



Distribution-Support Technologies in Commercialisation: The Malaysia Research Universities (RU) Experiences

Siti Asma' MOHD ROSDI¹, Mohamad Rohieszan RAMDAN², Sabrinah ADAM³, Nursyazwani Mohd FUZI⁴, Azila ABDUL RAZAK⁵, Nurul Atasha JAMALUDIN⁶

Received: July 01, 2022. Revised: September 01, 2022. Accepted: November 05, 2022.

Abstract

Purpose: This article explores the experiences of Research Universities (RU) on distribution-support technologies in commercialisation with a specific focus in the Malaysian context. **Research design, data and methodology:** A qualitative research was carried out, in which six RU were interviewed. A structured interview was conducted. To analyse and interpret the data was using an approach adopted in qualitative thematic strategy. The findings were transcribed using Atlas.ti software to analyse related themes through a thematic analysis approach to link theories. **Results:** The findings provide useful insights into the significant roles of distribution-support technologies on the commercialisation strategy and impacts on the ecosystem of innovation and commercialisation in providing the importance of Distribution-support Technologies to strengthen the role of university-industry-community relation to drive the economy towards a high-income nation. **Conclusions:** This study will contribute theory through commercialisation literature by adding new knowledge concerning the link between universities and distribution-support technologies in commercialisation. Therefore, the practical contributions are significant for universities; industries; research institutes; government and societies to develop and plan strategically for effective, strategic and sustainable distribution-support technologies in innovation and commercialisation ecosystem.

Keywords : Distribution-Support Technologies, Commercialisation, Research University, Malaysia

JEL Classification Code : L30, M15, P40, O30

* Acknowledgements: This study was supported by Ministry of Higher Education (MOHE), the title of this research is "The Development of Dynamic Support Services of Universities Research Output and Commercialisation", research code: 2019-0168-106-62 (RACER/1/2019/SS01/UPSI//2). We thank to Research Management and Innovation Centre (RMIC), Universiti Pendidikan Sultan Idris (UPSI), and all contributors of the research team who have contributed to this research. We additionally thank the guidance committee, informants, and different stakeholders who participated with inside the study.

1 First Author or Corresponding Author. Senior Lecturer, Faculty of Management and Economics, Universiti Pendidikan Sultan Idris, Malaysia. Email: sitiasma@fpe.upsi.edu.my ORCID: <https://orcid.org/0000-0001-8291-4997>

2 Second Author. Senior Lecturer, Faculty of Management and Economics, Universiti Pendidikan Sultan Idris, Malaysia. Email: rohieszan@fpe.upsi.edu.my ORCID: <https://orcid.org/0000-0002-4899-7079>

3 Third Author. Senior Lecturer, Faculty of Management, Universiti Teknologi Malaysia, Malaysia. Email: sabrinah@utm.my ORCID: <https://orcid.org/0000-0001-6765-8104>

4 Fourth Author. Senior Lecturer, Faculty of Management, Universiti Teknologi Malaysia, Malaysia. Email: nursyazwani.mohdfuzi@utm.my ORCID: <https://orcid.org/0000-0001-9418-0337>

5 Fifth Author. Senior Lecturer, Faculty of Management and Economics, Universiti Pendidikan Sultan Idris, Malaysia. Email: azila@fpe.upsi.edu.my ORCID: <https://orcid.org/0000-0003-1518-6525>

6 Six Author. Senior Lecturer, Faculty of Economic and Management, Universiti Kebangsaan Malaysia, Malaysia. Email: nurulatasha@ukm.edu.my ORCID: <https://orcid.org/0000-0002-3545-3398>

© Copyright: The Author(s)
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

1. Introduction

Malaysia is a developing country that strives to be developed. It recognises that one of the keys in achieving this ambitious goal is to focus on the development of its higher education (HE) system. The Malaysian government has structured all public universities into three categories, namely, Research University (RU); Focused University (FU); and Comprehensive University (CU). The research universities (RU) are University of Malaya (UM), Universiti Kebangsaan Malaysia (UKM), Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM) and Universiti Teknologi Malaysia (UTM). These research universities (RU) are required to focus primarily on research and innovation activities, driven by highly competent academics and competitive student admissions. Research universities (RU) are expected to explore their intellectual capacity and become models of Malaysian universities in conducting research activities aimed at knowledge advancement. Apart from this research universities (RU) are entrusted to generate their own income and establish holding companies responsible for conducting business ventures through the commercialization of their research products (Da Wan et al., 2020). Thus, the higher education institutions (HEIs) have been geared towards reduction of reliance on the government, and universities are required to generate own income through commercialisation and other income generating activities (Da Wan et al., 2018). Definitely, universities play a pivotal position within the innovation atmosphere, given their position within the introduction and diffusion of recent knowledge, simultaneously changing the role of university traditions, from teaching and learning to innovation and commercialisation (Da Wan et al., 2020).

