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Insights Into University Knowledge Transfer in the Social Sciences and Humanities (SSH) and Other Scientific Disciplines – More Similarities Than Differences

Markus C. Hayden[1]*, *Martin Weiß*[1], *Alice Pechriggl*[1] and *Daniel Wutti*[1,2]

[1] Institut für Philosophie, Alpen-Adria-Universität Klagenfurt, Klagenfurt, Austria, [2] Institut für Mehrsprachigkeit und Interkulturelle Bildung, Viktor Frankl Hochschule, Pädagogische Hochschule Kärnten, Klagenfurt, Austria

Knowledge transfer from universities to other portions of society is highly relevant in both academia and public policy. However, the focus on high-quality research outputs has forced researchers to concentrate their efforts mainly on "science-to-science" achievements. Knowledge transfer activities are usually reduced to topics that are associated with university-industry collaboration or the exploitation of research results, such as procurement of patents. Achievements in fields characterized by "science-to-professionals" and "science-to-public" knowledge transfer are often not appreciated, but rather evaluated as extraordinary and voluntary contributions. Therefore, these are deemed as not beneficial for progression in academic careers. Furthermore, study of such aspects of knowledge transfer has rarely been conducted. While the reduction of knowledge transfer to profit-oriented indicators should in general be questioned, such an objective is particularly inappropriate in the social sciences and humanities (SSH). In the current study, we explored whether researchers themselves have a differentiated understanding of knowledge transfer and which attitudes toward knowledge transfer can be described. We also investigated motivators and obstacles associated with knowledge transfer itself. To analyze differences between the SSH and other scientific disciplines, we compared SSH researchers with those of other fields. Our sample consisted of 283 participants from 18 different Austrian universities. Results indicate that researchers possess a comprehensive understanding of knowledge transfer that is closely related to science-to-public and science-to-professionals disciplines, as well as university instruction. Importantly, issues regarding the exploitation of research results were questioned and motivators were linked to moral rather than economic issues. Within the scientific community, knowledge transfer is insufficiently appreciated and is not beneficial for progress in an academic career. As such, researchers are hindered in participating in knowledge transfer activities. Differences between SSH and non-SSH

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***Correspondence:**
Markus C. Hayden
markus.hayden@aau.at

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researchers were noted in several evaluated categories, but were mainly small in effect size. Both subsamples answered consistently along the same trend, indicating that the differences are smaller than we hypothesized. Our findings are critically discussed, and implications are extrapolated.

Keywords: university knowledge transfer, social sciences, humanities, science-to-public, science-to-professionals, indicators

INTRODUCTION

Education and research have historically constituted the founding mission of universities (Zawdie, 2010; Trencher et al., 2014). However, academic affairs are not limited to these two responsibilities. Duties that go beyond teaching and research, including the dissemination of knowledge to other parts of society, are often summarized as a "*third mission*" of universities (Trencher et al., 2014). Despite the fact that this process benefits all involved parties (Caldera and Debande, 2010; Lightowler and Knight, 2013; Wutti and Hayden, 2017), university knowledge transfer (KT) remains unappreciated. As investigators tend to focus on high-quality research outputs beneficial for the advancement of an academic career, science-to-science achievements constitute a great majority of all research. On the contrary, KT practices are often evaluated as extraordinary and voluntary issues not beneficial for advancement in academia (Wutti and Hayden, 2017). The only aspects of KT that are noticeably appreciated and frequently assessed are related to the exploitation of research results and university-industry collaborations (Agrawal, 2001; Geuna and Muscio, 2009; European Commission, 2013). Apart from links between academia and industry or the economy, KT enables the transmission of insights between many societal segments. Targets may be professionals, politicians and other decision makers (science-to-professionals), or civilians (science-to-public). When taking into consideration the social responsibility of universities (Vasilescu et al., 2010), the issue of academic KT appears even more important. Federal research institutions are important stakeholders in the development of sustainable solutions to societal and environmental challenges. Therefore, universities must contribute to the public discourse and to the development of a knowledge-based society. A variety of research-funding initiatives, such as *Horizon 2020*, even requires dissemination of research results[1].

