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Managerial challenges and main barriers in universities within the Triple Helix context

The Triple Helix model of innovation is unquestionably the most discussed model for innovation in both developed and developing countries. This model advocates reinforcement of the cooperation between the university, business and government. The world is changing rapidly; consequently, this innovation model is mutating by taking different forms of interactions and collaborating under various conditions, posing various challenges and barriers toward three agents' interactions. There have been many studies on three helices relationships type, three actors` interaction cases and main challenges. However, few studies concerning the Triple Helix model examined the managerial challenges in academia in realizing the Triple Helix Model and University-Industry linkages. A significant role is imposed on universities as the primary source of new knowledge, ideas, creativity and innovation. To push forward the strengthening of the university-industry collaborations within the Triple Helix model in universities of Kazakhstan, we aimed to define the main managerial challenges and barriers in other developing countries in this model realization. As a result, the systematic literature review displayed many challenging aspects in the universities' micro-level management and the main difficulties of university-industry collaborations.

Key words: triple helix, university-industry collaborations, managerial issues.

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Университеттерде «Үштік спираль» моделін жүзеге асырудағы басқару мәселелері мен кедергілері

Triple Helix инновациялық моделі сөзсіз дамыған және дамушы елдердегі инновацияның ең көп талқыланатын моделі болып табылады. Бұл модель университет, бизнес және үкімет арасындағы ынтымақтастықты нығайтуды қолдайды. Әлем тез өзгеруде; демек, бұл инновациялық модель өзара әрекеттесудің әр түрлі формаларын қабылдау және әртүрлі жағдайларда ынтымақтастық жасау арқылы өзгеруге ұшырайды, үш агенттің өзара әрекеттесуінде түрлі қиындықтар мен кедергілер тудырады. Үштік спираль қатынастары, үш актердің өзара әрекеттері және негізгі проблемалар туралы көптеген зерттеулер жүргізілді. Алайда, Triple Helix моделіне қатысты зерттеулер және де академиядағы Triple Helix моделі мен университет-индустрия байланысын жүзеге асырудағы басқарушылық мәселелерді қарастыратын зерттеулер саны шамалы. Жаңа білімнің, идеяның, шығармашылық пен инновацияның бастапқы көзі ретінде университеттерге маңызды рөл жүктеледі. Қазақстанның университеттерінде Triple Helix моделі аясында университет-салалық ынтымақтастықты нығайтуды алға жылжыту үшін біз осы модельді іске асырудағы басқа дамушы елдердегі негізгі басқарушылық қиындықтар мен кедергілерді анықтауға бағытталғанбыз. Нәтижесінде әдебиеттерге жүйелі шолу университеттердің микродеңгейіндегі басқарудың көптеген күрделі аспектілері мен университеттер мен өндірістер арасындағы ынтымақтастықтың негізгі қиындықтары көрсетілді.

Түйін сөздер: үштік спираль, университет-өнеркәсіп ынтымақтастығы, басқару мәселелері.

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Проблемы управления и барьеры в университетах в условиях реализации модели Тройной спирали

Модель инноваций «Тройная спираль», несомненно, является наиболее обсуждаемой моделью инноваций как в развитых, так и в развивающихся странах. Эта модель выступает за укрепление сотрудничества между университетом, бизнесом и государством. Мир быстро меняется, следовательно, видоизменяется и инновационная модель, принимая различные формы взаимодействия и сотрудничества в различных условиях,

создавая различные проблемы и препятствия для взаимодействия трех агентов. Было проведено много исследований по типу трех спиралей отношений, взаимодействия трех субъектов и основным проблемам. Однако проводилось мало исследований, касающихся модели Тройной спирали, где изучались управленческие проблемы в академических кругах при реализации модели Тройной спирали и связей между университетом и промышленностью. Значительная роль отводится университетам как первоисточнику новых знаний, идей, творчества и инноваций. Для способствования укреплению сотрудничества между университетами и промышленностью в рамках модели Тройной спирали в университетах Казахстана авторы статьи стремились определить основные управленческие проблемы и барьеры в других развивающихся странах при реализации этой модели. В результате систематический обзор литературы выявил множество сложных аспектов управления университетами на микроуровне и основные трудности сотрудничества между университетами и промышленностью.

Ключевые слова: Тройная спираль, сотрудничество университета и индустрии, управленческие вопросы.