To enhance diffusion, the institutional framework must promote knowledge sharing among innovation players, namely knowledge creators and users. As a result, the phrases Triple Helix, Quadruple Helix, and Quintuple Helix have gained acceptance in academic circles. Etzkowitz and Leydesdorff (2000), find knowledge and use in context of university-industry-government relation are on the focus on The Triple Helix meanwhile the Quadruple Helix extends of it by adding the helix of media-based and culture-based public (Carrayanis & Cambell, 2009). Consequently, the emergent Quadruple Helix Model of Stakeholder Relationships reflects a shift from the normative Triple Helix (government, university and industry) to include end users as a core stakeholder in regional innovation ecosystems (Carayannis & Campbell, 2009; Leydesdorff, 2012; Carayannis & Rakhmatullin, 2014; Lara et al., 2021). According to the World Bank (2020), there are five factors of simplified technology transfer channels in terms of research orientation and capability, structure and more effective governance to research institutions; employment

laws governing public research institutions and universities; readily available financial support as well as the firm's absorption capacity.

Technology has transformed the way researchers seek, obtain and use information (Ayob & Sendut, 2013). In this contact, Distribution-support Technologies refer to the technology supports that provide technopreneurs with the support of finding a place in the market, as well as ways to distribute technopreneurs' products. It is consisting of certain business associations, alumni associations and online social sites consisting of Facebook, LinkedIn, friends, community-markers and distributors (Sujianto, 2021). Distribution-support Technologies such as technology transfer will improve innovations among start-up businesses through the collaboration among private agencies, public agencies, industry, and universities will help to enhance processes and method of the operation and business activities, include foster technology collaboration to form research and development (R&D) that focused on promoting the business network, commercialisation of knowledge, financial incentives such as R&D grants and levies for technology development, and promoting technology distribution.

This paper seeks to explore the experiences of Research Universities (RU) on Distribution-support Technologies in commercialisation with a specific focus in the Malaysian context. This paper consists of six sections. First, this paper generally introduces the research universities and its role in higher education system. Second, discuss on the current issues on commercialisation and the Distribution-support Technologies in commercialisation. Third, the methodology to explore the experiences of RU on Distribution-support Technologies in commercialisation, guided by the question: "What experiences do RU perceived of the Distribution-support Technologies in commercialisation?". This is followed by section four which discusses the finding of distribution-support technologies for the Malaysia's RU. The conclusion briefly deliberates in section five, limitation and future research deliberates the final section.

2. Literature Review

2.1. Current Issues on Commercialisation

The ecosystem of innovation and commercialisation still needs to improve due to the dynamic challenges especially in the era of COVID-19 pandemic. Innovation and commercialisation are indeed a challenging process for HEIs. HEIs face competition and challenges in order to gain competitive advantage in both national and international settings. For example, changing government policy,

ongoing student growth, stakeholder demand for quality, change in leadership, renewed institutional strategy; and financial sustainability are some of the internal factors contributing to the challenges within universities (De Wan et al., 2018). According Miller et al. (2018), challenges of academic entrepreneurship include three levels of challenges. The first level is individual challenges such as lack of resources for combining different roles and absence of entrepreneurial role model, the second level of challenges is institutional level challenges such as lack of legitimacy and incentives, lack of institutional support, and uncertainty university roles for society and the third level of challenges is regional level challenges such as policy related issues, geographical proximity and clusters presence.

Unfortunately, in 2020, the prolonged lockdown imposed by political authorities to halt the development of the COVID-19 had negative effects felt all around the world. As to overcome, the pandemic outbreak is likely to require global effort, sharing resources, knowledge and global cooperation to deal with other global challenges; practicing more openness in science and technology for example, user innovation find attractive business uses is to experiment in a wide variety of strategic ways (Ramdan et al., 2021; Siegel & Guerrero, 2021).

