headings. These groups are; Technology transfer methods, technology transfer processes, evaluation of the success of technology transfer.

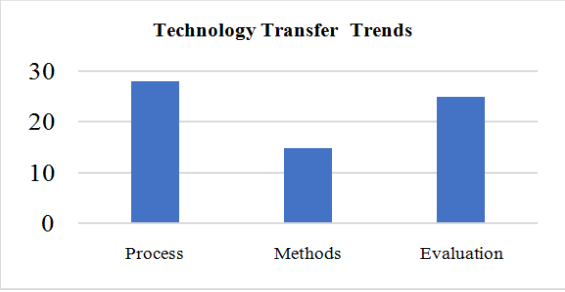


Figure1. Technology Transfer Research Trends

RQ 1. What are the research trends in technology transfer for last five year?

*Group 1.*What are the research trends about technology transfer processes?

As previously stated, there are four stages of the technology transfer process. Table 3 shows the 28 studies that were included in the TT processes from

the 59 studies examined within the scope of the research.

Process	Papers
Research	50,51
Disclosure	19, 25, 26
Development	11,12,13,14,15,16,17,18,19,26 ,51
Commercialization	1,2,3,4,5,6,7,8,9,10,17,18

Table 3. Related papers with technology transfer process

As demonstrated in Figure 2, when academic studies are examined, it is seen that the studies concerned mostly focus on the stages of commercialization and development, from technology transfer processes. It is seen that 42% of these TT processes belong to commercialization and 39% belong to the development stage. When the keywords of the studies on the TT process are examined, it is seen that studies are mainly carried out on topics such as intellectual property, innovation, patent, sustainable development, organizational learning, sponsorship, university-industry collaboration, knowledge transfer, licenses, entrepreneurial development, industry (aqua, automotive, climate, etc.).

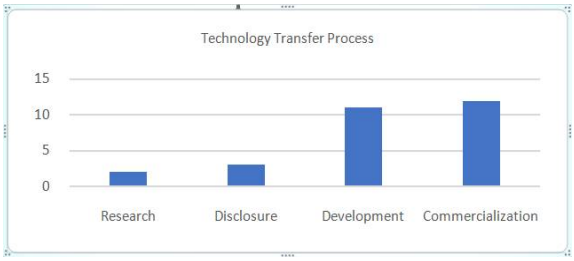


Figure 2. Trend of studies in technology transfer process

Group 2. What are the research trends in methods of technology transfer?
As aforementioned in the introduction, technology transfer methods are divided into two horizontally and vertically. According to this, from the 59 academic studies examined, 15 belong to the technology transfer method. Table 4 shows these studies.

Methods	Papers
Horizontal	48,49,52,53,54,55,56,57,58
Vertical	20,21,22,23,24,47

Table 4. Related papers with methods of technology transfer

Examined academic studies shows that the studies concerned mostly focus on the horizontal methods. It is seen that 60% of these TT methods belong to horizontal and 40% belong to vertical. When the keywords of the studies related to technology transfer methods are evaluated, it is seen that the studies are carried out in fields of foreign direct investment, multinational companies, patent sale, outsourcing, strategic trade, and technology management (Figure 3).

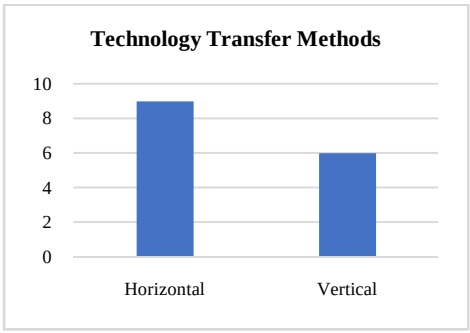


Figure 3. Trend of studies in methods of technology transfer

Group 3. What are the research trends in technology transfer evaluation?
It is seen that the 26 articles evaluated in the study are composed of the studies carried out to measure the performance of the technology transfer. (Table 5) The topics of the articles are related to the keywords which are performance, quality management, absorptive capacity, and industry.

