Three Scenarios of Innovation and Technology Transfer: The Case of Key Enabling Technologies in the Danube Region

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Abstract: The interconnected and globalized world is increasingly interdependent. Part of the interdependence is driven also by global trends that act as steering forces for local actors to orient themselves. One of the global trends is without doubt open innovation. It is the technology transfer and cooperation between the business sphere and academia that is proposed as a solution for keeping up with the innovation demand of global markets. The empirical part of the article is based on a series of focus group discussions conducted through fourteen countries of the Danube Region. By applying data from collected focus groups we can detect distinct patterns of development of the technology transfer system in the Danube Region. For this purpose, we elaborate on three scenarios of future collaboration between the business and the academic sphere. The researchers discuss the potential future relationships between the business sphere and academia in the Danube Region. The perspective taken into account is self-identification of each of the spheres in the light of the open innovation paradigm demands for increased cooperation.

INTRODUCTION

The interconnected and globalized world is increasingly interdependent. Part of the interdependence is driven also by global trends that act as steering forces for local actors to orient themselves. One of the global trends is without doubt Open innovation[1]. It is the Technology Transfer (TT) and cooperation between the business sphere and academia that is proposed as a solution for keeping up with the innovation idea of global markets[2-4].

Decades ago, Kaufman[5] noticed that in a certain period in which one specific idea is superior, other ideas are never completely unnoticed or left out and actors organize and work towards the pursuit of the values of the dominant idea. Based on Kaufman's thought, it would be reasonable to conclude that at one point one normative model of the future of the academia or economic sphere persist while another (or others) play a slightly less significant role within the prevailing opinion or model (ibid.). Therefore, future scenarios remain more or less imaginary stories but inevitably include the characteristics of contemporary global trends and response to them[6]. Global trends and open innovation as one of them, encompass some to the main characteristic of contemporary societies and contribute towards the emergence of a myriad of new interactions.

Table 1: Distribution of Danube Region countries regarding GCI ranking[7]

I. Advanced	GCI	II. Intermediate	GCI	III. Lagging	GCI
Germany	3	Slovakia	41	Serbia	65
Austria	22	Hungary	48	Croatia	68
Czech Republic	29	Bulgaria	51	Montenegro	71
Slovenia	35	Romania	52	Ukraine	83
				Moldova	88
				Bosnia and Herzegovina	91

Scenarios should encourage actors in anticipating the consequences of global trends and organize their actions to be able to keep up or even lead the global trends. Doing so, they could ultimately contribute to making strategic decisions when steering innovation and leading development[8, 9]. In the presented specific case of business-academia collaboration, scenarios could contribute to a better definition of type and level of cooperation between the business and academia in the context of synchronous production and transfer of socially relevant knowledge/technology from the academic to the economic sphere and vice versa.

To establish a line of thought, we propose the following research question: What are potential scenarios for increased technology transfer between academia and the economic sphere in the Danube Region (DR) countries?

MATERIALS AND METHODS

As a basis for our research data from EU Project InterregInnoHPC (InnoHPC project co-funded by European Union, ERDF and IPA funds under Danube Transnational Programme, Interreg Danube. The project was lead by Faculty of Information Studies under the number DTP1-260-1.1. http://www.interreg-danube.eu/approved-projects/innohpc) were used which included 14 countries (Table 1) of the DR, encompassing in a total of 92 participants, one focus group per country. For the sake of analysis, we divided them into three groups, according to the level of The global competitiveness Index[7] as shown in Table 1. The focus of our research has been focused on the research question.

RQ: What are potential scenarios for increased technology transfer between academia and the economic sphere in the DR countries?

