

# KNOWLEDGE TRANSFER IN ROMANIAN UNIVERSITY QUADRUPLE HELIX ECOSYSTEMS

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**ABSTRACT:** Lately, there has been an unprecedented increasing attention paid to the dimension of knowledge transfer from HEIs to the bigger ecosystems and also to the collaboration existing between stakeholders within the innovation ecosystems, particularly due to the growing demands for innovations and their commercialization. Additionally, the paradigm shift from triple helix to the quadruple helix has prompted the necessity for more research on the collaboration between actors, the drivers of success and also the challenges encountered. This research aims to analyse the perceptions of the stakeholders through a qualitative study, focusing mainly on solutions to increase the effectiveness of knowledge transfer. The results acknowledged the necessity for effective collaborations for the knowledge transfer, possible only through the engagement of all stakeholders. The study contributes to the existing literature by revealing the challenges which emerge from the collaboration of the actors involved in the knowledge transfer.

**KEYWORDS:** knowledge transfer; triple helix; quadruple helix; stakeholders; HEIs.

## 1. INTRODUCTION

Knowledge transfer from universities to communities with the help of governments and industry represents a key driver of innovation, societal and economic development [1-3], all stakeholders benefitting from it. The activities enclosed by the construct “knowledge transfer” have as final outcome the commercialization of new knowledge or innovations within companies, which are further directed towards end-users, namely the community under the supervision, and according to the regulations of each state.

When analysing the role played by Romanian academia and their collaborations with the government, the industry and the society, this research focuses on how the configuration of a Quadruple Helix model materialise in the academia-industry-government-community relationship.

Taking into consideration the importance held by the HEIs both in the technological, social and economic growth, and by consequence, its relationship with the State and the market, the objective of this study is to analyse the structure of the Quadruple Helix approach as far as the academia-industry-government-community collaboration is concerned, by focusing on challenges, strengths and weaknesses of each actor. For achieving this aim, several questions need to be answered: How does the academia-industry-government-community relationship occur within the

context of the Quadruple Helix? What role does each of these actors play? What barriers and drivers do they encounter in their collaboration?

During the last decade, the academic discussions have been mostly oriented towards the Triple Helix Theory, developed by Etzkowitz and Leydesdorff [4], which remains an important model of analysis regarding the university-industry-state relationship [5-7], particularly if we consider that it “introduces the university in the context of the Entrepreneurial University”[8, p. 942] More recently, the above mentioned approach was extended with another helix, the new model being known as the Quadruple Helix (QH), established by Carayannis and Campbell [9], which further on received another extension being transformed into the Quintuple Helix Theory [10].

The paradigm shift from triple helix to the quadruple helix has prompted the necessity for more research on the collaboration between actors, the drivers of success and also the challenges encountered.

This research aims to analyse the perceptions of the stakeholders through a qualitative study, focusing mainly on solutions to increase the effectiveness of knowledge transfer. The study contributes to the existing literature by revealing the challenges which emerge from the collaboration of the actors involved in the knowledge transfer.

This paper is organized as it follows: the first section is an introduction in which the core constructs of the

research are being spotted. Further it continues with the literature review focusing on knowledge transfer and the Triple and Quadruple Helix theories. The collaboration between the actors of the QH model is carefully reviewed. The third section outlines our qualitative research, from the point of view of the methodology used, meanwhile the results are outlined in the in the fourth section. The conclusions and the limitations of the study are presented in the last section, where are also identified the needs to implement measures in order to eliminate the problems and challenges to KT performance between quadruple actors.

## 2. LITERATURE REVIEW

This section consists of the main constructs of the paper: knowledge transfer and factors impacting it, Triple Helix model and Quadruple Helix model.

### 2.1 Knowledge transfer

The concept knowledge transfer from a university viewpoint encapsulates “a wide range of activities ranging from less formal joint projects between universities and industry such as joint publications, student projects and executive education to more formal collaborative research, consultancy and start up activity”[11, p. 374]. From the point of view of internal and external involved actors, the variety is ample, from general to research staff, from managers of the knowledge transfer centre to central and local authorities, industry and community [12].

Previous researches concluded that for a knowledge transfer to be effective, it must rely “upon long-term partnerships, engagement and trust which both increases the probability that knowledge will be freely shared and increasing the breadth of knowledge available for transfer” [11, p. 374]. However, the process of KT is not smooth between the stakeholders, many barriers emerging along the way. These barriers and also the enablers have been studied through various methodologies.

