Do scientists differ in their expectations towards technology transfer offices? – Adjusting university services to specific groups of scientists

Sándor Huszár[1,2], Szabolcs Prónay[1,2], Norbert Buzás[1,3]

[1] Knowledge Management Research Center, University of Szeged, Hungary

[2] Institute of Business Studies, Faculty of Economics and Business Administration, University of Szeged, Hungary

[3] Department of Health Economics, Faculty of Medicine, University of Szeged, Hungary

Abstract:

In the recent decades, the commercialization of scientific results generated at universities has gained an increasing attention in the literature and in practice as well. In order to facilitate the transfer of these research results into marketable products, universities established technology transfer offices (TTO) to interact with scientists and with industrial partners. There are certain tasks that have to be performed for successful commercialization and in most cases both scientists and the personel of TTO can complement each other during these activities. Although TTOs assist in technology transfer as a unit which is entitled for the management of these activities, scientists can contribute to the process with their personal network, industrial experiences, etc. From this perspective, TTOs should distinguish different groups of scientists and determine their needs towards assistance and services. Based on the previous arguments we suppose that there are specific groups of academics that have different expectations towards tasks distribution between scientists and technology transfer offices. Our aim is to gain insights about which tasks should be performed by scientists or by technology transfer offices according to the individuals' opinion.

In 2015, we conducted a survey among researchers at 20 Hungarian higher education institutions (which covers the whole population) in order to get better understanding of individuals' expectations. The data collection yielded 660 responses. We investigated 8 different tasks relating to technology transfer which have been grouped into three distinctive categories with principal component analysis: *commercialization-oriented activities*, *relationship-oriented activities* and *opportunity-seeking activities*. According to the results, scientists expect more assistance in case of *relationship-oriented activities* and *commercialization-oriented activities* while they perceive *opportunity-seeking activities* as a task that should be performed equally between technology transfer offices and scientists. This suggests that TTOs should allocate more efforts on keeping contact with industrial partners and in determining possible application areas of scientific results while scientists are tend to play greater role in collecting industrial needs and in monitoring R&D funding opportunities. Further research has been done to investigate the differences of expectations relating to the previously determined tasks among the specific groups of scientists. We determined 4 clusters of scientists based on their engagement with different knowledge transfer channels: *commercialization-oriented scientists*, *collaboration-oriented scientists*, *consultancy-oriented scientists* and *irresponsive scientists*. Our aim was to unfold differences among these groups of scientists regarding their expectations towards technology transfer offices. Despite of our presumption, the results show only slight differences that raise important questions for practitioners.

Our study concluded that while the scientists are *heterogeneous* based on their engagement with these knowledge transfer channels, they are rather *homogenous* in their expectations. On one hand this may cause difficulties for technology transfer management at universities, because they cannot adjust their serviceses to the needs of these specific groups and on the other hand engagement in various knowledge transfer channels have no impact on scientists expectations towards task distribution.

Keywords:

technology transfer office, commercialization, task distribution, academics

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1 Introduction

Universities play a major role in the generation of scientific knowledge in the society, since these scientific results have become important for innovation and new business development in the economy (Mansfield - Lee 1996). Hence, the role of universities has changed towards engaging in commercialization (Etzkowitz et al. 2000; Rasmussen et al. 2006), and higher education institutions pay increased attention to the commercialization of scientific results as part of their third mission, besides their traditional roles (teaching and research) (Etzkowitz 2003).

In parallel with these advancements technology transfer offices (TTO) emerged at universities in order to facilitate the application of scientific results in industrial environment. TTOs' primary role is to manage and perform technology transfer activities and these special units are dedicated to provide support services to academics. As Baldini (2010) highlighted, academics are tend to rely on TTOs conducting business meetings or legal issues that would cause difficulties for scientists since they do not have enough experiences to deal with these issues. Furthermore, the role of TTOs is crucial in case of intellectual protection which is one of their main responsibilities (Welsh et al. 2008). Thus, TTOs should maintain close relationship with academics in order to foster invention generation mechanisms and provide them proper assistance during university-industry linkages.