However, in the real world of today, the process of establishing, growing, and maintaining structured techno-companies can be difficult and complex. Competencies such as R&D contracts, suppliers, customers, and competitors can be required to translate scientific output into marketable goods or services in order to gain a competitive advantage (Mascarenhas et al., 2018; Cenamor, 2021). In this sense, techno-companies have to gain profit by creating new values and accomplish competitive advantage through innovation and commercialisation capabilities while providing new product and service development through R&D, investment and quality improvement (Kim et al., 2020). The linkages and network between these players are weak and fragmented (Khin et al., 2017). Siegel and Guerrero (2021), have identified three new areas of micro and macro research on how COVID-19 affects the commercialization of science.

The first thing to pay special attention to is the performance, quantity and quality of research bases and performance, social networks, and strategic management of innovation, commercialization of research as well as the relationship between universities and industry. The second point of concern is innovation and the entrepreneurial ecosystem which have important public policy implications as there is substantial public investment in property-based institutions and high-tech economic development initiatives. The third thing to pay attention to is the scientific workforce, such as role conflict, identity, work-life balance, 'winning', organizational justice and leadership. This is important to understand micro and macro, especially those involved in

commercialization efforts to assist and determine how to better manage the scientific workforce and the process of commercialization of research in challenging conditions. Thus, the innovation and commercialisation support system still need to be enhanced due to the dynamic issues and challenges (Khin et al., 2017).

Malaysia continues to rely heavily on technology transfer from abroad to boost its competitive advantage in export markets. In addition, technopreneurs face operational and strategic challenges such as achieving monetary sustainability; finding and retentive management groups with the proper mentality and skill sets; and strive to achieve the right "deal flow" (Khin et al., 2017). Prior literature indicates that industry players require support in term of technology, market, finance, training and skill development programs (Heydebreck & Klostner, 2000). Therefore, the accessibility of the support system is crucial as it facilitates and accelerates its operation and commercialisation process to transform Malaysian innovation landscape not only the needs of society today, but critically, of tomorrow.

2.2. Distribution-support Technologies in Commercialisation

The commercialisation environment has been nicely comprehended because of its significance to the development of industry and manufacturing sector that fuels the increase of factories and companies, which, in turn, creates employment and wealth. A commercialisation atmosphere is a mixture of diverse social, political, economic and cultural, technology, marketplace and community factors inside a place that guide the development and growth of innovative start-ups, assist and evokes nascent technopreneurs to require on the beginning and funding risky ventures (Mason & Brown, 2015). The essential concept of commercialisation environment is to create and surroundings conducive to assisting innovation, forming new success ventures, and producing the corresponding sustainable employment growth inside a selected geographic region (Jackson et al., 2018). Ecosystems constitute extra of a conceptual umbrella encompassing a whole lot of exclusive views at the geography of entrepreneurship instead of a coherent principle approximately the emergence of a sustainable group of technology entrepreneurs (Spigel, 2017).

Distribution-support Technologies such as technology transfer will improve innovations through the collaboration among private agencies, public agencies, industry, and universities will help to enhance processes and method of the operation and business activities (Li & Tan, 2020). Distribution-support Technologies include foster technology collaboration to form research and development (R&D) that focused on promoting the business network,

commercialisation of knowledge, financial incentives such as R&D grants and levies for technology development, and promoting technology distribution. Also, in Malaysia a lot of agencies that provide the support for technopreneurs such as SMECorp Malaysia, Majlis Amanah Rakyat (MARA), Center for Entrepreneur Development and Research (CEDAR), Institut Keusahawanan Negara (INSKEN), and Perbadanan Usahawan nasional Berhad (PUNB). To Bongso and Hartoyo (2022) distribution of SMEs products and services in Indonesia are directly influenced by IT capability where small and medium enterprises (SME) need to adapt with the variety of distribution platforms nowadays for competitive advantage.

3. Research Methods

The objective of this research is to explore the experience of RU on Distribution-support Technologies in commercialisation phase. In this case, the Distribution-support Technologies were not generalized or understood based on the results of a survey, but researched and understood in the natural environment of the innovation ecosystem. This case study technique appears to be suitable considering the fact that this paper is an exploratory study of those ambitions to increase a higher knowledge of the Distribution-support Technologies. We chose this population, research university outputs. One of the reasons is that RUs spend lots of grant money on research projects but only few percentages of outputs are commercialized (MOSTI, 2018). So, this study will uncover the Distribution-support Technologies that will help them generate economic return for the invested effort in research projects. Therefore, this research targeted one RU in Malaysia due to the recognition of excellent status in innovation and commercialisation. Structured interviews were administered during work hours.

