

# MESSAGE FROM AUTOMOTIVE INDUSTRY TO TECHNOLOGY TRANSFER OFFICES

## ABSTRACT

Our study shows that technology transfer between Slovenian universities (or public research organisations) and Slovenian automotive industry is not sufficient. On one hand, technology transfer offices offer patented inventions for which automotive industry claims they have no value for them. On the other hand, the industry is seeking the help of (university) scientists to solve specific technical problems for inventions they propose and they could successfully commercialise, but unfortunately they often encounter unresponsiveness or rejection of their invitation. By conducting a focus group method where we confronted representatives of different groups, we have tried to find mutual solutions to this challenge. We claim that technology transfer offices have to be transformed in that way to attract direct industrial funding rather than purely focusing on commercialising results of ongoing research at universities or public research organisations.

## INTRODUCTION

European Commission (2020) observes that Europe is lagging behind South Korea, Japan and US in translating research and innovation results into the economy. Although Europe is a world leader in some high tech sectors such as green technology, efforts need to be channelled towards strengthening industrial innovation, technology transfer and fostering the uptake of solutions and the diffusion of innovation through knowledge transfer and public – private cooperation. In this paper we will try to explore where are the basic challenges of weak technology transfer by taking in account one EU country – Slovenia, and a specific industry: automotive industry. Automotive industry is one of the most important foundations of the Slovenian economy and mainly represents first and

second tier suppliers for the EU original equipment manufacturers (automobile producers such as Volkswagen, Daimler or Renault) and a number of their subcontractors.

Technology transfer, as defined by Association of University Technology Managers, is the process of designating the formal transfer to industry of discoveries resulting from university or private research, for marketing purposes under the form of new products and/or services (Vac and Fitiu, 2017). For the purpose of this paper we will focus on public institutions only. They can be universities (or other higher educational institutions) or other public research organisations (PROs), such as research institutes. The difference between the two is that first have research and educational role while research institutes mostly have the research mission only. With the mission of supporting and helping professors, researchers and students to develop and commercialize their research work and inventions, technology transfer offices (TTOs) at universities and PROs were established. The first known TTO is considered to be Wisconsin Alumni Research Foundation started in 1925 (Apple, 2008). TTOs are essentially institutions that bridges academia with the industry (Vac and Fitiu, 2017). From an organizational perspective, they are separate units created within universities or PROs whose primary role is the management of technology transfer processes. In Slovenia, first technology transfer office was established in 1996 at the Jožef Stefan Institute, while Slovenian government started with financial support to TTOs in 2009 (Habjanič et al., 2015).

At the US universities, patent activity has expanded in the last decades, and royalties form licences support governmental funding, while in Europe, a long tradition has been for universities to turn

over intellectual property rights to the firms where they consult. Although this practice is changing, and European universities increasingly follow the US model (Etzkowitz, 2013), they seem to be one step behind. For example, researchers claim that US TTOs place a greater emphasis on 'generating revenue' as an objective, they employ more staff who have experience in the industry sector and are more skilled at negotiating than European TTOs (Vac and Fitiu, 2017). Current studies also show that European TTOs' intellectual property management is lagging behind the US. It is less professional compared to their US counterparts resulting into fewer patents, and at the same time in the EU the revenue from academic – industry knowledge transfer is highly concentrated, with the top 10% of universities accounting for almost 90% of all revenue (Gerbin and Drnovsek, 2016). Research by Holgersson and Aaboen (2019) shows that the strict patenting practice (i.e.s. patenting only the technologies with high business potential) have a significant negative effect on European TTOs' performance (while they have no significant effect on Japan TTOs' performance).

Many studies which explore TTOs' performance are focused on the patent production of universities/ PROs in which the TTOs are located (e.g., Coupe, 2003; Dalmarco et al., 2011; Hülsbeck et al. etc.), probably because this is the most simply measurable phenomenon and the data are publicly available. However, TTOs should have another important function too: to encourage any kind of university/ PRO-industrial research cooperation. One of forms of such cooperation can be direct industrial funding which is according to (above mentioned) Etzkowitz (2013) already a European tradition. This is defined as industry's direct financial support for the development of technology by a university scientists or PRO researchers. Studies on direct industrial funding are still lacking and Belitski et al. (2019) specifically claim that no research to date has established and empirically tested the role that university TTO and direct industrial funding play in research commercialization in transition economies. The aim of this paper is to contribute to bridging this research gap.