In light of the aforementioned extent and importance of KT, it seems odd that there are hardly any reliable and valid global benchmarks. Common indicators of university KT include the number of university patents, licenses, and number of university spin-offs established (European Commission, 2013). Despite the prevalent use of such indicators in evaluating KT, several researchers have emphasized that available data are unreliable (Agrawal and Henderson, 2002; Cohen et al., 2002; Olmos-Peñuela et al., 2014a). Even in technological fields (e.g., biotechnology or computer science), aforementioned indicators do not represent university KT achievements adequately (Cohen and Walsh, 2001). In the social sciences and humanities (SSH) the reduction of KT to topics closely related to industry and economics are particularly inappropriate. The SSH have completely different research traditions than do disciplines such as science, technology, engineering, and mathematics (STEM), medicine, or economics (Olmos-Peñuela et al., 2014a). The SSH focus on issues of social relevance and have a certain obligation to raise awareness of and elucidate sustainable solutions for global challenges (Van Langenhove, 2012). Therefore, KT to non-academic fields, such as professional practice, politics, or civil society, is a task many SSH-researchers have incorporated into their occupational routines (Hayden et al., 2018). Such measures, in turn, have produced research results that require more sophisticated evaluation (Ochsner et al., 2016). Therefore, a research output can often lack accurate representation by common key performance indicators, especially the number of patents issued or university spin-offs established (Olmos-Peñuela et al., 2014a). Consequently, a diversification of benchmarks for KT stands to reason (Hewitt-Dundas, 2012; Wutti and Hayden, 2017).

In line with the partial depiction of university KT, research itself has addressed KT only to a limited extent. While some prior studies explored topics of university-industry collaboration (Geuna and Muscio, 2009; Perkmann et al., 2013), investigation of other aspects of university KT is scarce (Wutti and Hayden, 2017). Investigation of KT in the SSH can especially be considered uncharted territory (Olmos-Peñuela et al., 2014a,b). The biggest knowledge gap associated with this issue is related to prevalent attitudes toward university KT. Investigators seem to possess a positive attitude toward university KT (Jacobson et al., 2005; Wutti and Hayden, 2017). However, it appears that within the scientific community, KT achievements are not acknowledged since they are not deemed beneficial for advancement in academia (Lightowler and Knight, 2013; Wutti and Hayden, 2017). Possible motivators of university KT constitute an additional knowledge gap. If KT activities are not beneficial for occupational progress, it is reasonable that other motivators must exist for researchers to conduct KT. Yet, to date, no evidence elucidating such motivators has been detailed.

In the current study, we categorized as precisely as possible the components of, obstacles to, and specific motivators for university KT. We explored researchers' perceptions of and

Abbreviations: KT, knowledge transfer; SSH, social sciences and humanities; STEM, science, technology, engineering and mathematics; WTZ, Wissenstransferzentren (Knowledge Transfer Centers).

[1]See for example Article 29 of the H2020 Annotated Model Grant Agreement (http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_en.pdf#page=234).

attitudes toward university KT. Additionally, we investigated differences in KT practice between the SSH and other scientific disciplines such as STEM.

We hypothesized that:

1) University KT would be a complex topic including several additional components beyond mere collaboration between universities and economic entities, or other forms of exploitation of academically generated knowledge.
2) Motivators would be closely linked to personal commitment.
3) Obstacles would be linked to system-related aspects and accepted traditions in scientific affairs.
4) Researchers would exhibit a positive attitude toward university KT.
5) KT practices would not be appreciated in the scientific community and would not be beneficial for advancement in an academic career.
6) SSH researchers would have a different understanding of and attitude toward university KT.