Evaluation	27,28,29,30,31,32,33, 34,35,36,37,38,39,40, 41,42,43,44,45,46,47, 48,49,50,17,24

Table 5. Related papers with technology transfer evaluation

CONCLUSION

Technology transfer is an important resource for firms, sectors, and countries that have not reached the competence to produce their own technology. In economic growth and development, undoubtedly the place and the importance of technology transfer is undisputed. As in the past, the rapid development of technology, in particular, the changes it has made in business processes, and the limited resources for knowledge creation have made technology transfer a very important issue. Therefore, this motivated us to conduct a systematic mapping study on technology transfer. We included 59 papers from the retrieved papers. While using systematic mapping study it is also important to state the research and space limitations. For this reason, these restrictions have encouraged us, to sum up the studies of technology transfer in three main titles and to evaluate each title on its own. Accordingly, the main headings are; Technology transfer processes, technology transfer methods and technology transfer evaluation.
The scope of this research has been composed of academic studies on technology transfer in the last five years in three separate databases. As a result, most of the studies on TT concentrated on TT performance evaluation and TT processes. The lack of studies on TT methods attracted attention. When the subtitles of TT processes are examined, it is seen

that the fewest studies are at the stages of research and disclosure.

Finally, the study has led us to make a systematic literature review which is a more detailed and deep study of technology transfer.

REFERENCES

[1] Tiryakioğlu, M., Teknoloji Transfer, TeknolojiYoksulluğu Mu? , Ankara Üniversitesi SBF Dergisi, Cilt 66, No.2, 2011, s.169-199.

[2] Çetindamar D., Phall, R., Probert D., Teknoloji Yönetimi: Faaliyetlerve Araçlar, Efil Yayınevi, Ankara, 2013.

[3] Tiryakioğlu M, Teknolojik YetenekTransferi: TürkiyeIçin AlternatifBir Politika Arayışı, Orion Yayınevi, Ankara, 2015

[4] Petersen, K., Feldt, R., Mujtaba, S. &Mattsson M. 2008. Systematic Mapping Studies in Software Engineer-ing. In: Proceedings of the 12th international Conference on Evaluation and Assessment in Software Engineering, Italy, June 26-27 2008, pp. 68-77.

[5] Kitchenham, B. (2004). “Procedures for performing systematic reviews.” Technical Report TR/SE 0401, ISSN:1353-7776, Keele University.

APPENDIX – Reviewed Papers

[1] K.A. Alexander, A.D. Hughes, A problem shared: Technology transfer and development in European integrated multi-trophic aquaculture (IMTA), Aquaculture, Volume 473, 20 April 2017, Pages 13-19, ISSN 0044-8486, http://dx.doi.org/10.1016/j.aquaculture.2017.01.029.

[2] LeonidsNovickis, AntanasMitasiunas, ViktorijaPonomarenko, Information Technology Transfer Mo-del as a Bridge between Science and Business Sector, Procedia Computer Science, Volume 104, 2017, Pages 120-126, ISSN 1877-0509, http://dx.doi.org/10.1016/j.procs.2017.01.083.

[3] JaruneeWonglimpiyarat, The innovation incubator, university business incubator and technology transfer strategy: The case of Thailand, Technology in Society, Volume 46, August 2016, Pages 18-27, ISSN 0160-791X, http://dx.doi.org/10.1016/j.techsoc.2016.04.002.

[4] "MioriţaUngureanu, Nicolae Pop, NicolaeUngureanu, Innovation and Technology Transfer for Busi-ness Development, Procedia Engineering, Volume 149, 2016, Pages 495-500, ISSN 1877-7058, http://dx.doi.org/10.1016/j.proeng.2016.06.697."

[5] Selić B. The Iceberg Effect: On Technology Transfer from Research to Practice. Proceedings - 2Nd In-ternational Workshop On Software Engineering Research And Industrial Practice, SER And IP 2015 [serial online]. August 19, 2015;(Proceedings - 2nd International Workshop on Software Engineering Research and Industrial Practice, SER and IP 2015):58-61.