Our aim is to provide empirical evidence of scientists' expectations towards preferred task allocation between individuals and technology transfer offices. As recent studies revealed (Jain et al. 2009), scientists have difficulties in their new role, thus technology transfer offices have to provide assistance to them and have to facilitate the commercialization of scientific results. But, technology transfer offices should gain more insights about scientists' opinion about what are the main activities that scientists need assistance because in some cases, researchers could have significant industrial relations or experiences in commercialization. Firstly, TTOs need to understand that *what are the specific groups of scientists* who are engaged in different forms of technology transfer channels and *what are the needs of these specific groups* towards assistance in technology transfer. From this perspective TTOs can better focus and concentrate their resources on those groups that better fit to their innovation strategy. Our paper contributes to the emerging literature on relationship between academics and technology transfer offices with a special focus on academics' expectation towards tasks allocation relating to technology transfer processes.

2 Role of individuals and technology transfer offices

The generation of scientific knowledge at the university and its transfer to the industry has been a topic of interest in the international literature over many decades. Even at universities where patenting activity and technology transfer mechanisms are more developed, patent disclosures usually only happen if the scientists want to patent their research results (Shane 2004). This suggests that individual factors can have a greater impact on patenting activity than organizational factors which emphasize the investigation of individuals' opinion.

University researchers are inherently scientists whose achievement is largely measured in teaching and publication performance, while commercialization activity is undervalued at HEIs. There are scientists who can easily adjust their academic role to commercial activities with the creation of a composite persona, while engaging in commercialization can cause difficulties for most individuals due to the conflict of interests between academic norms and business motives (Jain et al. 2009). In a similar vein, Hoye and Pries (2009) also argue for the importance of individuals because it is primarily university scientists that experience factors

that can hinder their participation in technology transfer activities. Due to the additional workload and difficulties in devoting resources to technology transfer, academics are tend to delegate search activities to technology transfer offices, because the delegation can reduce scientists' additional workload and scientists can pursue their research activities. Furthermore, technology transfer offices can be more efficent than the individuals but it depends on the given conditions. The allocation of responsibilities allows both parties to task specialization, which can be mutually beneficial (Hellmann 2005). In addition, TTOs also rely on academics in marketing activities because they have an overview about potential industrial partners for commercializing scientific results (Siegel et al. 2003). This suggest that there are certain tasks that are better to performed by the individual researchers or the personell of the technology transfer offices.

Scientists percieve patenting as a time-consuming proccess that is difficult to comply with the research and teaching duties. Furthermore in some cases scientists are lack of expertise to determine what scientific results can be protected by patent application and have small experiences in the technology transfer process (Renault 2006). Baldini (2010) concluded that the role of technology transfer offices during this activity is high and reducing administrative barriers can increase scientists' engagement towards technology transfer.

The role of technology transfer offices may differ by institutions based on different circumstances. According to Van Dierdonck et al. (1990) technology transfer offices should play an intermediare role between the university and industrial partners that suggest that TTOs have to be responsible for the successful launch of scientific projects but their participation in the other phases of the project is unneccessary. This strategy helps to avoid overcoordination that can result in failure of the process. But this concept raise the question: how efficent are scientists in the coordination of such university-industry projects and can they perform these tasks properly without the active participation of the TTO? In contrast, there are evidences that highlight the deficiencies of technology transfer offices. Chaplle et al. (2005) found the lack of business skills and capabilities of personell in technology transfer offices which highlight the need to upgrade these deficiencies in order to increase efficency. In addition, there are scientific disciplines that requires different business models for efficent technology transfer at the university which may cause difficulties for institutions, expecially large higher education institutions with numerous scientific disciplines (Druilhe – Garnsey 2004; Owen-Smith – Powel 2001).