MATERIALS AND METHODS

We incorporated a quantitative online survey study as part of a bigger mixed-methods research project (see Hayden et al., 2018). We developed a questionnaire and uploaded it to the *lime survey* platform[2]. Distribution of the questionnaire was accomplished via the "*Wissenstransferzentren*[3]" *(Knowledge Transfer Centers*; WTZ). These nationwide projects are meant to link Austria's federal universities and promote KT from science to business and society. The intention of the WTZ is to provide different targets with specific information in order to improve and accelerate the access to new technologies, discoveries, expertise and knowledge bases. Although the WTZ primarily focus on collaborations between scientific and economic entities, the transfer of knowledge in areas extending beyond pure commercialization is a defined priority. Hence, KT in the SSH is a mandatory component of each project. Invitations for study participation were sent to each university that participates in the WTZ network. Participants were required to be currently employed at a university, but could be at any level of an academic career.

Procedure

The first portion of the questionnaire informed participants about the purpose of the study, data privacy, and the distribution of research results after final analyses. The following part was dedicated to the sociodemographic parameters of participants. Research mainly focused on components of KT, personal achievements that are linked to KT, as well as both motivators and obstacles associated with KT. In the final section of the questionnaire, participants were asked to rate 35 statements on a seven-point Likert scale, ranging from "totally disagree" to "totally agree." Statements could be classified into the following topics: personal attitude toward KT, role of KT within the scientific community, significance of KT, exploitation of research results, and benchmarking for KT achievements.

Data Analysis

For the purpose of comparing SSH researchers with those of other scientific disciplines, we conducted two different statistical tests, using *IBM SPSS Statistics* version 24. The items regarding aspects of KT, as well as motivators and obstacles that are associated with KT were dichotomous. Therefore, we used chi-square tests of independence. For the analyses of attitudes toward KT, we used independent samples *t*-tests for equality of means, because the items were continuous. All variables that were analyzed via *t*-tests were checked for homoscedasticity using Levene's test for equality of variances (Levene, 1960). If the test detected variance inhomogeneity in an item, analysis of this item was adjusted by applying the Satterthwaite procedure (Satterthwaite, 1946).

RESULTS

Sample

The final sample consisted of 283 researchers from 18 different Austrian universities. The description of the sample is displayed in **Table 1**. The educational level of the sample was high, with the majority of researchers being either professors or possessing a PhD. degree. Consequently, more than 40% of participants described their current position as either a full or an associated professorship. Another ∼20% were currently employed either as assistant professors or in post-doctoral positions.

The majority of participants in this study (57.6%) cited the SSH as their main professional field, and 24% were working in STEM specialties at the time the study was conducted. Consequently, other disciplines, such as medicine, law, and economy were noticeably underrepresented in the sample. Calculations using G*Power (Faul et al., 2007) revealed that the sample had sufficient statistical power for the conducted analyses.

Outlining the Spectrum of University KT

We initially investigated which activities, achievements, and issues are associated with the broad field of academic KT. We created a list of 15 possible associated aspects derived from available literature, a specific prior study (Wutti and Hayden, 2017), and from research conducted by other WTZ projects. Participants were asked to rate whether each item describes a component of university KT or not. Results are displayed in **Figure 1**.

Items rated highest were "*science communication and public relations activities*" and "*lectures/conferences outside of academic environments."* About 90% of participants agreed that these two categories constitute vital aspects of university KT. "*University teaching,*" "*training for professionals, institutions, companies, etc.,*" "*workshops for professionals, institutions, companies, etc.,*" "*publications for professionals,*" and "*cooperation with non-university (research) institutions*" followed with over 60% approval each. More than half of sample participants acknowledged that cooperation with civilian segments of society (including organizations) as well as firms or corporations are

[2]www.limesurvey.org
[3]www.wtz.ac.at/wissenstransferzentrum-english/

TABLE 1 | Description of the study sample.