We took a qualitative approach with structured interviews. The structured interviews were conducted in January 2020. We operationalized our enquiry by asking broad questions about the Distribution-support Technologies in Malaysia. The consent of the interviewees was obtained for the recording of the interview. All questions were open ended. The interview lasted an hour on average. Use an open interview schedule such as the following questions: "What experiences do you perceive of the Distribution-support Technologies in commercialisation?"

Upon completion of data collection through interview sessions, the findings were transcribed using Atlas.ti software to analyse related themes through a thematic analysis approach to link theories (Ramdan et al., 2020). Thematic analysis refers to a procedure that allows for easy information retrieval and organizes important and relevant themes or sub -themes, which can then be applied (Javadi &

Zarea, 2016; Guest et al., 2020). Specifically, this software can help easily read, organize and encode data as it has comprehensive online support guidelines to assist users (Friese, 2019; Othman, 2019). Thus, the distribution of themes was divided into codes corresponding to the findings of the study which could be categorized separately.

Each recorded interview transcribed verbatim in English. At the beginning of the interview process, we coded data related to different themes, then used different methods to identify key themes (Glaser & Strauss, 1967). Through non-stop methods, we discover the sub-theme under each main theme, such as trends or descriptors, and the nature of the theme underlying the study. By non-stop methods, we discover the sub-themes under each main theme as properties or descriptors making explicit the underlying theme properties. The data are provided thematically and the connection among findings and literature is included into thematic discussions (Glaser & Strauss, 1967).

3.1. Data Analysis

To analyse and use the data, we used qualitative thematic strategies (Boyatzis, 1998). Data are presented thematically and the relationship between findings and literature is integrated into thematic discussions (Glaser & Strauss, 1967).

4. Results and Discussion

The results of the interviews are presented below:

"In terms of technology, we have an organization called ITMA, Innovation and Technology Manager Association. Currently its president is UPM. I am from AJK only. It has a lot of potential in it. We also have Malaysian Bioeconomy Development Corporation Sdn Bhd. We also have CREST Sdn Bhd, a government-owned company; commercials do not just talk about technology because innovation can be product, technology and know-how. Therefore, the importance of technology in commercialization is depending again by project. There are technological projects, some more than expertise" (RU1).

"Technology is an enabler now in people's everyday tasks; computers and smart devices are becoming an indispensable part of life. Technology nowadays is building fast, even 5G technology will widely use in the future. The evaluation demonstrates that the commercial potential of information technologies and biotechnologies are most influenced by elements such as technology features and value for the consumer by using technology for commercialisation, it will increase the rate of successful" (RU2).

"Most of start-up businesses in Malaysia need to access

this kind of support (Distribution-support Technologies) and by the help from consultant/expert or RU will increase chances to get the support. The agencies that provide these supports such as Malaysian Industrial Development Finance Berhad (MIDF), Majlis Amanah Rakyat (MARA), Technology Park Malaysia (TPM), SME Corporation, Malaysian Technology Development Corporation (MTDC), Ministry of Science, Technology and Innovation (MOSTI), Federal Agriculture Marketing Authority (FAMA) and SIRIM Berhad” (RU3).

“This university is actually in my opinion; it has a very clear platform. Now any university must have at least one innovation centre in cooperation with the research management centre. Why a research management centre? Because in the Research Management Centre (RMC) we usually call CCI do not be surprised if you use that term. When a research management centre he manages and when he manages the funds, he has to make sure there is output. In addition, that output, all kinds of output and one of them is intellectual property. Okay, because the output can be human capital, student, it can also be output, okay, expertise, and well that means that people are not experts, so are experts. But along with the big innovation centre is IP. Therefore, our academicians are also technopreneurs because some of them not only do research, they have IP and commercialise their R&D output. As you asked about distribution-support, yes we need it to support our research output in the marketplace, ways to distribute our products” (RU3).

“How to commercialise this thing, meaning how product to be recognised and want to be commercialise. Of course, we need that technology support in term of distribution maybe via online social sites like Facebook, LinkedIn, and others platform...business network, financial incentives, R&D grants and promoting technology distribution. A lot of research, lot of IP but the commercialise very low including industry demand low, why?. The government needs to look at policies especially supply chain and distribution system. Universities need to understand the needs of the industry and understand the needs of the local community. Industry, don't think he needs R&D because that's what determines his profitability at the end.... Researcher does market research. What makes it an innovation centre?” (RU4).