In a research conducted by Miller et al., [13] in 2016, the list of the factors impacting KT is ample, according to Figure 1.

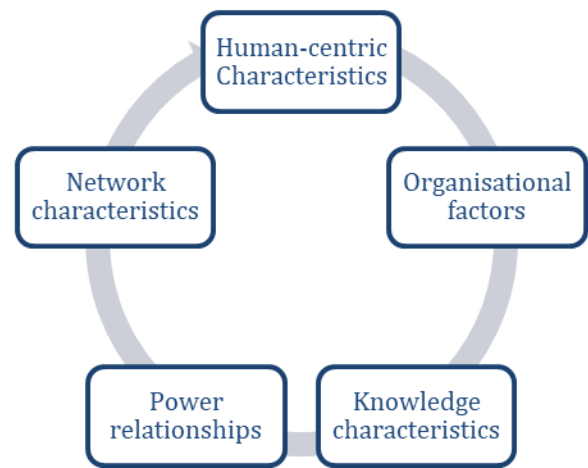


Figure 1. Factors impacting KT [13]

The barriers which impact KT in this research are the following:

- Human-centric characteristics (the skills to network/collaborate; personal traits);
- Organisational factors (internal procedures and mechanisms);
- Knowledge characteristics (business-related knowledge);
- Power relationships (actors have different priorities, being exposed to increasing pressure from authorities);
- Network characteristics (networking/ collaboration/ trust building, particularly in agreement with QH theory);

Other studies concluded that there are three major factors which affect KT (Figure 2)[1,14-16]:

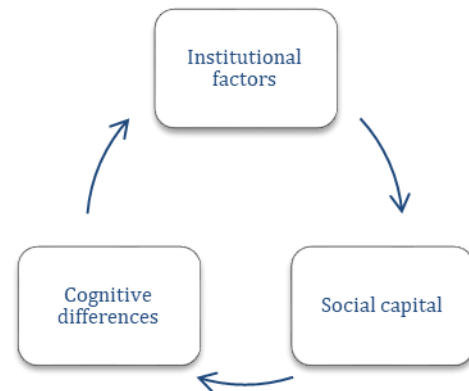


Figure 2. Factors impacting KT [1]

These factors are confirmed by many other researches, but individual, not together, the cognitive factors being the most repetitive ones [17-19].

According to a more recent research, Alexander et al.[11] conclude that there are three major causes which impact KT, and they can be found in Figure 3.



**Figure 3.** Factors impacting KT [11]

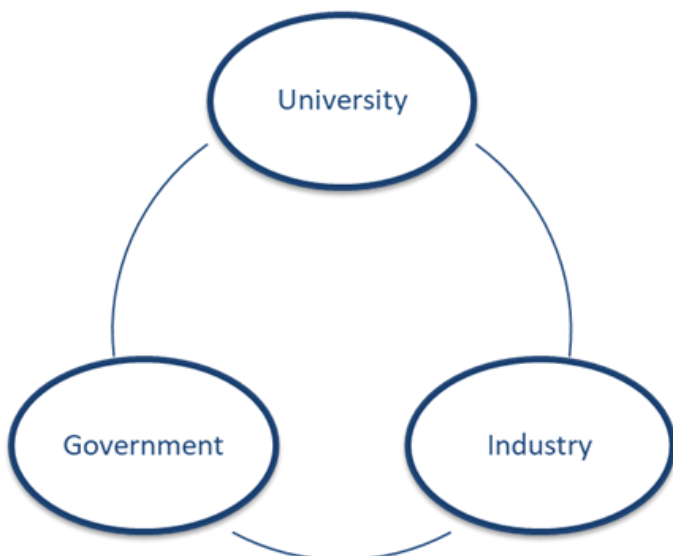
In this study, the factors impacting KT are:

- Contextual factors (legislative interventions; academic motivations; skills of the staff)
- Organisational factors (bureaucracy and inflexibility; internal tensions) and
- Stakeholder factors (divergence in stakeholder expectations; deadlines).

All these translate into the relationships and collaborations existing between stakeholders either internally or externally.