Age	Mean:	45.05
	Standard deviation:	11.88
Sex	Female:	127 (44.9%)
	Male:	144 (50.9%)
	No response:	12 (4.2%)
Level of education	Habilitation:	119 (42.0%)
	PhD:	98 (34.6%)
	Master:	60 (21.2%)
	Bachelor/other:	6 (2.2%)
Current position	Full professorship:	56 (19.8%)
	Associated professorship:	51 (18.0%)
	Assistant professorship:	29 (10.2%)
	Post-doc assistant:	24 (8.5%)
	Predoc assistant:	23 (8.1%)
	Senior scientist / project member:	54 (19.1%)
	Senior lecturer:	18 (6.4%)
	Academic in special department:	16 (5.7%)
	Other:	5 (1.8%)
	No response:	7 (2.5%)
Main field of research	SSH:	163 (57.6%)
	STEM:	68 (24.0%)
	Medicine:	16 (5.7%)
	Economy:	9 (3.2%)
	Other:	18 (6.4%)
	No response:	9 (3.2%)

SSH, social sciences and humanities; STEM, science, technology, engineering, and mathematics.

all vital components of KT. However, several categories that frequently represent KT as typical benchmarks, namely "*contract research*," the "*exploitation of research results*" in the forms of patents or copyrights, and the "*establishment of university spin-offs*," were only rarely considered as significant. Additionally, one participant did not choose any available option and stated that none were appropriate as delineations of KT.

Differences Between the SSH and Other Scientific Disciplines

We strived to clarify whether SSH investigators possess a different understanding of the spectrum of KT. Results of our analyses are displayed in **Table 2**.

Significant differences were detected in eight out of the 15 total categories. SSH researchers were more likely to rate "*science communication and public relations activities*," "*cooperation with societies, unions, associations, etc.*," "*organization of exhibitions*," and "*involvement in non-university committees*" as vital components of university KT. Researchers from other scientific disciplines were more likely to rate topics related to typical benchmarks as important elements of KT. Effect sizes between the groups were consistently minor and ranged from $\varphi = -0.127$ for "*publications for professionals*" to $\varphi = -0.226$ for "*cooperation with firms, corporation, concern, etc.*" These numbers indicate that the differences between the SSH and other scientific disciplines are minimal.

Motivators and Obstacles for the Engagement in KT

Motivators

Participants were asked for possible motivators regarding their engagement in KT. Results are displayed in **Figure 2**.

Personal obligations were the most common motivators for engagement in a KT practice with over 80% approval, followed by either societal obligations or the purpose of making knowledge useable (over 60% approval each). An improvement in the reputation of a university or research project was motivating for about half of the participants. The two categories with the least amount of approval were linked to the exploitation of knowledge and requirements from superiors.

Obstacles

We were also interested in determining what obstacles could prevent researchers from participation in KT. However only two categories were derived from our data: "*I do not have enough time*" with about 50% approval and "*engagement in knowledge transfer is not important for my career*" with about 20% approval.

Differences Between the SSH and Other Scientific Disciplines

Results of the chi-square-tests of independence are displayed in **Table 3**.

Data indicate that SSH researchers are more prone to be motivated by perceived societal obligations. On the other hand, researchers working in other scientific disciplines were more often motivated by financial interests, such as funding, and the possibility of research result exploitation. Furthermore, they exhibited greater interest in communicating with professionals or companies and strived for utilization of knowledge. However, significant differences were detected in the analysis of time availability; non-SSH researchers were found to possess less time for engagement in KT, and considered this a major obstacle to participation in associated activities. In the light of the small effect sizes (Cohen, 1988), it appears that the differences between SSH researchers and researchers of other scientific disciplines are marginal.

Attitudes Toward University KT

Results obtained from the last part of the questionnaire were divided into four statement clusters considering the following topics:

Importance of University KT

Scientists who took part in the study identified KT as an important and vital component of university affairs. According to participants, KT enables exchange between universities and practical fields, as well as exchange between universities and other parts of society. Therefore, KT would be important for the

TABLE 2 | Results of the χ^2-tests for differences between researchers of the SSH and researchers of other scientific disciplines.