Introduction

In the State Program of industrial and innovative development of the Republic Kazakhstan for 2020-2025 (hereinafter SPIID), it is planned to carry out work in innovative potential and innovation advancement. This State Program dedicated several areas to strengthen the innovation capacity and its development in Kazakhstan, owing to Kazakhstan's low scores in the Global Competitiveness Index (GCI).

According to Global Competitiveness Report 2019 in GCI by World Economic Forum, Kazakhstan took 55th place and have improved its position by four points compared to 2018. Out of 12 factors of competitiveness, the improvement occurred in 5 aspects, a decrease in 4 factors, and in 3 factors, the positions did not change. Out of 103 indicators, there was an improvement in 33 indicators, deterioration in 49 indicators and no changes in 21 indicators. The competitiveness of Kazakhstan is at an average level in terms of such factors as "ICT" – 44th place, "Education and skills" – 57th place, "Macroeconomic stability" – 60th place. And one of the weakest positions of Kazakhstan is "Innovation potential" – 95th place. An average score of an innovative potential is 32 out of 100. Being aware of the statistics in innovation and competitiveness urges us to develop innovative potential, consequently being competitive. There are various innovation models to implement in the context of Kazakhstani reality. One of the most thriving ones is the Triple Helix Model of Innovation. And the most real and reliable one, since three actors are involved in the realization of this model. The first time this term was used as a biological term for gene splicing, they commercialized this innovative idea, and the Federal support developed an ownership patent. Initially, the innovative biological idea had turned into a valuable business.

The main point is to produce the ideas and then employ these ideas for societal issues, strengthening the nation's whole economy. As the leading agent in this triangle – the universities/ higher education institutions (HEIs), and the industry/ companies, employ the knowledge/skills developed by the Universities. In the Triple Helix Model of Innovation, the University-Industry linkages are typical, thus critical. So, here the entrepreneurial university as a driver of the triple helix [Etzkowitz, 2008: 29]. Although the government plays a crucial part in supporting the business in subsidies/grants, and in the startup development process [Pique et al, 2018: 4] However, UI collaborations remain more significant for innovation management in the context of developing countries. The University -as a knowledge and skills generator, and the industry realise those skills in practical terms by making business and profit. However, in this knowledge transfer process, many issues occur.

Literature review

Generally, the state government documents are devoted to the problematic issues Kazakhstan has to deal with in further development and economic competitiveness areas. One of those documents is the State program of industrial and innovative development for 2020-2025.

World Economic Forum data for Global Competitiveness Index (GCI) is retrieved from the official internet site of trading economics. Due to covid 2019, the GCI 2020 report was missed, and the data displays 2018-2019.

Innovation, innovation management and the Triple Helix model of innovation are widely discussed and explored for the last centuries. Many researchers contributed to the innovation and the triple helix model studies. Such foreign scientists devoted their works to the innovation, triple helix model issues

along with U-I collaborations as Etzkowitz H., Leydesdorff., Drucker P., Zhou Chunyan., Lowe C [Lowe, 1982] Elias G.Carayannis, Elpida T.Samara., Yannis L. Bakouros., Nsanzumuhire Silas., Piqué J., Razak A., Asad Abbas [Asad Abbas et al., 2019],Wan Ming., Hladchenko M., Pinheiro R., Fagerberg, J., Mowery, D., Nelson, R [Fagerberg, 2006] and others. Among Russian scientists, it is worth noting the work of Osmuk L.A [Osmuk, 2019]. Kazakhstani scientists as Dnishev F.M., Alzhanova F.G., Alibekova G.Zh [Dnishev et al, 2015] devoted some of their works to the triple helix model of innovation. Mainly Etzkowitz H worked on research problems as in triple helix model, entrepreneurial science, university-industry linkages, the dynamics of innovation, innovation, etc.; Leydesdorff has many studies in a triple helix, university-industry interactions, innovation system, knowledge-based economy, etc., Carayannis, E – the role of knowledge management, U-I R&D partnerships, Quadruple Helix, innovation ecosystem, innovation, encyclopedia of creativity, innovation and invention, innovation and entrepreneurship -theory, policy, practice etc., Perkmann, M- university engagement with industry, academic engagement and commercialization, open innovation.,Santoro, M- university research centres, university-industry knowledge transfers, U-I interactions, research centres and industrial firms, etc., Hughes, A -Knowledge exchange activities, open innovation, knowledge production, the role of universities, etc., Saad, M- developing countries innovation systems, triple helix strategy, barriers to U-I links, etc.