## METHODOLOGY

The research project "Innovation potential of

Slovenian automotive industry" (supported by European Union, ERDF, and Republic of Slovenia, Ministry of Education, Science and Sport (Operation No. C3330-17-529006 »Researchers-2.0-FIŠ-529006«)) started in the second half of 2017 with patent analysis and survey on patent applicants, and continued with semi-structured in-depth interviews with twenty scientists and inventors in the field of automotive industry, representatives of automotive (supplier) companies, (automotive) spin-out enterprises and representatives of supportive organisations (automotive clusters and TTOs). Interviews were conducted in the second half of 2018 in Slovenia, and in 2019 extended to two neighbouring countries, Austria, and Hungary. With the interviews we were able to identify some mayor problems concerning the basic topic of identifying and seeking how to increase the innovation potential of Slovenian (and consequently EU's) automotive industry. This subject also included the possibilities of strengthening the university – industry collaboration.

In this paper we will present the results of the focus group discussion conducted after the interviews in November 2019. The focus group method is one of the qualitative research approaches and to gain an in – depth understanding of social issues. This method aims to obtain data from a purposely selected group of individuals rather than from a statistically representative sample of a broader population (Nyumba at al., 2018). Therefore, with interviews we identified basic problems of university – industry cooperation while with organizing a focus group we wanted to clarify them. Our intention was for the participants (P1... P4), who otherwise belong to different organizations, to reach consensus on common issues during the discussion.

The focus group was attended by:

- P1 – representative of the supportive environment – Slovenian automotive cluster,
- P2 – representative of a large automotive (supplier) company,
- P3 – representative of a public research organization – a university professor and researcher,
- P4 – representative of a micro company, also an independent inventor with several inventive solutions for the automotive industry.

## RESULTS

### Current state of technology transfer in Slovenia

Our preliminary patent analysis showed that joint university/PRO-industry patents are very rare and they are mostly result of public financial support calls to encourage such collaboration, for instance, governmental support for establishment of the Centres of Excellence. Successful selling or licensing university/PRO's patents to Slovenian industry is also rare. Some successful examples exist, for example, a special water-soluble form of coenzyme Q10 which was developed by National institute of chemistry and licensed in 2005 to Slovenian company Valens (National institute of chemistry, 2005). Products, such as food additives which integrate the developed solution, are selling well even now in 2021.

University/PRO's spin-out companies are however more frequent and it looks like that they are on average more successful than an ordinary start-up (i.e. not established by university/PRO's researchers). For example, in 2018, there were 24 acknowledged spin-outs in Slovenia connected to Consortium of TTOs which consists of eight Slovenian universities/PROs' (Modic et al., 2021). There are of course more of them – either they are older, not connected to this Consortium or they are not presented as spin-outs. Among very successful examples we can name Cosylab, spin-out of Jožef Stefan Institute with almost 200 employees and Acies Bio, spin-out of University of Ljubljana.

Lastly, what is the most successful form of technology transfer, is direct industrial funding. Some Slovenian faculties are very well known to have a long tradition of such cooperation. Such cooperation usually occurs when a company has a particular technical problem to be solved and it hires a university researcher to solve this problem. Such collaboration, if we focus to automotive industry, is however limited to a small number of Slovenian (technical/natural sciences) faculties/PROs while other faculties have very weak collaboration with industry although they could be relevant for automotive industry as well.

### Possible solutions

Our participants in the focus group agreed that universities/PROs might be a source of breakthrough

inventions which are usually protected with patents. The problem is that these are mostly not of interest to our companies, at least as far as the automotive industry is concerned. A representative of a large automotive supplier company (P2) explained why their company never bought or licensed any of the university patents.

*P2: 'An invention can be interesting, but if a company does not see any commercial value in it, this is it. If the invention is good, someone will surely buy it.'*

We have to emphasize that especially Slovenian Tier 1 suppliers which communicate directly with original equipment manufacturers (car producers) have the possibility to develop their own solutions, for example a particular component in a car. Some of them also have a status of so-called 'developmental supplier'. So the development of new car components is entrusted to them, but a car producer gives them clear guidelines of what they want. When suppliers develop something new, they are also free to apply for a patent without asking the car producer for permission. In the development phase suppliers may sometimes seek for external knowledge, for example from universities/PROs. However, though the TTOs are established in Slovenia for several years now, they still seem to have too little connection with the industry to understand what the real needs of the industry are. A representative of the automotive cluster commented:

*P1: 'Technology transfer offices sell solutions created at these institutes instead of checking where the real problems of the companies are and motivating their researchers to find solutions to these problems. They are selling something for what there is no market. If they would ask us: explain what you want, and we will give the best researchers to solve your problems, then this would be a breakthrough! I can say that no one TTO employee has come to me in the last 10 years. But we came to YYY (PRO) twice.'*

P2 as a representative of large Tier 1 automotive supplier company also emphasised that industry is actively looking for help of specialized scientists, however, they do not have good experiences in Slovenia.