Through the research process, we applied a qualitative approach as this approach is based on the interpretative paradigm[10, 11] which assumes that there is no such thing as social objectivity as every individual's experience is unique. Researched individuals in our case, a representative from SME, Tier I or Tier II supplier in the automotive industry, a representative from SME, Tier I or Tier II supplier in the electronics industry, a representative from an HPC provider or competence centre an expert or consultant familiar with the topic of innovation and digitalization of industry and a policy-maker (regional or national level) dealing with innovation-policy, relevant from the perspective-of this proposal were those who based on their perceptions, made it possible to create a social reality tied to future scenarios of transfer of technology.

We also took into account the phenomenological aspect of the qualitative approach to research[12]. This view emphasizes the importance of examining the experience gained by the participants in the research through many years of work in the fields of electronics and automotive industries. We illuminated the research problem through the experiences of the interviewees in the most authentic context possible as the interpretation of a research problem is also conditioned by the cultural context in which it is located. Data were collected using 14 focus groups, one in each of the DR countries. The focus groups were taking place in the period between April and October, 2017. Focus group sessions have been held to research the situation regarding social aspects of cooperation. Transcripts of focus groups were analysed using the standard qualitative data analysis technique by applying the process of coding and category assignment. The NVivo software was used for the purpose.

RESULTS AND DISCUSSION

In the context of the impact of global trends on the dynamics between academic, economic and political spheres for TT opportunities, academia is recognized in the DR as a key carrier of KET information but the effectiveness of academia between countries varies. Advanced as well as intermediate countries, identify the obstacles to the use of KET in industrial R&D in, firstly, the decentralization or dispersion of information on applications and capabilities of KET in R&D and secondly in low industry awareness of the possible use of KET. In lagging countries, barriers to the dissemination of information on KET by academia are perceived, especially through lack of knowledge and the unavailability of KET information for the industry. Search for information about KET is mostly left to the initiative of an individual or organization/company. Intermediate countries also believe that government institutions are responsible for creating a structured system for the transfer of information on KET.

The role of the political sphere in TT across the DR is perceived as weak. Also, the activities of public organizations are recognized by most DR countries as a barrier to TT. The inhibitory role of the political sphere in TT in the DR countries relates to unregulated legislation and high costs of IPR protection; insufficient financial resources; weak, deficient or outdated KET infrastructure; lack of a long-term vision in TT strategy papers; lack of interest and awareness in the effectiveness of the use of KET in TT; the declarative orientation of national policy towards the promotion of cooperation between academia and business.

Among DR countries, different levels of development of the economic sphere as a KET user are shown. In advanced countries, the existence of high-tech companies is identified with their R&D centers operating very successfully. In intermediate countries, low-tech, low value-added companies still predominate. In these countries, the rapid expansion of KET into the industrial sphere is detected but independent use of KET is still not realized as they still rely on the help of the academic sphere and national policy. Lagging countries face different problems. On the one hand with the gray economy and tax evasion with the economic sphere focused on the development of primary industries (e.g., agriculture). The use of KET here is only in the phase of identifying potentials of KET use.

In advanced countries, there is a tradition and openness to cooperation between spheres and a high level of trust is present. Here, the conservative mindset of key actors regarding technology-oriented cooperation is identified as an obstacle to the creation of social frameworks.

Intermediate DR countries report on various forms of networking between actors (national, regional, cross-border, formal, informal, sectoral and cross-sectoral networks) where support environment and co-operation in EU projects strengthen trust between actors in the fields of innovation and technology. Networking between actors in academic and economic spheres is weakened because lack of interest of economic sphere in academic research and the applicability of its results; Industry does not recognize the opportunities to use New Technologies (NT), industrial clusters do not know the usefulness of KET services in industrial R&D and also SMEs use new ICT services rather poorly. Lagging countries lack experience in creating social networks. Here, trust is only being established through consultations of R&D actors who show a willingness to participate in joint R&D projects. Trust is built mostly on a personal level.