According to the recent legislation of most developed countries and regulation of the institutions, academics are obliged to cooperate with the technology transfer offices if they got possession of a commercializable research result. But, in Sweden the commercial rights belong to the inventor even if the inventor is a professor whose invention closely belongs to a university research project. Nilsson et al. (2010) argues for that such regulation makes academics more motivated and can reach better results. In such cases university scientists can decide wether to cooperate with the technology transfer office or not. The decision highly depends on how the scientists evaluate his own industrial relations and the competencies of the technology transfer office. In our case, the individuals' evaluation about the competencies of the technology transfer offices may influence the preferred task allocation. Thus, we suppose that the more experience and competence relating to technology transfer the scientists possess, the less assistance the scientist expect from the technology transfer offices.

In the following sections we demonstrate our research method and emprical results relating to preferred task allocation between scientists and technology transfer offices respect to findings of our previous qualitative research (Huszár et al. 2014) and international literature review.

3 Research method

The present study was carried out among academics in order to better understand their opinion relating to technology transfer offices. In order to investigate our presumptions, a questionnaire has been developed based on literature review and on a previous qualitative study conducted with 21 scientists in 2014 (Huszár et al. 2014). In the following sections we introduce the data collection and our hypotheses.

3.1 Data collection

The data collection has been done at 20 higher education institutions which represent all institutions that meet the following criteria. Two principles were taken into consideration during the collection of contact information that was carried out at the departments' websites. Firstly, the scientific field represented at the department had to be relevant to life sciences, natural sciences, engineering or agriculture, while departments relating to arts (e.g. literature, history, etc.) were excluded in our survey. Secondly, the personnel listed on the websites had to have relevant research activity like full professors, associate professors, assistant professors, assistant lecturers, PhD students; or who held any research-related positions (e.g. research fellow or head of research) according to the websites. Others were excluded, like assistants, technical staff and administrators. Finally, 7,967 relevant e-mail addresses were collected. We used *EVASYS web-based survey system* for collecting responses and in 2015, we have received 660 responses from the approached scientists (response rate: 8.3%).

3.2 The sample

The respondents of natural scientists (N=269) have the highest share within the sample, while the field of engineering (N=138) and medicine (N=140) have also a significant share among the respondents. The share of agriculture is much lower (N=36), but it is due to the less number of higher education instutions were agriculture is represented, furthermore e.g. natural sciences involves many scientific disciplines (e.g. biology, chemistry, physics, etc.) that increased the number of scientists.

Table 1 Scientific fields represented within the sample

	Engineering				Medicine				Natural sciences				Agriculture			
	Frequencies		Distribution		Frequencies		Distribution		Frequencies		Distribution		Frequencies		Distribution	
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M
Professor emiritus	1	7	13%	88%	0	1	0%	100%	0	5	0%	100%	0	2	0%	100%
Full professor	5	16	24%	76%	2	20	9%	91%	3	39	7%	93%	1	9	10%	90%
Assosiate professor	8	49	14%	86%	6	31	16%	84%	14	70	17%	83%	3	8	27%	73%
Assistant professor	2	16	11%	89%	21	19	53%	48%	29	48	38%	62%	2	4	33%	67%
Assistant lecturer	4	28	13%	88%	7	18	28%	72%	10	22	31%	69%	1	3	25%	75%
PhD student	0	2	0%	100%	8	7	53%	47%	12	17	41%	59%	2	1	67%	33%
Total	20	118	14%	86%	44	96	31%	69%	68	201	25%	75%	9	27	25%	75%
	138		100%		140		100%		269		100%		36		100%	

F: female scientists; M: male scientists

Source: own research

3.2 Hypotheses

Prior to the analysis we had presumptions relating to the relationship between academics and technology transfer offices. Based on the literature review and our recent qualitative study we suppose that individuals have different expectations towards task allocation based on their competencies and experiences gained from previous technology transfer activity.

In order to investigate our presumption, we assume that scientists are heterogenous in their competencies and previous experiences, furthermore in their expectations towards technology transfer offices. Thus our hypotheses are the following:

Hypothesis 1: Scientists differ in their expectations towards technology transfer offices about how to allocate tasks.

Hypothesis 2: Scientists shape heterogeneous groups based on their competencies and engagement in technology transfer channels.