## 2.2 The Triple Helix and Quadruple Helix Models

Within the Triple Helix (TH), HEIs can be viewed as both a knowledge producer and at the same time a pipeline between the other actors: state and industry (Figure 4), the concept introducing “the notion of overlapping exchange relationships between the institutional spheres, with the intent of generating a new form of knowledge infrastructure through interrelationships between the various social actors involved” [8, p. 944].



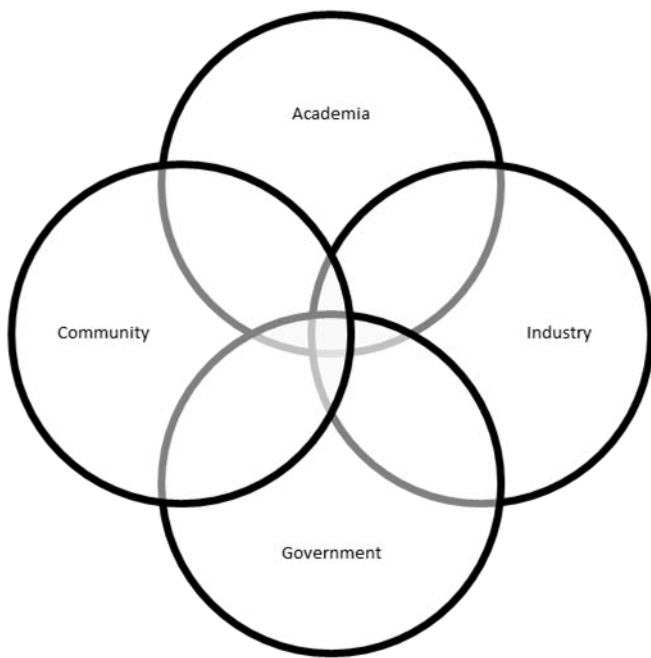
**Figure 4.** The Quadruple Helix Model [4]

At the same time, as stated before, “the entrepreneurial university literature has associated the third mission with knowledge transfer/commercialisation (i.e., patents, licenses, intellectual property rights), and entrepreneurial innovation initiatives (i.e., start-ups, spin-offs)” [20, p. 4], accentuating the importance of the HEIs in the economic and regional development [21, 22]. This encouraged the use of the Triple Helix model, usually corroborated with the entrepreneurial university, determining modern and different opportunities for knowledge transfer. Lately, however, putting aside the economic and technological results, HEIs widened their attention and started focusing much more on sustainability, promoting knowledge transfer highly influenced by Sustainable Development Goals supported by the UN [23]. This prompted the necessity for supplementary helixes, the fourth one - that of the community (society) (the Quadruple Helix model) and the fifth one, that of the sustainability (the Quintuple Helix model). Further on, the attention will be on the paradigm shift from the Triple Helix to the Quadruple Helix, the last one serving the purpose of the current research.

Additionally, every actor holds a particular role, respectively:

- The HEIs provide new knowledge and therefore innovations;
- The industry takes care of production, meanwhile
- The public authorities provide the legislative framework and stability for an effective development [24-25].

Lately, new models of user-driven innovation were developed; one of them added another actor to the TH model: the community (figure 4).



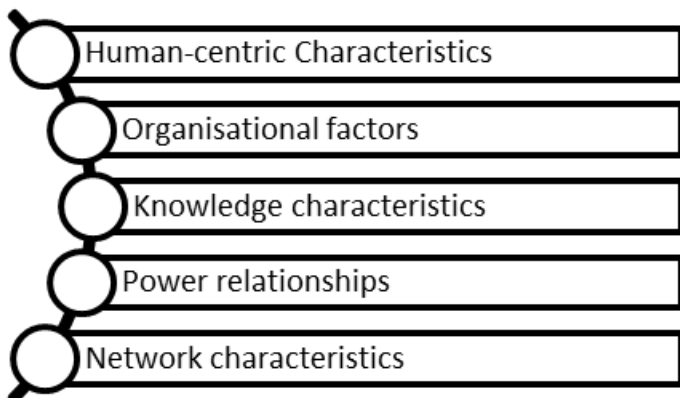
**Figure 5.** The Quadruple Helix Model [9]

This new model connects four stakeholders: Industry, Government, University, and Public [26], admitting