Research Methodology

The paper aims to explore the managerial challenges the universities face in university-industry collaborations and overall the triple helix model implementation. Besides, we seek to ascertain the main barriers toward collaborations between academia and industry. We employed the systematic review of literature conducted in the field of UIC, such as Silas U.Nzanzumuhire [Nsanzumuhire et al, 2020], Brekke [Brekke, 2020]. We used SLR (a systematic literature review) with limited open recourses available.

A list of relevant literature was obtained using online databases like Web of Science (WoS), Scopus, and Google Scholar; moreover, the books by reliable scientific publishers (Springer, Routledge, Springer reference, Harper etc) were taken into account. We searched these databases by applying different combinations. We employed the following search string in those databases: (University-Industry Collaboration) OR (Triple Helix Management), AND (Triple Helix) all the other key words brought completely irrelevant publications, which were not of our concern. We considered only the articles with open access since the availability of the account access to other publications were limited, or access was not full. Apart from the WoS and Scopus, we used the key search string for the Google Scholar: “triple helix management”.

The period of publications time ranged from 1980 to 2021. The search started in April 2021 and ended in May 2021. Generally, with a key search “university-industry collaboration”, the massive publications were about the overall or too specific UI collaborations, models, practical uses, and realizations. However, in some of those articles, we could find out the challenges and barriers toward implementing the TH model. In the search string: Triple helix management, we could find some articles closely related to our objectives and concerns. The total number in the WoS database with the key search string: Triple Helix Management is 332. In the exact search string, Scopus had 274 publications. A bulk of those papers are from the US, Brasil, UK, China and other European countries. The number of article paper is 169, conference paper 70. All open access papers number 65 Google Scholar displayed 24 000 documents; however, only the first ten was relevant. The key search string “University-Industry collaboration” yielded 1348 results: article 850 with open access – 296 only in Web of Science, and 5727 total and 2669 articles with 1109 open access in Scopus database. Publications obtained after reading the abstracts. Because the articles we aspire to analyse have high legitimacy, the search approach only included peer-reviewed journal papers available in an electronic database. The most relevant articles with open access had been retrieved; in some cases, the full text was not available.

Initially, we wanted to understand the main challenges the academia faced in UI collaborations, and we chose the period started from 1980 since the articles regarding the triple helix from that year are considered a separate model for innovation and was the term was first used in its commercial sense in the Yale Journal of Biology and medicine. Unlike other systematic reviews, this study focuses only on in-depth problems in micro-level management within academia toward realizing the triple helix model. We mainly highlighted the role of managers’ perceptions in the universities and the main barriers in implementing UI co-operations. Some challenges and barriers were described in a certain country as

a case study in realizing the TH model. We seek to learn what gets in the way of such co-operations and what we can do about those obstacles as a developing country. As for the content, publications selected according to whether they answered these questions:

1. Does the publication discuss the problems of UI collaborations?

2. What kind of problem does the article discuss?

3. Do the publication discuss the challenges the universities encounter during the Triple Helix Model implementation?

4. Do those challenges discuss the concerns of the managerial aspects of the university?

Finally, relevant articles and book chapters were downloaded manually to the computer; they were added to the MAXQDA2020 software [https://www.maxqda.com/trial]. In MAXQDA2020 software (demo version), we divided the publications, books, book chapters into two-time range categories. The first-period category documents were from 1980 to 2000, and the second category documents were from 2000 up to the present. Only published work in English language was included. Each relevant article was read repeatedly; major findings were synthesized and compiled into figures.

Discussion and results

For the last decades, there has been many discussions and studies around the triple helix model of innovation, university-industry and university-industry-government collaborations, entrepreneurship and innovation stuff. However, little research had been dedicated to the triple helix management, even less in micro-level management challenges in the universities.

Since the university is the main agent in transferring the knowledge-based economy, it plays a crucial role in implementing the innovation model triangle, thus affecting regional sustainable development. The university plays a significant role in technology innovation as a knowledge-producing and disseminating institution. The university's conventional teaching mission is reimagined as it aids the modernization of low- and mid-tech businesses [Etzkowitz H., Webster A et al, 2000]. Multiple research findings even suggested the urge for theoretical, conceptual frameworks of business education for sustainable development apart from innovative teaching approaches and programs [Adomssent et al, 2012]. Being cognizant of the university role in the sustainable economic development of the whole country urges us to find out, facilitate management challenges, and thrive faster. By management, here again, we imply the THM of innovation management.