While the previous hypotheses focus on the expectations in general and on the possibility of identifying more homogenous groups, we are also curious about wether the expecations of different groups (that we identify through clustering) differ or not.

Hypothesis 3: Homogenous groups of scientists express different expectation towards technology transfer offices respect to certain tasks.

4 Research results

In this section we demonstrate our empirical results and investigate our research questions and hypotheses as follows: firstly, we provide results of preferred task allocation according to scientists and conduct principal component analysis in order to gain better insights which tasks are perceived by scientists as closely related tasks. Secondly, we conduct cluster analysis and identify specific groups of scientists wich are more homogenous respect to their competencies and previous engagement in technology transfer. Finally, we investigate the expectations of the specific groups towards technology transfer offices that highlight some differences in preferred task allocation.

4.1 Preferrred task allocation according to scientists

In our study we investigated various tasks that play import role during technology transfer activities. These tasks requires different skills and previous experiences and in most cases scientists have difficulties to perform these activities, thus they rely more on personell of the technology transfer offices.

In present research we analyzed scientists opinion about what would be the best allocation of tasks between scientists and personell of the TTO. The investigated tasks were the following:

- searching for commercial opportunities of invention
- conducting business meetings
- searching for possible industrial partners for commercialization

- keeping contact with industrial partners
- offering research capacities to industrial partners
- marketing activities relating to the invention
- collecting industrial needs
- searching R&D funding opportunities

The results show that scientists devote *marketing activities* (M=4.29; SD=0.90; N=495), *collecting industrial needs* (M=4.00; SD=1.02; N=506) and *searching R&D funding opportunities* (M=3.93; SD=1.00; N=505) mostly to the TTO (Table 2). Scientists would take part to a higher extent in *offering research capacities* (M=3.77; SD=1.10; N=496) and *searching for possible industrial partners for commercialization* (M=3.65; SD=1.01; N=497) – compared to previous tasks. Moreover, scientists suggest a more or less balanced task allocation between themselves and TTO relating to *conducting busieness meetings* (M=3.32; SD=1.07; N=496), *keeping contact with industrial partners* (M=3.20; SD=1.10; N=501) and *searching for commercial opportunities of invention* (M=3.15; SD=1.03; N=496).

Table 2 Preferred task allocation between academics and technology transfer offices

	N	Minimum	Maximum	Mean	Std. Deviation
searching for commercial opportunities of invention	496	1,00	5,00	3,1492	1,02589
conducting business meetings	496	1,00	5,00	3,3206	1,06556
searching for possible industrial partners for commercialization	497	1,00	5,00	3,6499	1,00711
keeping contact with industrial partners	501	1,00	5,00	3,2016	1,09967
offering research capacities to industrial partners	496	1,00	5,00	3,7702	1,10078
marketing activities relating to the invention	495	1,00	5,00	4,2869	,89902
collecting industrial needs	506	1,00	5,00	3,9960	1,02251
searching for R&D funding opportunities	505	1,00	5,00	3,9347	,99686

Range (1-5):
1: task should be performend mostly by the scientists;
5: task should be performed mostly by the technology transfer office

Source: own research

We can conclude that most scientists would hand over the responsibility of performing the above mentioned tasks to the technology transfer offices. However they would share the responsibility in searching for commercial opprotunities and keeping contact with industrial partners, while they would take part to a lowest extent in the marketing activities.

In order to gain better insights into individuals perception about technology transfer activities we conducted principal component analysis among the investigated tasks. Our aim is to identify what are the tasks that the scientists evaluate as related tasks. The analysis suggested three different factors that are demonstrated below (Table 3). According to scientists' opinion we can distingish *relationship-oriented activities*, *commercialization-oriented activities* and *opportunity-seeking activities*. The *relationship-oriented activities* are about keeping contact and includes marketing activities as well as offering research capacities for industrial parters. The focus of this activity is on the industrial partner and on the relationship established with

it. The *commercialization-oriented activies* describes tasks that have much more business orientation thus these tasks focus on the possible utilization opportunities and business meetings. The latter, *opportunity-seeking activities* are about searching for R&D funding opportunities and collecting industrial needs that the university can meet.