### 3. METHODOLOGY

#### 3.1 Research Design

The study uses the qualitative research methodology. The primary data collection was done through 26 semi-structured interviews with the four stakeholders represented in the QH model. The focus was on the knowledge transfer from universities to the other three stakeholders. Because of the COVID-19 challenge and social distancing phenomenon, the interviews could not be conducted face-to-face, therefore were conducted virtually, via Skype, in January, February and March of 2021. Before starting the interviews, the general objective of the research was explained to the participants and their permission was required for recording the interviews. The focus of the interview has been on 5 aspects, according to figure 6:



**Figure 6.** Main areas of the interview

the important role played by the public which becomes the end-user, particularly since they are the ones who generate demands for innovations [27]. Recently there have been many European and national debates arguing that universities need to reinforce their role at the basis of the QH innovation ecosystem, “where the need for the unconstrained flow of knowledge and expertise is embodied in collaboration and cooperation between quadruple helix stakeholders” [28, p. 129].

Scholars have considered the challenges for effective KT implied by these changes in the role of the university [11, 28], but in spite of this they paid little attention to the knowledge contribution of industrial collaborators. All in all, this research area requires further investigation as there is an imperative need for a better understanding and definition in order to find the most appropriate methods for effective knowledge transfer.

#### 3.2 Sample characterization

The sample consisted of researchers from two research centres, representatives of industry (3 firms), local authorities (three city councils) and associations. All participants were involved in research projects and clusters which implied the QH model of collaboration.

**Table 1.** Sample characterisation

Stakeholder	No.	%
Research centres (2)	5	19
Industry (3)	9	35
Government (3)	6	23
Community (2)	6	23
TOTAL	26	100%

### 4. RESULTS AND DISCUSSIONS

In terms of human-centric characteristics the skills of the staff to collaborate to each stakeholder were observed, as well as their personal traits. Researchers usually complained about the industry representatives, stating that “they do not seem really interested about our efforts. When we send them emails with the technical information the usual answer we receive is ‘We’ll talk later’ and most of the time nobody calls back” (Univ. 2, M. A.). Also, a similar situation occurs with the authorities: “There are changes all the time, no continuity. Today you talk to one secretary of state or public manager, tomorrow he’s gone. You need to explain again to the new

manager...and so on” (Univ. 1, N. V.) At the same time, all stakeholders welcome the end-users’ opinions: “The input from the community is highly valued” (Gov. 2, S.D.). It resulted that individual attitudes towards partners is really valuable. Many university participants expressed their reticence towards engaging with industry. The same reticence was observed on behalf of the industry. Similarly, the attitudes towards the public authorities were conflicted: “They just set deadlines without any reality in it” (Ind. 1, M. F.). All these can lead to different goals and implicitly different research agendas. There were also industry members who pointed out that “there are language differences between us (stakeholders) which limit the acquisition and assimilation of knowledge.” (Ind. 2, D. D.). A public manager concluded that “Some scholars are really absorbed in what they do, and they fail to articulate their knowledge at time” (Gov., 1, N.M.). Consequently, attitudes and cultural differences represent an important barrier to effective KT.

The second section of the interview focused on organisational factors, and particularly on problems that emerged within organisations. One particular problem underlined was the necessity to modernize and invest in creation and knowledge transfer. This issue was stipulated by university, industry and public authority representatives. Unfortunately, even if the power is held by government, they had little to no solution to the funding problems. There were also positive aspects observed, such as the Knowledge Transfer Office existing in the analysed research centres (universities), this staff focusing particularly on KT. Thus, one participant stated that “managers demand more and more from us. On the one hand there is academic excellence, awards, citations, publications, conferences, and on the other hand there are industry-university collaborations” (Univ. 2, G. T.). This translates into low motivation and therefore negatively impacts KT. Also, a representative of the public authorities complained about the fact that there is “little stability in my work. Governments change often, managers too, it is really difficult to follow up a medium or long-term plan” (Gov. 3, P.O.)