	X^2	p	φ
University teaching	0.005	0.943	–
Science communication and public relations activities	13.004	**<0.001**	0.214
Contract research	1.722	0.189	–
Training for professionals, institutions, companies, etc.	1.347	0.246	–
Workshops for professionals, institutions, companies, etc.	1.464	0.226	–
Lectures/conferences outside of academic environments	3.311	0.069	–
Publications for professionals	4.532	**0.033**	–0.127
Popular science	1.363	0.243	–
Cooperation with non-university (research)institutions	0.574	0.449	–
Cooperation with societies, unions, associations, etc.	7.291	**0.007**	0.161
Cooperation with firms, corporations, concerns, etc.	14.393	**<0.001**	–0.226
Exploitation of research results (patents, copyrights, etc.)	7.672	**0.006**	–0.165
University spin-offs	13.130	**<0.001**	–0.215
Organization of exhibitions	12.054	**0.001**	0.206
Involvement in non-university committees	11.375	**0.001**	0.200

df = 1; N = 283. Bold values are used to highlight statistically significant values ($p < 0.05$).

Hence, a focus on increasing KT associated with science-to-science achievements was deemed imperative. Participants also supported the inclusion of science-to-professionals and science-to-public strategies in selection criteria for research funding whenever possible.

Comparison Between the SSH and Other Scientific Disciplines

Significant differences were noted in our analyses of 11 variables related to result exploitation, the purpose of KT, and relevance of KT activities in academia. Each of these variables was met with either agreement or disagreement, with both subsamples replying similarly to a variable. Nine items were found to have minor differences in effect size, ranging from $d_{\text{Cohan}} = -0.254$ to $d_{\text{Cohan}} = -0.455$. The remaining two statements "*knowledge that was gained at the universities should preferably be sold to interested parties (e.g., to firms, associations, government agencies)*" and "*knowledge transfer should be financially profitable (e.g., via the selling of knowledge that was gathered at the university)*" were met with disagreement by both subsamples; however, the disparity was significantly larger here. Non-SSH researchers disagreed slightly, whereas researchers of the SSH disagreed considerably. Effect sizes of these two items were therefore large ($d_{\text{Cohan}} = -0.811$ and $d_{\text{Cohan}} = -0.908$, respectively).

DISCUSSION

In line with our assumptions, interpretation of our results revealed that researchers indeed possess a wide and complex understanding of university KT. Eleven of our 15 predefined categories describing potential KT activities were met with more than 50% approval. In particular, science communication and activities involving public relations, as well as conferences and lectures for professionals and the general public, were viewed as KT practices. The three categories met with the least amounts of approval were those often included in quality ratings (OECD, 2013). In particular, the exploitation of research results and the establishment of university spin-offs were not uniformly viewed as accurate markers of university KT. In addition, the exploitation of research results was predominantly rejected by participants. Our findings support our initial view of current KT descriptions being inappropriate and far from reliable. Although numbers of patents issued and spin-offs established may be easily accessible data, they do not represent a comprehensive overview of KT in the academic setting. In order to reliably evaluate the field, novel benchmarks should be established and implemented.

Differences between SSH and researchers of other scientific disciplines were noted in several categories. However, effects between these two subsamples were only small. These findings contradict our presumption of a vastly varied understanding of KT across different disciplines. Rather, researchers were found to possess a similar (albeit not identical) understanding of KT. In light of our findings, the disparity between research regarding university-industry collaborations (Geuna and Muscio, 2009) and research regarding other aspects of university KT (Olmos-Peñuela et al., 2014b) appears deceptive. The focus on economic aspects of KT suggests that the majority of scientists (at least in STEM fields) interpret KT as an economic matter. Our results, however, demonstrate that this conjecture is not true.