Table 3 Rotated Component Matrix[a]

	Component		
	Relationship-oriented activities	**Commercialization-oriented activities**	**Opportunities-seeking activities**
keeping contact with industrial partners	,858		
offering research capacities to industrial partners	,682		
marketing activities relating to the invention	,477		
searching for commercial opportunities of invention		,873	
conducting business meetings	,502	,678	
searching for possible industrial partners for commercialization		,627	
searching R&D funding opportunities			,892
collecting industrial needs	,493		,619

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

4.2 Identifying specific groups of scientists

In this study we take attempt to categorize academics based on their competencies and previous experiences gained in technology transfer, furthermore taking into consideration their industrial relations and entrepreneurial competencies. Firstly, we demonstrate the descriptive statistics of the whole sample (Table 4). As we can see, scientists evaluate the importance of patenting and spin-off creation for themeselves a bit lower than the avaerage and possess limited experiences in patenting and spin-off creation. Alhtough, the results are a bit surprizing since the experiences relating to spin-off creation/operation was indicated higher according to the respondents. Moreover, scientists stated that they possess less entrepreneurial competencies and proper industrial relations.

Regarding the different linkages with industry, scientists are most active in joint research, contract research and consultancy services for industrial partners while they have less experiences in commercialization.

Table 4 Scientists' attitudes and experiences towards technology transfer activities

		N	**Min.**	**Max.**	**Mean**	**Std. Deviation**
Experiences in technology transfer	joint research with industrial partner	638	1,00	11,00	3,8511	3,37849
	contract research	630	1,00	11,00	3,8397	3,59624
	consultancy for industrial partner	624	1,00	11,00	3,7147	3,65117

	commercialization of invention or know-how	616	1,00	11,00	1,5601	1,54382
Attitudes towards technology transfer	The patenting of my scientific results is important for me.	551	1,00	5,00	2,8566	1,33735
	I have huge experiences in patenting	641	1,00	5,00	1,6396	1,08955
	The commercialization of my scientific results in spin-off company is important for me.	427	1,00	5,00	2,9766	1,31956
	I have huge entrepreneurial experiences	642	1,00	5,00	1,9829	1,29731
	I possess appropriate entrepreneurial competencies.	613	1,00	5,00	2,2610	1,34446
	I possess appropriate industrial relations.	645	1,00	5,00	2,7519	1,47984

Source: own research

In order to distinguish certain groups of scientists based on their attitudes and previous experiences, we conducted cluter analysis that suggested 4 different groups of academics: *commercialization-oriented scientists*, *collaboration-oriented scientists*, *consultancy-oriented scientists* and *irresponsive scientists* (Table 5).

As the results show, *comercialization-oriented scientists* (N=46, 13.4%) are the most active scientists in case of all university-industry linkages and express a quite postive attitude towards patenting and spin-off creation compared to other groups of scientists. *Collaboration-oriented scientists* (N=52, 15.2%) are engaged mostly in contract research and joint research with industrial partners, but expressed less interest towards commercialization than *commercialization-oriented scientists*. *Consultancy-oriented scientists* (N=34, 9.9%) – as their label demonstrate – spend most of their expertise on consultancy services and their participation in other university-industry linkages is less common. The last, but biggest group of scientists are called *irresponsive scientists* (N=211, 61.5%), because they usually do not engage in any form of university-industry linkages and possess less experiences and competencies in patenting and spin-off companies.