The following figure is dedicated to the main challenges to develop a hybrid THM in developing countries and, as for developing countries mentioned, here regarded countries of Central and Eastern European (CEECs). The figure 1 is complied by author based on the scientific article on holistic exploration of barriers and enablers [Razak et al, 2015: 7, 8, 9, 10].

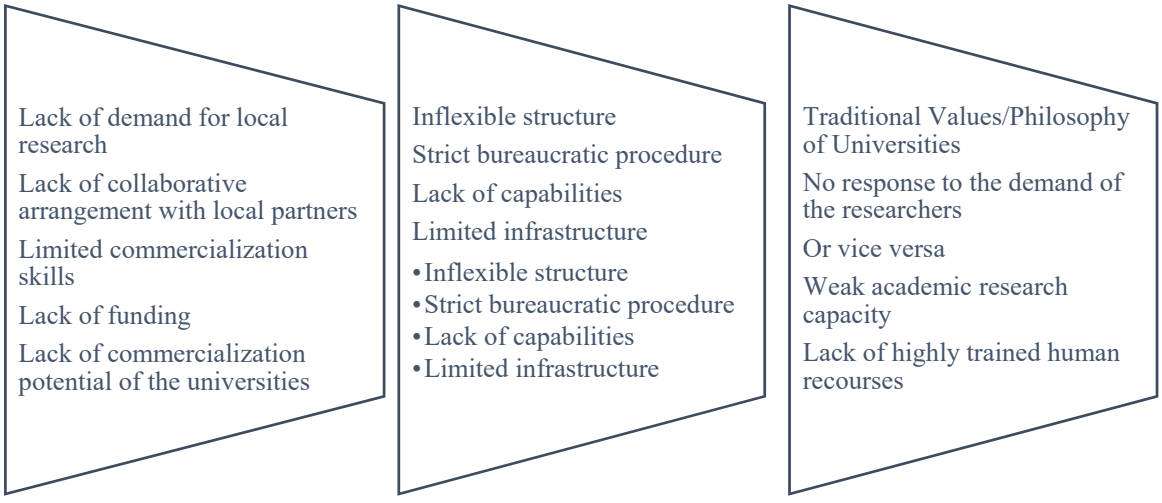

Figure 1 – Main challenges to a hybrid THM development
Note*: compiled by the authors according to Razak et al.,2015

The authors divided these barriers found in this article Razak et al., 2015, into three. The first category goes to the lack of main recourses available in the universities, in either soft skills difficulties, social and financial terms, and the second category concerns infrastructure and procedural policies during the University-Industry collaboration process. The last one involves more of people values and attitudes. By values and attitudes of people, the authors imply the "perception" of the universities` role by researchers, managers and those involved. Furthermore, again, the challenge of academics/researcher and managers` perception of their work in the universities viewed from both perspectives: the conflict between the classic academic and societal perspective on science [Ernø-Kjølhede et al., 2001: 3-4] where we can observe how the problem is profound and requires a careful approach.

According to the article by Vick, T.E., and Robertson, M. (2018), the author Perkmann et al. (2013) suggested four central measures (FCM) that characterize the process of knowledge transfer. Motivation and barriers are one of the main FCM. The article examined existing studies on the FCM, and two different systems of knowledge production were offered as an example of barriers. Understanding perceived barriers to U-I linkages is critical because it reveals the significant issues that arise during the knowledge transfer process. Apart from barriers, assessing the outcomes of such engagement becomes challenging for both agents: academia and industry [Vick, T.E et al., 2018]. Not many studies pointed out the importance of motivation in driving U-I collaborations, nor it has been included as the reason. The understanding motivation that drives both sides to engage with each other is paramount of importance. In the research paper: Systematic literature review of UK university-industry collaboration for knowledge transfer: a future research agenda, the authors have figured out the distinctions regarding motivations and distinctions between barriers across the two perspectives for the formation of U-I connections in the UK. Those two perspectives are social-political and contextual perspectives [Vick, T.E et al., 2018: 5].

Table 1 – Contextual perspective two significant distinctions

Orientation-related	Transaction- related
Differences in incentives and orientation	Potential conflicts between university and industry over intellectual property and university regulations

Note* compiled based on the Vick, T.E., & Robertson, M. (2018)

As can be seen from the table, Bruneel, D`Este and Salter (2010) and Tartari, Salter and D`Este (2012) distinguished two major obstacles toward U-I connections in the UK. The industry says that they experience more transaction-related obstacles, whereas academics view orientation-related barriers as more challenging. Interesting to note that for academics with entrepreneurial experience and for those who have more faith in their industry partners, the orientation-related difficulties become less challenging [Vick, T.E et al., 2018: 6].