*P2: 'Let me mention an example of CCC (technical*

field) where we have in Slovenia at the XXX (PRO) a superior knowledge, but because of their unresponsiveness we found a solution in England and we paid for a scientist there to solve these problems for us.'

University researchers are on the other hand frequently complaining that they are overburdened with pedagogical and scientific work, so it is not possible to devote themselves entirely to the applicable solutions which the industry is actively seeking for. Here the problem of an appropriate university leadership might be detected since a professor which would be engaged in a project for industry should be relieved of pedagogical work. However, the representative of university (P3) considered that pedagogical obligations were not such a big problem, as in principle every professor should have enough time despite these obligations.

*P3: 'I myself have a relatively large number of patents despite pedagogical work. I see the problem in the fact that the industry, when a problem arises and is looking for a patentable solution, is relatively closed, while PROs' knowledge is open. That is why it is very difficult for companies to rely on PROs. However, if you are in daily contact with what the companies need, then it is not a problem for the dean to relieve me of other work. If we manage to create such a climate that we can solve problems together, this relationship of trust will also rise.'*

Another issue is the distinction between basic and applied science. The latter is often perceived by scientists as inferior. It also does not enable them to publish papers in reputable journals and limits their scientific career progression. This is in line with so-called European Paradox of high research productivity and low economic return (Etzkowitz, 2013). P3, a university professor, who works intensively with companies, proposed a suitable solution for this problem as well.

*P3: 'The state does not pay me 100%, I have to earn 50% on the market. This should be a general rule. So I see the solution in the model that PRO researchers would be only 50% paid from the public sources, either European or national. If we did so, our researchers would always be available. But now they simply do not need to be. So our famous PRO can*

*always imagine how fantastic scientific things they have done, but they do not need to solve a concrete problem for the industry.'*

## DISCUSSION

Universities and PROs are, now more than ever, increasingly expected to facilitate economic development and societal welfare, straying from their traditional role, which is focused exclusively on research and the transfer of knowledge (Dabić, 2021). However, our study unfortunately confirms one of the interesting facts acknowledged in the recent TTO literature, that universities may have only a few research results worth commercializing (see Belitski et al., 2019). The question is therefore, why are Slovenian universities and PROs applying for patents what is expensive and may not bring significant revenue. First reason is that patents pay off for individual researchers and research groups. Patents are, if they are a subject of prior art search and substantive examination conducted by a patent office, recognized by Slovenian Research Agency similarly to scientific articles published in the high impact factor journals. This is not wrong: by such measures the state wanted to stimulate the applied research. The next issue is TTOs' governmental funding. For the funds received, the TTOs have to prove certain results and one of these is the number of patents. This is also not wrong. The problem is the nature of these patents. If companies are not interested in them this might be also due to embryonic nature of (patented) technology which require significant further development (Bradley et al., 2013).

Instead of focusing on commercializing the research work by applying for patents and then trying to license them, TTOs should focus on the current needs of the industry, attract direct industrial funding and encourage their researchers to collaborate with companies. This is in line with findings of Belitski et al. (2019) who focused on transition economies and conclude that direct industrial funding is the most efficient route of research commercialization by scientists as compared to disclosure, marketing and adaptation of technology via TTOs. Moreover, Belitski et al. claim that TTOs have become neither facilitators nor promoters of knowledge transfer and knowledge spillover from universities what challenges

the legitimacy of TTOs. On the contrary, we do not claim that TTOs are not important, but there is evidence that they should necessarily change their way of working to complete their mission of being the bridge between academia and industry.

For university and industry collaboration also so called Proof of Concept funds seem to be more and more important. For example, in the United States, Proof of Concept Centres (POC) emerged as successful structures to address the challenges of the proof of concept phase in university technology transfer which is considered to be critical for the success of both licensing and the creation of spin-off companies (Maia and Claro, 2013). Study by Munari et al. (2017) analysed seven in-depth case studies of university-oriented POCs in Europe (from UK, Belgium, Sweden, Netherlands, Switzerland, and Russia) and illustrated how to effectively design POCs as innovative forms of demand – side instrument to enhance the commercialisation of university technologies. We propose establishment of such centres also to Slovenian TTOs.

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