“The centre of innovation is the safest way to avoid unwanted legal issues with a special purpose vehicle. Not only for the promotion but also for the endorsement of the job and not only for the academic staff it should be available to the executives. Social science is okay. That is all I can suggest ... So, yes I believe it helps to clear the guidelines. In all areas of innovation-incubation-university. The driving line must be clear. The second is to ensure that the researcher understands the need to protect intellectual property, when protected, there should be a feeling of market

driven rather than market push because we think that is what universities should be more like” (RU5).

“In any case, SMEs are the only university that generates market reports for researchers. Other universities do not, so industry and government need to join forces to create an IP Repository marketplace. This means that there is one ministry that holds a single database where all the IP Universities are located. Ready with description is not just a list. So when the industry has access to it, they can shop. To this day it is no longer in Malaysia ... So in order to promote this innovation what I suggest is that at the start of 2017 all public universities have sent representatives to discuss with MyIPO about building an IPR market place. It's where it helps promote intellectual property from universities to industry”. So, we are playing that role especially the technology and innovation. We have the labs, we have the experts here. So, which can grow and contribute into higher level but need to strategies on how the best that we can contribute to the other channel in other words to through the commercialization” (RU5).

“This leadership must be on the research track, the entrepreneurial track, and the legal track. It means they understand the results of research, entrepreneurship, legal and financial. To support innovation, leadership research in innovation on publishing, consulting, intellectual property (IP) innovation, legislation and regulation and policy. Financial is about financial governance. Financial governance means that there is a budget, some in terms of accountability. Integrity is in the legal aspect. These leadership characters are essential in guiding an innovation; there is competency and knowledge about research. That's why I believe that any university's innovation centre must be guided by academics. So, in this case managerial and technical competencies that we see must be related to these 4 things. Research, innovation, legal and financial” (RU2)
“Recently we will find recruit new marketing officer for help or to promote.so far we don't have it, we lacking at marketing... So, Marketing Officer really not just our problem but others also don't have the position for marketing officer for universities, no warren that warren don't have, need to use N or Q, so that also the things we still confuse. Can't use Q, because Q is researcher. So, now we proposing warren for real...” (RU6).

Therefore, Distribution-support Technologies is essential for innovation and commercialisation in today's know-how intensive and innovation-led economy. Not surprisingly, technology, innovations and commercialisation have created successful techno-companies that have transformed industries landscape and society as a whole through new economic growth that increase jobs creation and wealth. The development of R&D in Malaysia is evolving from time to time through innovation and improvement of various aspects as well as developing

human capital skills among academics in addition to the competencies and outcomes of science, technology and innovation (Fini et al., 2020). Recognizing the importance of productivity to model improvement, research assets and expenditure, of course, Malaysia recognizes the need to adopt an innovation -driven improvement model to weather the dynamic global crisis and achieve its aspiration to transform into a high -income nation. To prepare for the Smart Industry 4.0, the support system for innovation and commercialization in Malaysia needs to be strengthened. Given that commercialisation includes transferring information from research laboratories to market areas to innovative products and services, there is a need to focus efforts on improving the governance effectiveness of public research systems with a view to positive impact and impact in markets and society (Liboreiro et al., 2022).

Therefore, innovation and commercialisation entail collaborating between academia and industry to successfully move new scientific discoveries, information, and technologies from the research lab to the market (Clayton et al., 2018). These two inter-related ideas of innovation and commercialisation have set the tone and direction for the nation to enhance the quality of life by emphasizing technology commercialization activities, connecting entrepreneurs, innovators, investors, social media, society, government, university and industry in strategic collaborations (Spigel, 2017; Zahra et al., 2018). The connection and strategic collaboration between these entities is a vital driver of innovation, and productivity (De Wit-de Vries et al., 2019; Fini et al., 2020).