Table 5 Clusters and descriptive statistics of grouping variables

	Range	Consultancy-oriented scientists	Collaboration-oriented scientists	Irresponsive scientists	Commercialization-oriented scientists
joint research with indutrial partner	0-10	3,74	5,40	1,07	9,00
contract research	0-10	3,59	6,15	0,91	9,48
consultancy for industrial partner	0-10	9,59	2,69	0,74	9,04
commercialization of invention or know-how	0-10	0,32	0,67	0,20	2,76
I possess appropriate industrial relations.	1-5	3,79	3,56	2,31	4,46
I have huge experiences in patenting.	1-5	1,62	2,06	1,50	2,76
I have huge experiences in entrepreneurship.	1-5	2,82	2,27	1,78	2,72
I possess appropriate entrepreneurial competencies.	1-5	3,12	2,65	2,10	2,96
The patenting of my scientific results is important for me.	1-5	2,59	3,04	2,85	3,78

The commercialization of my scientific results in spin-off company is important for me.	1-5	3,00	3,10	2,86	3,26

Source: own research

4.3 Investigating the expectations of specific groups of scientists

In previous section we identified and demonstrated the different groups of scientists. Now, we provide insights about what are the differences between these groups respect to their expectations. As Table 6 show, there are only slight differences in the preferred task allocation among scientists, thus we suggest to continue our analysis with the results of the principal component analysis.

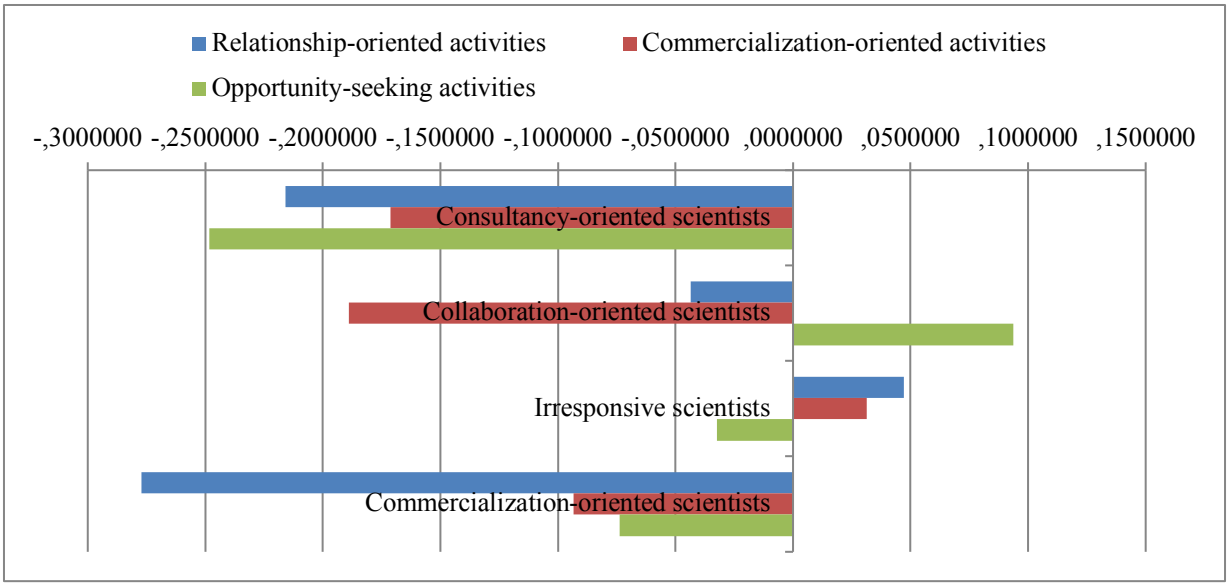
Table 6 Differences in task allocation of specific groups of scientists

	Consultancy-oriented scientists	Collaboration-oriented scientists	Irresponsive scientists	Commercialization-oriented scientists
keeping contact with industrial partners	3,0313	3,0217	3,2746	2,6905
offering research capacities to industrial partners	3,8065	3,7778	3,7801	3,6977
marketing activities relating to the invention	4,0968	4,4222	4,3118	4,3023
searching for commercial opportunities of invention	3,0000	2,8478	3,2116	3,0233
conducting business meetings	2,9688	3,0652	3,3684	3,1429
searching for possible industrial partners for commercialization	3,4063	3,5106	3,6230	3,4884
searching for R&D funding opportunities	3,7188	4,0213	3,9005	3,8780
collecting industrial needs	3,6970	3,8261	4,0885	3,7209