Differences between countries in the DR also exist related to the culture and attitude of the population towards Creativity, Entrepreneurship and New Technologies (CE&NT) the learning process and competitiveness. The positive attitude of the population of the advanced and intermediate countries of the Danube towards CE&NT is mainly reflected in the industrial orientation in ICT innovation and KET. In the intermediate Danube countries, the population is rapidly conquering new trends. In these and lagging countries, the tendency towards CE&NT is particularly pronounced among the young generations who are open to new ideas and thus become trends-setters.

On the other hand, in all DR countries, older generations show conservatism in thinking which is an obstacle regarding the attitude of the younger population towards CE&NT. This is reflected in the avoidance or unwillingness to accept the business risk as business failure is seen as a disgrace; distrust of NT (such as KET) in industry, general distrust of the competences of the population; unwillingness to experiment with the business using creative business approaches; closed social networks related to (non) cooperation between the academic and industrial spheres.

Differences are also indicated in the context of the population's attitude towards learning. In advanced DR countries, the population shows a tendency towards lifelong learning which is supported by the academic sphere which is open and ready to change study processes for the needs of the industrial sphere. The population has a positive attitude towards competitiveness there which they recognize as a positive value in the form of motivation to develop and penetrate CE&NT KET in industrial R&D, solidarity between key actors in the design of high-tech solutions.

In intermediate countries, most in favor of learning to use NT is the younger generation. Openness to learning through non-formal education in higher education and industry is promoted. In lagging countries, attitude towards learning seems inadequate and also, young people already perceive a lack of motivation or apathy to learning which might be induced by the fact that (young) employees receive relatively low incomes considering the complexity of their work. There are reports of unfair competition in lagging countries. With the emergence of rivalry, cooperation between actors to achieve a common goal is weakened and as is the correctness of relations between actors is crippled. In the advanced and intermediate countries of the DR, the rivalry is an obstacle to cooperation between companies and in the academic sphere, KET-related rivalry causes too much dispersion both in terms of infrastructure and financial resources.

Regarding the role of globalization in the use of KET/TT, there are no significant differences between the DR countries. The population of the entire DR has a positive attitude towards globalization as it creates various opportunities for the use of NT. The key advantage of the globalization process in the DR countries is spread over three segments. The first relates to opportunities in

strengthening SN. The second segment of the positive impact of globalization is the accessibility of information and knowledge about KET and foreign markets. The third aspect is related to the development of NT through openness to learning. In the DR, there is a reciprocal relationship between openness to learning which encourages the development of innovativeness while the development of NT can be considered as one of the positive consequences of globalization.

Research question: What are potential scenarios for increased technology transfer between academia and the economic sphere in Danube Region countries?

Answer to research question: Based on the identified differences between the studied DR countries related to academic, economic and political spheres and their commitment to establishing cooperation for more efficient TT, we created three different potential scenarios for (increased) TT between academia and economics.

The analysis of the situation of the lagging DR countries coincides with the future Scenario 1, named Ivory tower in which the boundaries between SF are maintained while most intermediate and advanced countries pursue the future Scenario 2 named opportunity network by maintaining and crossing SF boundaries.

However, some advanced countries are already showing the potential to realize future Scenario 3, named Open network which seeks to disappear borders and homogenize the academic and economic spheres.

To provide a coherent response to the above question, we presented cooperation potentials between two spheres, business and academia. The global trend of Open innovation is understood as the global trend impacting both. The three patterns of collaboration were detected setting the foundation for the development of three scenarios for TT.

The first identified scenario where according to the data collected, the lagging countries of the DR fit is named the "Ivory tower". This scenario presupposes the lack of interest in systematic cooperation between both spheres. Each of the spheres desires to maintain the elite position of independence. Following the Ivory tower scenario, there are not enough mechanisms to promote the benefits of cooperation contributing to enhanced TT. The level of TT is minimal and is based only on individual enthusiasm.