5. Conclusions

In the era of globalisation, the fact that needs to be recognised is that universities in Malaysia need to have their own mould to become a learning institution that is relevant to the National Education Philosophy as its starting point and guiding principle. While there have been drastic changes to the key role of universities, the Malaysian HEIs system must clearly have the right structure, efficient governance and no exception in relevant leadership if they are to be relevant and actively participate in reshaping life through education. The governance system of HEIs plays an important role in the education of world citizens who receive and contribute to the creation and dissemination of relevant knowledge for the community, society at large. This and many more are the way forward for the future. This study will contribute to commercialisation literature by adding new knowledge concerning the link between innovation, commercialisation and Distribution-support Technologies. Practically, the findings of this study will be valuable to HEIs because the success of technopreneurs will, in turn,

encourage and promote innovation by means of Research, Development & Commercialization (R&D&C) among Malaysian HEIs. Global Innovation Index (2009-2010) reported that Malaysia is ranked 28th, way below other Asian countries such as Singapore, China, Korea, and Taiwan. These situations have prompted the Malaysian government to shift policies to promote new forms of research communication and collaboration between universities and industries (Lu & Etkowitz, 2008). Thus, this study impacts on the ecosystem of innovation and commercialisation in providing the importance of Distribution-support Technologies to strengthen the role of university-industry-community relation to drive the economy towards a high-income nation to meet the needs of today and more critically, that of tomorrow.

6. Limitations and Future Research

These findings are subject to the usual limitations arising from the field survey method. The interview used in this study has not been triangulated with data from other sources. From the perspectives of Research University (RU), the findings give rise to several questions for practice. Within a bundle of Distribution-support Technologies, which particular Distribution-support Technologies are more critical to achieving sustained commercialisation? Can a separate bundle of Distribution-support Technologies be managed to improve innovation outcomes? Thus, further research could address such questions, and provide greater insights into the issue of managing Distribution-support Technologies systems in the university especially in terms of innovation, technology transfer and commercialisation. Moreover, future research could also seek to refine the instrument constructed in this study and further test its validity.

References

- Bongso, G., & Hartoyo, R., (2022). The urgency of businessagility during COVID-19 pandemic: Distribution of small and medium business products and services. *Journal of Distribution Science*, 20(6), 57-66.
- Boyatzis, R. (1998). *Transforming qualitative information: thematic analysis and code development*. Sage: Thousand Oaks, CA.
- Carayannis, E. G., & Campbell, D. F. J. (2009). Mode 3 and quadruple helix: toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46(3/4), 201–234.
- Carayannis, E. G., & Rakhmatullin, R. (2014). The quadruple/ quintuple innovation helixes and smart specialisation strategies