[6] Parmit K. Chilana, Mary P. Czerwinski, Tovi Grossman, Chris Harrison, Ranjitha Kumar, Tapan S. Pa-rikh, and ShuminZhai. 2015. Technology Transfer of HCI Research Innovations: Challenges and Opportunities. In Proceedings of the 33rd Annual ACM Conference Extended Abstracts on Human Factors in Computing Systems (CHI EA '15). ACM, New York, NY, USA, 823-828. DOI: https://doi.org/10.1145/2702613.2724724

[7] "Gary E. McGraw. 2014. Software security: a study in technology transfer. In Proceedings of the companion publication of the 2014 ACM SIGPLAN conference on Systems, Programming, and Applications: Software for Humanity (SPLASH '14). ACM, New York, NY, USA, 1-1. DOI=http://dx.doi.org/10.1145/2660252.2661745"

[8] Estep, Judith, and TugrulDaim. "A framework for technology transfer potential assessment." In Management of Engineering and Technology (PICMET), 2016 Portland International Conference on, pp. 2846-2852. IEEE, 2016.

[9] Teixeira, Luciana AC, Paulo TS Nascimento, Abraham Yu, and Ana Marisa ChudzinskiTavassi. "A technology transfer model from public to private sector in biopharmaceutical industry." In Management of Engineering and Technology (PICMET), 2016 Portland International Conference on, pp. 2887-2893. IEEE, 2016.

[10] Philipp Diebold and Antonio Vetrò. 2014. Bridging the gap: SE technology transfer into practice: study design and preliminary results. In Proceedings of the 8th ACM/IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM '14). ACM, New York, NY, USA, , Article 52 , 4 pages. DOI: http://dx.doi.org/10.1145/2652524.2652552

[11] Elisa Villani, Einar Rasmussen, Rosa Grimaldi, How intermediary organizations facilitate university–industry technology transfer: A proximity approach, Technological Forecasting and Social Change, Volume 114, January 2017, Pages 86-102, ISSN 0040-1625, http://dx.doi.org/10.1016/j.techfore.2016.06.004.

[12] Jordan Smart, HaymBenaroya, An examination of non-linear and passive technology transfer in the space sector: Consideration of the Contingent Effectiveness Model as a basis for formal modeling, Space Policy, Volume 38, November 2016, Pages 39-47, ISSN 0265-9646, http://dx.doi.org/10.1016/j.spacepol.2016.05.010.

[13] ConorO’Kane, Technology transfer executives' backwards integration: An examination of interactions between university technology transfer executives and principal investigators, Technovation, Available online 31 August 2016, ISSN 0166-4972, http://dx.doi.org/10.1016/j.technovation.2016.08.001.

[14] Changli Li, Tony Lan, Shang-Jyh Liu, Patent attorney as technology intermediary: A patent attorney-facilitated model of technology transfer in developing countries, World Patent Information, Volume 43, December 2015, Pages 62-73, ISSN 0172-2190, http://dx.doi.org/10.1016/j.wpi.2015.08.003.

[15] PatarapongIntarakumnerd, PeeraCharoenporn, Impact of stronger patent regimes on technology transfer: The case study of Thai automotive industry, Research Policy, Volume 44, Issue 7, September 2015, Pages 1314-1326, ISSN 0048-7333, http://dx.doi.org/10.1016/j.respol.2015.04.001.

[16] Mancha, Ruben, Cory Hallam, and Bernd Wurth. "Licensing for good: Social responsibility in the university-industry technology transfer process." In Management of Engineering and Technology (PICMET), 2016 Portland International Conference on, pp. 307-313. IEEE, 2016.

[17] KyriakosDrivas, Claire Economidou, DimitrisKaramanis, Arleen Zank, Academic patents and techno-logy transfer, Journal of Engineering and Technology Management, Volume 40, April–June 2016, Pa-ges 45-63, ISSN 0923-4748, http://dx.doi.org/10.1016/j.jengtecman.2016.04.001.

[18] Hallam, Cory RA, J. Michael Munson, W. Austin Spivey, and Bernd Wurth. "How university techno-logy transfer offices at US medical schools value innovation." In Management of Engineering and Technology (PICMET), 2016 Portland International Conference on, pp. 2810-2824. IEEE, 2016.

[19] Dagmara M. Weckowska, Learning in university technology transfer offices: transactions-focused and relations-focused approaches to commercialization of academic research, Technovation, Volumes 41–42, July–August 2015, Pages 62-74, ISSN 0166-4972, http://dx.doi.org/10.1016/j.technovation.2014.11.003.