In agreement with prior studies, interpretation of our results indicated that researchers argue in favor of a more comprehensive system of indicators capable of validly benchmarking university KT. Indicators for achievements in science-to-professionals and science-to-public activities were emphasized. As current key performance indicators do not cover the whole spectrum of university KT, they are neither valid nor reliable. Furthermore, important aspects of KT, such as social benefits, cannot be evaluated with present benchmarks (Olmos-Peñuela et al., 2014b). In line with recommendations issued by Hewitt-Dundas (2012), our data highlights the necessity for advanced indicators of university KT. Such indicators should cover the entire breadth of KT activities, not only those associated with result exploitation and university-industry collaborations.

Data interpretation revealed a trend toward idealistic aims regarding motivators. Researchers emphasized that personal and societal obligations as well as the desire to actively apply knowledge to relevant issues were strong motivators. In contrast,

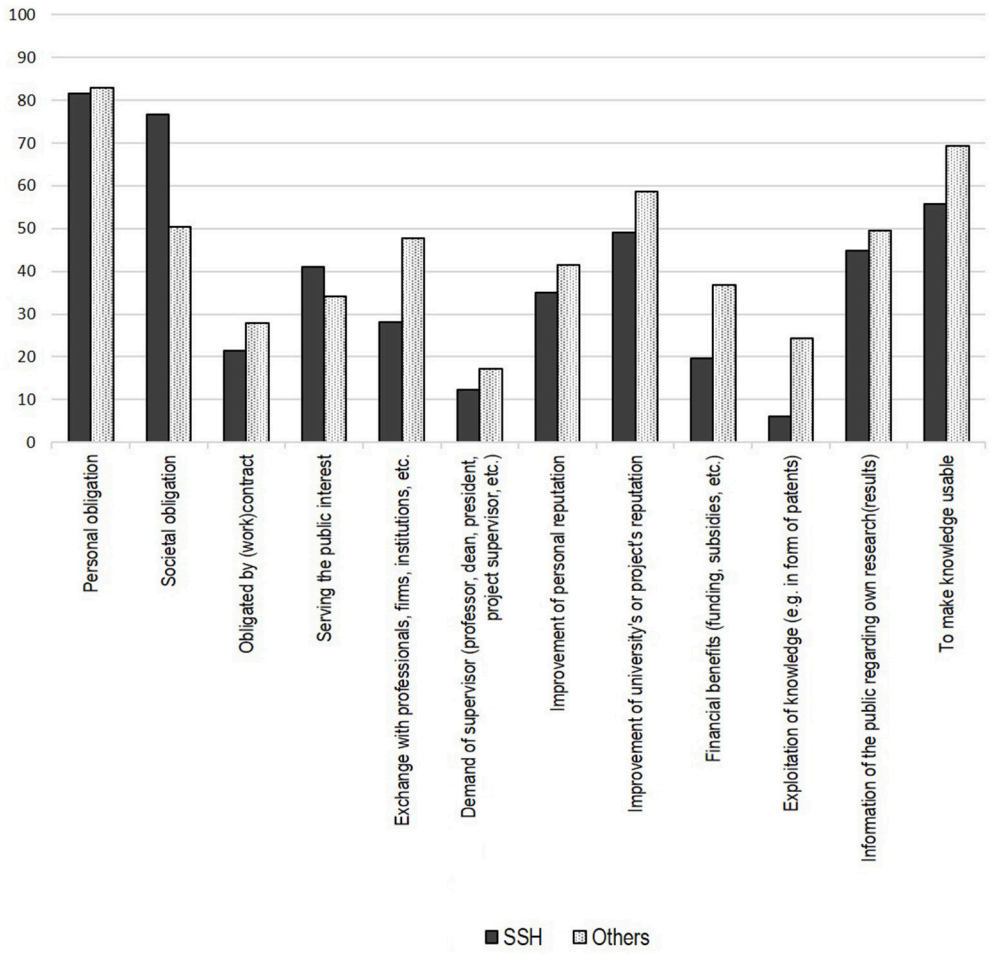

FIGURE 2 | Rates of approval (in percent) for different motivators of university knowledge transfer. SSH, Social sciences and humanities; Others, Other scientific disciplines.

a desire to exploit research results or procure other financial benefits was only rarely noted. Participants did cite the desire to improve one's reputation or that of the research institution as a motivator for engagement in KT.