Source: own research

Figure 1 show the results of principal component analysis by the identified groups of scientists. According to the results *consultancy-oriented scientists* would take part in a highest extent in technology transfer activities compared to other groups. This suggest that these scientists would rely on TTOs at a lower extent in case of technology transfer. *Collaboration-oriented scientists* would conduct primary commercialization-oriented activities while they do not prefer to perform opportunity-seeking activities at all. Irresponsive scientists are tend to delegate all activities to the personell of the technology transfer office, that is probably due to the less experiences in technology transfer. While *commercialization-oriented scientists* would pay less attention on commercialization-oriented activities and opportunity-seeking activities, they would take part mostly in relationship-oriented activities compared to other groups.

Figure 1 Differences in expecations of specific groups of scientists



Source: own research

From the perspective of the TTO, we can conclude that, while *opportunity-seeking activites* should support primarily collaboration-oriented, irresponsive and commercialization-oriented scientists, technology transfer offices should provide assistance in *relationship-oriented activities* for collaboration-oriented scientists and irresponsive scientists. Regarding the *commercialization-oriented activities* mostly irresponsive scientists need support.

5 Discussion

As the results show, there are differences among academics that suggest that university scientists are rather a heterogenous group than homogenous respect to their engagement in university-industry linkages and technology transfer. The aim of this study was to highlight these significant differences and provide better insights into their expectations towards technology transfer offices.

Although the primary goal of the technology transfer offices is to manage and perform technology transfer activities we identified three groups of scientists that possess previous experiences and competencies and can supplement TTOs' activities. Our results support the findings of Balindi (2010) who concluded that scientists tend to allocate marketing activities to the TTO, in our study this task was the least preferred task by scientists. In contrast, Siegel et al. (2003) found that TTOs rely more on academics in marketing activity because they know potential industrial partners for commercializing scientific results. Our study also concluded that – but called it not marketing activity – scientists have industrial relations and mostly the consultancy-oriented scientists and commercialization-oriented scientists are tend to take part in such relationship-oriented activities.

Jain (2009) revealed that scientists have difficulties in their new role and need assistance from technology transfer offices. Our study found that scientists would rely on technology transfer offices, because they would devote a significant part of the investigated tasks to TTOs, even if they are more experienced. This result reaise the question: how can scientists and TTOs achieve task specialization – as Hellmann (2005) suggested – if scientists

would allocate all tasks to the TTO or balance the responsibilities but not performing any of the investigated tasks solely alone. This result also raises some important remarks because Van Dierdonck (1990) suggested that TTOs should play an intermediary role rahter than overcordinating university-industry projects. But in the Hungarian case we observe that scientists rely more on TTOs which requires higher involvement in technology transfer activities than previous study suggested. Then, a significant barrier of more developed and successful technology transfer could be if the TTO does not possess appropriate business skills and capabilities, as Chaplle et al. (2005) stated. If the Hungarian scientists tend to allocate tasks to TTOs because they lack of neccessary competencies, how can TTOs provide proper assistance if they also have deficiencies?

According to the results we decided to accept H1 and H2 because we could find differences in scientists expectations towards task allocation and could identify distinct groups of academics. But, regarding our H3 we would rather not to make decision than drawing misleading conclusions because the differences of expecations towards technology transfer offices were slight and not clear. Of course, we could provide evidence of differences but we would expected higher differences which suggest that while the scientists are heterogeneous based on their engagement with these knowledge transfer channels, different specific groups are rather homogenous in their expectations towards technology transfer offices.

6 Conclusion

We investigated 8 different tasks relating to technology transfer which have been grouped into three distinctive categories with principal component analysis: *commercialization-oriented activities*, *relationship-oriented activities* and *opportunity-seeking activities*. According to the results, scientists expect more assistance in case of *relationship-oriented activities* and *commercialization-oriented activities* while they perceive *opportunity-seeking activities* as a task that should be performed equally between technology transfer offices and scientists. This suggests that TTOs should allocate more efforts on keeping contact with industrial partners and in determining possible application areas of scientific results while scientists are tend to play greater role in collecting industrial needs and in monitoring R&D funding opportunities.