[20] Ichiro Iwasaki, Masahiro Tokunaga, Technology transfer and spillovers from FDI in transition economies: A meta-analysis, Journal of Comparative Economics, Volume 44, Issue 4, November 2016, Pages 1086-1114, ISSN 0147-5967, http://dx.doi.org/10.1016/j.jce.2016.10.005.

[21] EstefaniaSantacreu-Vasut, Kensuke Teshima, Foreign employees as channel for technology transfer: Evidence from MNC's subsidiaries in Mexico, Journal of Development Economics, Volume 122, September 2016,

Pages 92-112, ISSN 0304-3878, http://dx.doi.org/10.1016/j.jdeveco.2016.05.001.
[22] TarunKabiraj, UdayBhanuSinha, Strategic outsourcing with technology transfer under price competition, International Review of Economics & Finance, Volume 44, July 2016, Pages 281-290, ISSN 1059-0560, http://dx.doi.org/10.1016/j.iref.2016.02.016.
[23] Marina Abdul Majid, AzizanBaharuddin, Lee Wei Chang, Preventing intangible technology transfer (ITT) on the Internet and telecommunications for bioterrorism through Malaysia's Strategic Trade Act 2010 (STA 2010), Computer Law & Security Review, Volume 32, Issue 3, June 2016, Pages 495-512, ISSN 0267-3649, http://dx.doi.org/10.1016/j.clsr.2016.01.008.
[24] Wiratmadja, IwanInrawan, IndryatiSunaryo, RevinaNovahestinSyafrian, and RajesriGovindaraju. "The measurement of humanware readiness in a technology transfer process: Case study in an electrical machinery company." In Technology, Informatics, Management, Engineering, and Environment (TIME-E), 2014 2nd International Conference on, pp. 321-325.IEEE, 2014.
[25] Chaewoon Oh, Shunji Matsuoka, Complementary approaches to discursive contestation on the effects of the IPR regime on technology transfer in the face of climate change, Journal of Cleaner Production, Volume 128, 1 August 2016, Pages 168-177, ISSN 0959-6526, http://dx.doi.org/10.1016/j.jclepro.2015.09.050.
[26] Gail A. Van Norman, RoïEisenkot, Technology Transfer: From the Research Bench to Commercialization: Part 1: Intellectual Property Rights—Basics of Patents and Copyrights, JACC: Basic to Translati-onal Science, Volume 2, Issue 1, February 2017, Pages 85-97, ISSN 2452-302X, http://dx.doi.org/10.1016/j.jacbts.2017.01.003.
[27] GulinIdilSonmezturkBolatan, SitkiGozlu, LutfihakAlpkan, SelimZaim, The Impact of Technology Transfer Performance on Total Quality Management and Quality Performance, Procedia - Social and Behavioral Sciences, Volume 235, 24 November 2016, Pages 746-755, ISSN 1877-0428, http://dx.doi.org/10.1016/j.sbspro.2016.11.076.
[28] Gary Grohmann, Donald P. Francis, JaspalSokhey, James Robertson, Challenges and successes for the grantees and the Technical Advisory Group of WHO's influenza vaccine technology transfer initiative, Vaccine, Volume 34, Issue 45, 26 October 2016, Pages 5420-5424, ISSN 0264-410X
[29] Patrick van der Heiden, Christine Pohl, ShuhaimiMansor, John van Genderen, Necessitated absorptive capacity and metaroutines in international technology transfer: A new model, Journal of Engineering and Technology Management, Volume 41, July–September 2016, Pages 65-78, ISSN 0923-4748, http://dx.doi.org/10.1016/j.jengtecman.2016.07.001.
[30] Fang Zhang, Kelly Sims Gallagher, Innovation and technology transfer through global value chains: Evidence from China's PV industry, Energy Policy, Volume 94, July 2016, Pages 191-203, ISSN 0301-4215, http://dx.doi.org/10.1016/j.enpol.2016.04.014.
[31] Mehdi Majidpour, International technology transfer and the dynamics of complementarity: A new approach, Technological Forecasting and Social Change, Available online 30 March 2016, ISSN 0040-1625, http://dx.doi.org/10.1016/j.techfore.2016.03.004.
[32] Adrian Lema, RasmusLema, Low-carbon innovation and technology transfer in latecomer countries: Insights from solar PV in the clean development mechanism, Technological Forecasting and Social Change, Volume 104, March 2016, Pages 223-236, ISSN 0040-1625, http://dx.doi.org/10.1016/j.techfore.2015.10.019.