- for sustainable and inclusive growth in Europe and beyond. *Journal of the Knowledge Economy*, 5(2), 212-239.
- Cenamor, J. (2021). Complementor competitive advantage: A framework for strategic decisions. *Journal of Business Research*, 122(2021), 335-343.
- Clayton, P., Feldman, M., & Lowe, N. (2018). Behind the scenes: intermediary organizations that facilitate science commercialization through entrepreneurship. *Academy of Management Perspectives*, 32(1), 104-124.
- Da Wan, C., Sirat, M., & Razak, D. A. (2018). Education in Malaysia towards a developed nation. *Proceeding at Yusof Ishak Institute*, 4(2018), 1-20.
- Da Wan, C., Sirat, M., & Razak, D. A. (2020). Academic governance and leadership in Malaysia: Examining the national higher education strategic initiatives. *Journal of International and Comparative Education (JICE)*, 9(2), 91-102.
- De Wit-de Vries, E., Dolfisma, W. A., van der Windt, H. J., & Gerkema, M. P. (2019). Knowledge transfer in university–industry research partnerships: a review. *The Journal of Technology Transfer*, 44(4), 1236-1255.
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: from national systems and “mode 2” to a triple helix of university-industry-government relations. *Research Policy*, 29(2000), 109-123.
- Fini, R., Grimaldi, R., & Meoli, A. (2020). The effectiveness of university regulations to foster science-based entrepreneurship. *Research Policy*, 49(10), 1-15.
- Friese, S. (2019). *Qualitative data analysis with Atlas.ti*. London, Thousand Oaks, New Delhi and Singapore: Sage Publication Ltd.
- Glaser, B. and Strauss, A. (1967). *The discovery of grounded theory: strategies for qualitative research*. Aldine:Chicago, IL.
- Guest, G., Namey, E., & Chen, M. (2020). A Simple Method to Assess and Report Thematic Saturation in Qualitative Research. *Plos One*, 15(5), 1–17.
- Heydebreck, P., & Klofsten, M. (2000). Innovation support for new technology-based firms: The Swedish Teknopol approach. *R&D Management*, 30(2000), 89-10
- Jackson, P., Mavi, R. K., Suseno, Y., & Standing, C. (2018). University–industry collaboration within the triple helix of innovation: The importance of mutuality. *Science and Public Policy*, 45(4), 553-564.
- Javadi, M., & Zarea, K. (2016). Understanding Thematic Analysis and Its Pitfall. *Journal of Client Care*, 1(1), 34–40.
- Khin, S., Kee, D. M. H., Taib, F. M., & Mohd Rosdi, S. A. (2017). Perspectives of start-up entrepreneurs on challenges, support services and entrepreneurial ecosystem. *International Journal of Economic Research*, 14(3), 335-353.
- Kim, J. H., Seok, B. I., Choi, H. J., Jung, S. H., & Yu, J. P. (2020). Sustainable management activities: A study on the relations between technology commercialisation capabilities, sustainable competitive advantage, and business performance. *Sustainability*, 12(19), 1-31.
- Lara, J. E., Esteves, C. M. A., Gonçalves Cremoniz, V., & Medeiros Ribeiro, R. (2021). The Quintuple Helix Modeling Technological Innovation: Characterization and the Status of Business Accelerators in a Metropolitan Region. *International Journal of, The Quintuple Helix Modeling Technological Innovation: Characterization and the Status of Business Accelerators in a Metropolitan Region (September 15, 2021)*. Lara, JE, Esteves, CMA, Cremoniz, VG, & Ribeiro, RM.
- Leydesdorff, L. (2012). The triple helix, quadruple helix, and an N-tuple of helices: explanatory models for analyzing the knowledge-based economy?. *Journal of the Knowledge Economy*, 3(1), 25-35.
- Li, X., & Tan, Y. (2020). University R&D activities and firm innovations. *Finance Research Letters*, 37(2020), 1-11.
- Liboreiro, K. R., Corradi, A. A., & Rapini, M. S. (2022). The role of the university research laboratory in technology transfer to firms in Brazil: Two case studies in biotechnology. *Industry and Higher Education*, 36(4), 398-414.
- Lu, L. & Etzkowitz, H. (2008). Strategic challenges for creating knowledge-based innovation in China: Transforming triple helix university-government-industry relations. *Journal of Technology Management in China*, 3(1), 5-11.
- Mascarenhas, C., Ferreira, J. J., & Marques, C. (2018). University–industry cooperation: A systematic literature review and research agenda. *Science and Public Policy*, 4(5), 708-718.
- Mason, C., & Brown, R. (2014). Entrepreneurial ecosystems and growth oriented entrepreneurship. *Dutch Ministry of Economic Affairs*, 1(2014), 1-38.
- Miller, K., Alexander, A., Cunningham, J. A., & Albats, E. (2018). Entrepreneurial academics and academic entrepreneurs: A systematic literature review. *International Journal of Technology Management*, 77(1-3), 9-37.
- Othman, T. (2019). *Qualitative Data Analysis with Atlas.ti* 8. Malaysia: Universiti Putra Malaysia.
- Ramdan, M. R., Abdullah, N. L., Isa, R. M. & Hanafiah, M. H. (2020). Exploring factors influencing the use of digital platform by micro and small enterprises. *Jurnal Pengurusan (UKM Journal of Management)*, 59(2020), 37–51.
- Ramdan, M. R., Abdullah, N. L., Isa, R. M., & Hanafiah, M. H. (2021). Organizational ambidexterity within supply chain management: a scoping review. *LogForum*, 17(4), 531-546.
- Siegel, D. S., & Guerrero, M. (2021). The impact of quarantines, lockdowns, and ‘reopenings’ on the commercialization of science: micro and macro issues. *Journal of Management Studies*, 58(5), 1389-1394.
- Spigel, B. (2017). The relational organization of entrepreneurial ecosystems. *Entrepreneurship Theory and Practice*, 41(1), 49-72.
- Sujianto, A. E. (2021). Online-based collaborative learning: economics teaching innovation in higher education. *Review of International Geographical Education (RIGEO)*, 11(2), 750-763.
- Zahra, S. A., Kaul, A., & Bolívar-Ramos, M. T. (2018). Why corporate science commercialization fails: Integrating diverse perspectives. *Academy of Management Perspectives*, 32(1), 156-176.