If to look upon the barriers to UI collaborations from the universities perspective, in figure below, we can observe the internal premises toward UI linkages apart from the external environment.

In general, in implementing any innovation model, the culture and values of people are the main challenges in any society. It takes time to adapt, perceive as it should be, accept the role to be taken in a new model. To help the people (managers/teachers/ industry employees) to perceive and adapt smoothly, we deem that change management strategies should be employed effectively. Moreover, knowledge transfer's different organisational forms and management styles are noteworthy to point out that managerial attitudes constituting shared values more than technical issues are more critical for UI linkages success [Razak et al., 2015: 13]. There is much research outside of the TH addressing the barriers to universities switching their role towards being an entrepreneurial university. University culture shows us how the norms and values are essential in changing and adapting a particular model. One of the critical barriers toward UI collaboration is the academic reward and evaluation system in the whole scientific system and the perception of the importance of such reward and evaluation per se. The social contribution carries more values for academia, which is counted by the number of publications and citations in the academic world. According to the research paper of SLR of UK U-I collaboration for KT, individual barriers included a lack of time and motivation, while institutional constraints included a lack of reward/incentive/investment and bureaucracy . It is worth noting that in their commercial interests, the vast majority of scientists are driven by reputational/ career benefits. [Vick, T.E et al., 2018: 6]. One can observe here the intrinsic motivation input and the expected outcome by academicians. In support of this viewpoint, two challenging issues [Saad and Zawdie, 2008] critical for triple helix innovation success should be mentioned. The first is about the various partners' engagement and commitment inside and within the three triple helix spheres:

government, industry, and academia. The second is linked to the difficulty of creating mechanisms for coordinating diverse and complicated interactions and interfaces to provide a context and conducive environment for knowledge exchange, learning, and invention. However, a considerable barrier to the TH culture development is that the bureaucratic nature of most institutions in developing nations, including companies and universities, is a significant impediment to knowledge transmission and utilization within and between organizational and institutional sectors [Saad, M., Zawdie, G., & Malairaja, C, 2008: 437]. In the Malaysian experience of triple helix research and technology, according to Saad et al., Ali (2003) describes the challenges of collaborating between universities and businesses as follows:

- Foreign investment dominance in vital industrial industries, particularly electronics.

- Deficiencies in government and industry-provided research funding;

- The venture capital business is still in its infancy.

- a scarcity of research scientists capable of delving into the depths of knowledge;

- Underdevelopment of a creative entrepreneurial culture; and misalignment of the university and industrial goals [Saad, M., Zawdie, G., & Malairaja, C, 2008: 438]. Besides the managerial issues in academia, government policies and systems are important. Here, in the same article [Saad and Zawdie, 2008: 440], Algerian universities dependency on the Ministry for Higher Education was underscored for their programs and policies.