[33] Villacís Enrique, Rodriguez Lorena, Ayarza Cynthia, The Technology Transfer Systems in Communities, Product Versus Processes, Procedia Engineering, Volume 145, 2016, Pages 364-371, ISSN 1877-7058, http://dx.doi.org/10.1016/j.proeng.2016.04.091.
[34] Sea-Hong Oh, Hee Young Lim, Byoungsoo Kim, Strategy to Promote the Effectiveness of Technology Transfer of National R&D Programs in Korea: Seen through the G7 Leading Technology Development Program, Procedia Computer Science, Volume 91, 2016, Pages 221-229, ISSN 1877-0509, http://dx.doi.org/10.1016/j.procs.2016.07.061.
[35] MikusDubickis, ElinaGaile-Sarkane, Perspectives on Innovation and Technology Transfer, Procedia - Social and Behavioral Sciences, Volume 213, 2015, Pages 965-970, ISSN 1877-0428, http://dx.doi.org/10.1016/j.sbspro.2015.11.512.
[36] Chi Zhang, Jinyue Yan, CDM's influence on technology transfers: A study of the implemented clean development mechanism projects in China, Applied Energy, Volume 158, 15 November 2015, Pages 355-365, ISSN 0306-2619, http://dx.doi.org/10.1016/j.apenergy.2015.06.072.
[37] Ayşe Günsel, Research on Effectiveness of Technology Transfer from a Knowledge Based Perspective, Procedia - Social and Behavioral Sciences, Volume 207, 2015, Pages 777-785, ISSN 1877-0428, http://dx.doi.org/10.1016/j.sbspro.2015.10.165.
[38] Sanjay Kumar, Sunil Luthra, AbidHaleem, Sachin K. Mangla, Dixit Garg, Identification and evaluation of critical factors to technology transfer using AHP approach, International Strategic Management Review, Volume 3, Issues 1–2, June–December 2015, Pages 24-42, ISSN 2306-7748, http://dx.doi.org/10.1016/j.ism.2015.09.001.
[39] Nelson, Barry L. "Technology transfer of simulation analysis methodology: One man's opinion." In Winter Simulation Conference (WSC), 2016, pp. 248-254.IEEE, 2016.
[40] Jin, D., X. Mo, A. M. Subramanian, K. H. Chai, and C. C. Hang. "Key management processes to technology transfer success." In Management of Innovation and Technology (ICMIT), 2016 IEEE International Conference on, pp. 67-71. IEEE, 2016.
[41] Tsuji, Masatsugu, Hiroki Idota, Yasushi Ueki, TeruyukiBunno, HidenoriShigeno, and Tomohiro Machikita. "Connectivity in the technology transfer process among local ASEAN firms." In Management of Innovation and Technology (ICMIT), 2016 IEEE International Conference on, pp. 264-269. IEEE, 2016.
[42] Mangelsdorf, Axel. "Private standards as means of technology transfer." In Standardization and Innovation in Information Technology (SIIT), 2015 IEEE 9th International Conference on, pp. 1-6. IEEE, 2015.
[43] Diebold, Philipp, Antonio Vetro, and Daniel Méndez Fernández. "An Exploratory Study on Technology Transfer in Software Engineering." In Empirical Software Engineering and Measurement (ESEM), 2015 ACM/IEEE International Symposium on, pp. 1-10. IEEE, 2015.
[44] Grigoleit, Florian, Antonio Vetrò, Philipp Diebold, Daniel Mendez Fernandez, and Wolfgang Bohm. "In quest for proper mediums for technology transfer in software engineering." In Empirical Software Engineering and Measurement (ESEM), 2015 ACM/IEEE International Symposium on, pp. 1-4. IEEE, 2015.
[45] Estep, Judith. "Development of a technology transfer score to inform the selection of a research proposal." In Management of Engineering and Technology (PICMET), 2015 Portland International Conference on, pp. 1754-1768. IEEE, 2015.
[46] Hsieh, Chih-Hung, Louis YY Lu, John S. Liu, and Alexander Kondrashov. "A literature review with citation analysis of technology transfer." In Management of Engineering & Technology (PICMET), 2014 Portland International Conference on, pp. 3202-3209. IEEE, 2014.
[47] KwakuAppiah-Adu, Bernard K. Okpattah, Justice G. Djokoto, Technology transfer, outsourcing, capability and performance: A comparison of foreign and local firms in Ghana, Technology in Society, Volume 47, November 2016, Pages 31-39, ISSN 0160-791X, http://dx.doi.org/10.1016/j.techsoc.2016.07.002.
[48] Cleland-Huang, Jane, and SmitaGhaisas. "Ready-Set-Transfer: Technology transfer in the requirements engineering domain." In Requirements Engineering Conference (RE), 2013 21st IEEE International, pp. 345-346. IEEE, 2013.