Further on, the third section analysed knowledge characteristics in order to help with knowledge commercialisation, which stands as the final goal. However, there were respondents who recognised that they didn’t have any experience in commercialisation: “I have never been involved in commercialisations before” (Univ. 1, E. R.). Also, there were company representatives who acknowledged that “A good sales person can immediately sell an IP no matter if is great or bad”

(Ind. 1, I.L.). This was also admitted by university researchers. Another important aspect was that of the adoption of the company’s perspective, underlined by the industry representatives. According to one of them: “Most of the time, researchers try to sell their ideas. However, the manner in which they present these ideas convinces the buyer or not. If they encapsulate the buyers’ perspective than it’s satisfactory for all parties” (Ind. 3, O.A.) This issue of perspective is available for all parties involved, leading to better understanding of the researchers, the industry, the government and especially of the end-users’ needs. Also, it was noted that the communication through email and telephone was not effective. Therefore, most participants argued in favour of video conferencing if face to face communication was not possible. It was observed that older participants (community) insisted on face to face meeting, probably due to low digital literacy.

Power relationships held a particular place in the research. During our study there were many moments when the complexity and difficulty of KT was sensed due to the multiple stakeholders involved. The collaboration between actors appeared many times as if there was some sort of a permanent conflict between them, which conducted to different scopes and objectives regarding the KT. Thus, all three stakeholders (university, industry and community) admitted that the coherence and implementation of public policies is low. Also, the organization of public authorities is constantly changing, confusing their partners. Even the representatives of the state admitted the need for an improved coordination of public funds and financial instruments in general. At the same time, there was no question about how was in charge from the point of view of the power relations, that is the government.

Last, networking was analysed. Network characteristics refer as already seen to networking, collaboration and trust building among stakeholders. Building trust is a difficult issue. Many participants in the research stated that they have a difficult time in trusting the other actors. Either due to the disclosure issues or due to different strategies which unfortunately often lead to different goals, the skills needed for effectively getting involved in the KT are important and rare: “Getting involved in this type of project (KT) means on the one hand secrecy (IP) and on the other hand developing collaboration and relations during the project. The balance is difficult to keep” (Ind. 3, D.F.). Therefore, from this statement it can be concluded the necessity for an open relationship and collaboration, which triggers knowledge openness. As F. M. puts it: “It is important

for us, researchers, to confide in the industry staff, to confide in the state authorities to respect their part of the deal, to trust that the social community have no hidden agendas. Placing trust in your partners is very important and this makes it even more difficult.” (Univ. 1, L.I.). The importance of trust is undeniable. Additionally, some participants stated that “I usually try to keep in contact even after a project ends. You never know what the future will bring” (Comm. 1, G.T.).

It was agreed by all participants that the involvement of young people in knowledge transfer projects is a must. Either under the form of volunteer, civic or community activities, there is a need for community involvement.

## 5. CONCLUSION

This study widens the literature on Quadruple Helix model, focusing on effective knowledge transfer. The factors which enable and hinder the effectiveness of KT between the four helixes are assessed through a qualitative research.

Empirical researches focusing on KT still have a long way ahead, scholars pointing out that constructs need to be looked into more thoroughly and further developed. From the KT perspective, especially when analyzing it from the QH model, where there are collaborations of multiple actors, many challenges surface that need to be further studied.

Our research focused on several (5) possible drivers or, on the contrary, inhibitors of the effectiveness of KT, chosen from the literature review.

Furthermore, the outcomes identified that the paradigm shift from TH to QH model was seen as beneficial, particularly since the community or end users were treated by all the rest of the actors as very important for KT and its’ commercialisation.

The results acknowledged the necessity for effective collaborations for the knowledge transfer, possible only through the engagement of all stakeholders. The outcomes also suggested that stakeholders need more open collaborations and relationships in order to facilitate KT, trust being a major factor in the effectiveness of KT. Also, the difference in perspective was found to be an important factor. Thus, each actor should try and view things from the other’s perspective in order to get a better idea of what the rest of the actors really need. In addition, organisational factors should also facilitate building relationships, not hinder them. Particularly researchers, industry and public representatives highlighted this issue, referring to the bureaucracy involved, to the permanent changes, lack of

continuity, loaded activity, pressure and others. Besides, this paper underlines the need for more effective collaborations and relationships based on openness and trust between actors.

At the same time, future works should also consider analysis the aspect of learning from knowledge transfer activities, as this is another important aspect to be carefully considered. At the end of each project, all participants should reflect on the current progress, the drawbacks and enablers in order to maximize strengths and minimize weaknesses.

As far as future works are regarded, an analysis concerning factors which enhance a good balancing of the power relationships between QH actors can be considered, particularly since this leads to effective commercialization of KT.

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