Further research has been done to investigate the differences of expectations relating to the previously determined tasks among the specific groups of scientists. We determined 4 clusters of scientists based on their engagement with different knowledge transfer channels: *commercialization-oriented scientists*, *collaboration-oriented scientists*, *consultancy-oriented scientists* and *irresponsive scientists*. Our aim was to unfold differences among these groups of scientists regarding their expectations towards technology transfer offices. Despite of our presumption, the results show only slight differences that raise important questions for practitioners: while university scientists are *heterogeneous* based on their engagement with these knowledge transfer channels, they are rather *homogenous* in their expectations. On one hand this may cause difficulties for technology transfer management at universities, because they cannot adjust their serviceses to the needs of these specific groups and on the other hand engagement in various knowledge transfer channels have no impact on scientists' expectations towards task distribution.

References

Baldini, N. (2010) 'Do royalties really foster university patenting activity? An answer from Italy.' Technovation, 30(2) 109-116

Chapple, W. – Lockett, A. – Siegel, D – Wright, M. (2005) 'Assessing the relative performance of U.K. university technology transfer offices: parametric and non-parametric evidence.' Research Policy, 34(3), 369–384

Druilhe, C., Garnsey, E. (2004) 'Do academic spin-outs differ and does it matter?' Journal of Technology Transfer, 29 (3/4), 269–285

Etzkowitz, H. (2003) 'Research groups as 'quasi-firms': the invention of the entrepreneurial university.' *Research Policy*, 32(1), 109-121

Etzkowitz, H., Webster, A., Gebhardt, C. & Terra, B. R. C. (2000) The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm.' Research Policy, 29(2), 313-330

Huszár S. – Prónay Sz. – Buzás N. (2014) Researchers' motivation and expectation in connection with patenting and technology transfer offices in Hungary. A*cademic Proceedings, 2014 University-Industry Interaction Conference: Challenges and Solutions for Fostering Entrepreneurial Universities and Collaborative Innovation,* Barcelona, Spain, April 23-25, 2014., 272-285

Jain, S. – George, G. – Maltarich, M. (2009) 'Academics or entrepreneurs? Investigating role identity modification of university scientists involved in commercialization activity.' Research Policy, 38 (6) 922-935

Mansfield, E., & Lee, J.Y., (1996) 'The modern university: contributor to industrial innovation and recipient of industrial R&D support.' Research Policy, 25(7), 1047-1058

Nilsson, A. S. – Rickne, A. – Bengtsson, L. (2010) 'Transfer of academic research: uncovering the grey zone.' Journal of Technology Transfer*,* 35(6), 617-636

Owen Smith, J., Powell, W.W., (2001) 'To patent or not: faculty decisions and institutional success in technology transfer.' Journal of Technology Transfer, 26 (1-2), 99–114

Rasmussen, E., Moen, Ø., & Gulbrandsen, M (2006) 'Initiatives to promote commercialization of university knowledge. ' Technovation, 26(4), 518-533

Renault, C. S. (2006) 'Academic capitalism and university incentives for faculty entrepreneurship. ' Journal of Technology Transfer*,* 31(2) 227-239

Shane, S. (2004) Academic entrepreneurship – University Spinoffs and Wealth Creation. Edward Elgar Publishing Limited, Chaltenham

Siegel, D. S. – Waldman, D. – Link, A. (2003) 'Assessing the impact of organizational practices on the relative productivity of university technology transfer offices: an exploratory study.' Research Policy, 32(1), 27-48

Van Dierdonck, R. – Debackere, K. – Engelen, B. (1990) 'University-industry relationships: How does Belgian academic community feel about it?' *Research Policy,* 19(6), 551-566

Welsh, R. – Glenna, L. – Lacy, W. – Biscotti, D. (2008) 'Close enough but not too far: Assessing the effects of university–industry research relationships and the rise of academic capitalism.' Research Policy, 37(10), 1854-1864