The second identified scenario where according to the data collected, the intermediate countries of the DR fit is named the "Opportunity network". This scenario presupposes the cooperation between both spheres, there is potential for full cooperation but the intermediate countries lack the trust to enhance the potentials of cooperation. Members of each of the two spheres do cross

the border to collaborate but with awareness on their borders and respect to own traditional roles in society. Networks are developed when the opportunity for TT emerges.

The third identified scenario-where according to the data collected the most developed countries of the DR fit is named the "Open Network" and presupposes the full cooperation between academia and business. The cooperation is fully inline with the Open Innovation paradigm and oftentimes results in a new and innovative solution to global trend demands. The spin-offs as new organizational entities can be understood as a new way of contributing to steering the global trend's demands.

Simple summary: In times of need for Open innovation business and academia deal with the question of possible cooperation. Following the extent of qualitative research undertaken within the InnoHPC project in 14 countries of the Danube Region, we were focusing on detecting potential patterns of collaboration in the context of innovation and technology transfer. Following the results, we were able to detect three distinct patterns of collaboration which we elaborated into three scenarios of innovation and technology transfer. The scenarios are ideal forms of relations between business and academia and as such do not fully exist. They ought to serve as a tool for policymakers to introduce the public debate on the topic of innovation and technology transfer for future development.

CONCLUSION

To conclude, when elaborating on different scenarios of the future of TT, we have to emphasize we are not making empirical predictions but we rather offer a normative vision of the future. The suggested three scenarios only show the potential paths of future collaboration as the proper response to the global trend of Open innovation. The scenarios are ideal forms of relations between business and academia and as such do not fully exist but they rather serve as a tool for considering the possibility and desirability of each of the scenarios for future development. Considering the prevalent values of the society, it is the task of the policymakers to provide the framework conditions for nurturing the desired futures.

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REFERENCES

01. Singh, N., B.P. Bartikowski, Y.K. Dwivedi and M.D. Williams, 2009. Global megatrends and the web: Convergence of globalization, networks and innovation. ACM SIGMIS Database: Adv. Inf. Syst., 40: 14-27.

02. Chesbrough, H. and A.K. Crowther, 2006. Beyond high tech: Early adopters of open innovation in other industries. R&D Manage., 36: 229-236.

03. Kolar, J., 2020. Social aspects of technology diffusion: Danube region HPC case. Ph.D. Thesis, School of Advanced Social Studies, Nova Gorica, Slovenia.

04. Valic, T.B., 2019. Innovation, Digitalisation and the HPC in the Danube Region. In: Go with the Flow: High-Performance Computing and Innovations in the Danube Region, Roncevic, B., C. Raluca and F. Urska (Eds.)., Vega Press Ltd., London, pp: 22-46.

05. Kaufman, H., 1956. Emerging conflicts in the doctrines of public administration. Am. Political Sci. Rev., 50: 1057-1073.

06. Lamut, U., 2014. [Portfolio of skills as innovative mode of networking]. Ph.D. Thesis, School of Advanced Social Studies, Nova Gorica, Nova Gorica, Slovenia. (In: Slovenian).

07. Schwab, K., 2018. The global competitiveness report 2018. World Economic Forum Corporation, Cologny, Switzerland.

08. Modic, D. and B. Roncevic, 2018. Social topography for sustainable innovation policy: Putting institutions, social networks and cognitive frames in their place. Comp. Sociology, 17: 100-127.

09. Roncevic, B. and T.B. Valic, 2019. How to think about regional development agencies as a sociologist. Social Sci., 14: 326-334.

10. Alase, A., 2017. The Interpretative Phenomenological Analysis (IPA): A guide to a good qualitative research approach. Int. J. Educ. Literacy Stud., 5: 9-19.

11. Smith, J.A. and P. Shinebourne, 2012. Interpretative phenomenological analysis. American Psychological Association, Washington, USA.

12. Miller, R.M., C.D. Chan and L.B. Farmer, 2018. Interpretative phenomenological analysis: A contemporary qualitative approach. Counselor Educ. Supervision, 57: 240-254.