[49] Wu, Fei-fei, Zi Yang, Lu-cheng Huang, and ZhengQiao. "Factors analysis and countermeasure rese-arch of influencing technology transfer across the industry."In Management of Engineering & Techno-logy (PICMET), 2014 Portland International Conference on, pp. 3210-3223.IEEE, 2014.

[50] Harriet Harden-Davies, Marine science and technology transfer: Can the Intergovernmental Oceanographic Commission advance governance of biodiversity beyond national jurisdiction?, Marine Policy, Volume 74, December 2016, Pages 260-267, ISSN 0308-597X, http://dx.doi.org/10.1016/j.marpol.2016.10.003.

[51] van der Heiden, Patrick, and Christine Pohl. "Organizational barriers to absorptive capacity building for international technology transfer to Malaysia." In Geoscience and Remote Sensing Symposium (IGARSS), 2016 IEEE International, pp. 7627-7630. IEEE, 2016.

[52] Omar Al-Tabbaa, Samuel Ankrah, Social capital to facilitate 'engineered' university–industry collaboration for technology transfer: A dynamic perspective, Technological Forecasting and Social Change, Volume 104, March 2016, Pages 1-15, ISSN 0040-1625, http://dx.doi.org/10.1016/j.techfore.2015.11.027.

[53] IlyongJi, Hyungjoo Lim, Tae-Young Park, Exploring Potential Users of Patents for Technology Trans-fer: Utilizing Patent Citation Data, Procedia Computer Science, Volume 91, 2016, Pages 211-220, ISSN 1877-0509, http://dx.doi.org/10.1016/j.procs.2016.07.059.

[54] HabilJuris-Roberts Kalnins, NataljaJarohnovich, System Thinking Approach in Solving Problems of Technology Transfer Process, Procedia - Social and Behavioral Sciences, Volume 195, 2015, Pages 783-789, ISSN 1877-0428, http://dx.doi.org/10.1016/j.sbspro.2015.06.176.

[55] XaysomphetNorasingh, Tomohiro Machikita, Yasushi Ueki, South-South technology transfer to Laos through face-to-face contacts, Journal of Business Research, Volume 68, Issue 7, July 2015, Pages 1420-1425, ISSN 0148-2963, http://dx.doi.org/10.1016/j.jbusres.2015.01.025.

[56] Cetindamar, Dilck. "A new role for universities: Technology transfer for social innovations." In Management of Engineering and Technology (PICMET), 2016 Portland International Conference on, pp. 290-295. IEEE, 2016.

[57] Leupers, Rainer. "Technology Transfer in computing systems: The TETRACOM approach." In Design, Automation & Test in Europe Conference & Exhibition (DATE), 2016, pp. 834-837. IEEE, 2016.

[58] Mulamula, George, and Joe AmadiEchendu. "Leveraging technology transfer, information communication technology and capacity building for sustainable development."In Engineering, Technology and Innovation/International Technology Management Conference (ICE/ITMC), 2015 IEEE International Conference on, pp. 1-11.IEEE, 2015.

★★★