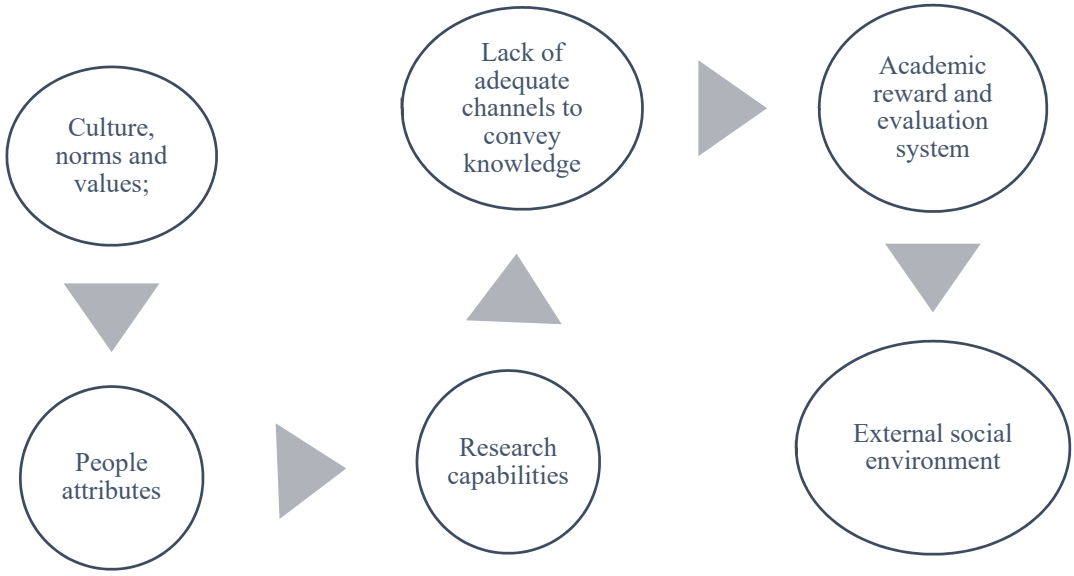

Figure 2 – Barriers to University-Industry Collaborations
Note*: compiled by the authors according to Razak et al.,2015

Academia managers and scientific workers were more inclined to fulfill their research interests and scientific curiosity than complying with the deadlines of contracts with their business partners in the TH context [Razak et al., 2015: 14]. The problem of social influences and cultural clash which occur between industry and academia obstructs such collaboration or its successful realisation. In reverse, the shared values, habits, belief, views, languages and ways of working lead to productive collaborations. In "the triple helix model for innovation: a holistic exploration of barriers and enablers" article, trustworthiness is addressed as the "starting point and a key ingredient" by Rosenberg and Nelson in 1994 as cited in the publication by Razak et al.,2015 [Razak et al., 2015: 12]. Meanwhile, in the same article, the author cited Brockhoff and Teichert (1995), mentioning the significant factor influencing the relationships between actors is the "people attributes". The subset of the peoples` values, norms, habits and attributes are motivations, outcomes of the process (in UI linkages) and academic engagement is suggested by Vick et al.,2018. In "Systematic literature review of UK university-industry collaboration for knowledge transfer: a future research agenda" the authors characterized activities, motivation, barriers to knowledge transfer and outcomes as central

measures that designate the process of knowledge conceptualization and knowledge transfer [Vick, Robertson, 2018: 1]. This systematic review focused on these central measures related to U-I links for knowledge transfer to identify what is known and unknown. By research capability and external environment in figure 2 are meant the current research results in academia and the market demand for new research from the companies.

Conclusion

This paper sought to provide a call for in-depth research in barriers and managerial challenges in academia toward the Triple Helix model implementation. We provided a thematic analysis using a systematic literature review method that many researchers in various fields have used. The discussion has provided key aspects of managerial difficulties in the universities and factors hampering the U-I collaborations. The gap existing in all THM research is the management aspects, few only covered. We also included particular case-study articles (from Algerian and Malaysian institutions) since they focused on the problems of developing a successful innovation model within the Triple Helix framework. The paper aimed to encourage and inspire such studies in Kazakhstan academia and the U-I collaboration process. We call for such a study in Kazakhstan due to the specific nature of the TH model realisation between the universities and companies in Kazakhstan. Since we are one of the post-Soviet and developing countries, it deserves particular attention and exploration via qualitative or quantitative methods to reveal the barriers and challenges occurring throughout the TH innovation model implementation. Hughes (2011) and Hughes and Kitson (2012) identified internal capabilities to manage relations and handle academic bureaucracy as a significant obstacle for industry. The bureaucracy issue is acute in developing economy. The future agenda for us is to identify the intenseness of this barrier in the context of Kazakhstan economic reality. And the research is required on in-depth analysis of both perspectives: academia and industry. Moreover, future research might also concentrate on demonstrating the results of the collaborative works between University and Industry, either in qualitative or quantitative analysis of joint generated start-ups, projects and so on. Apart from internal capabilities to manage effective change management in the university is required in this rapidly evolving environment.

An institutional strategy for developing such ties (U-I connections) put out in a strategic planning document, a development plan, or any other written stated policy is one of the most critical success elements in the management of university-industry links [Martin, 2000:35]. Probably, the control of such policies, strategic plans in the context of Kazakhstan is yet more crucial.

As a result of this limited SLR we could identify the main managerial challenges to develop the THM and the major barriers in academia and business collaborations. The main challenges we grouped into three huge categories of challenges each of them which requires special attention. When it comes to the barriers toward THM realisation between U-I agents the crucial points like the company culture and values, people attributes , reward and evaluation systems within the universities etcetera are found to be among barriers to be dealt with.

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