It is important to consider that social desirability may have played a role in falsely altruistic answers. However, since main risk factors for social desirability bias (Krumpal, 2013) were not encountered in our study, we argue that bias effects, if any, negligibly affected our data. Effect size differences noted between the two subsamples generally small. On average, both SSH and non-SSH researchers agreed with societal obligations and disagreed with the exploitation of knowledge as motivators for engagement in KT practices. Considering the fact that actual proceeds from KT are rarely lucrative for academic institutions (Laredo, 2007; Foray and Lissoni, 2010), researchers seem to have a realistic image of the financial benefits of research exploitation.

Obstacles for involvement in KT were only rarely specified. Shortage of time was mentioned by every second participant. This issue was previously investigated (Wutti and Hayden, 2017), and participants mentioned that high-quality KT would be demanding in terms of time and energy. In our current study, non-SSH researchers found the shortage of time available for KT activities to be particularly frustrating. One explanation for this disparity between the two subsamples may be that SSH researchers tend to evaluate KT as a mandatory part of their everyday academic duties (Wutti and Hayden, 2017).

We ascertained that researchers themselves value KT as an important task and obligatory part of academic affairs. Data confirmed that investigators associate KT with different moral and idealistic issues. Along with the obligation to foster societal benefits, researchers argued in favor of the transmission of publically funded knowledge to civil society. Demonstration of academic achievements to taxpayers was approved as well. Although such aims should be self-evident, they have hardly been expounded upon and have barely received any regard in scientific research or public policy (Wolpert, 2013; European Commission, 2014).

If universities do not engage in KT, knowledge will continue to accumulate within departments or the general scientific community. For the effective utilization of knowledge, it is

TABLE 3 | Results of the χ^2-tests for differences between researchers of the SSH and researchers of other scientific disciplines.

	X^2	p	φ
MOTIVATORS			
Personal obligation	0.567	0.451	–
Societal obligation	18.913	**<0.001**	0.259
Obligated by (work)contract	0.103	0.749	–
Serving the public interest	3.632	0.057	–
Exchange with professionals, firms, institutions, etc.	8.371	**0.004**	–0.172
Demand of supervisor (professor, dean, president, project supervisor, etc.)	0.912	0.340	–
Improvement of personal reputation	0.925	0.336	–
Improvement of university's or project's reputation	3.756	0.053	–
Financial benefits (funding, subsidies, etc.)	8.324	**0.004**	–0.171
Exploitation of knowledge (e.g., in form of patents)	17.212	**<0.001**	–0.247
Information of the public regarding own research (results)	0.241	0.623	–
To make knowledge usable	8.107	**0.004**	–0.169
OBSTACLES			
I do not have enough time	10.930	**0.001**	–0.197
Engagement in knowledge transfer is not important for my career	0.003	0.955	–

df = 1; N = 283. Bold values are used to highlight statistically significant values ($p < 0.05$).

important to transmit research results to other spheres of society (Green et al., 2009). This strategy is essential not only for the advancement of methods in professional practice but also for the development of a knowledge-based society. Furthermore, KT is vital for the raising of public consciousness and interest. Pragmatic or strategic considerations were raised, covering issues concerning mutual beneficiary exchanges between academia and practical fields, as well as non-professional social spheres. Since KT is a multi-dimensional endeavor, knowledge and expertise will be transmitted to all parties. Thus, insights from other portions of society can augment academic knowledge or even prompt novel research questions (Wutti and Hayden, 2017; Hayden et al., 2018). Considering our results regarding societal obligations, research utilization, and mutual benefits of KT, it is important to underline the importance of open access, data, and approaches to innovation (European Commission, 2016). By means of these strategies, the transmission of knowledge to most aspects of society can be effectively achieved. Research results will thus not become hoarded within the scientific community, but rather be utilized by groups ranging from scientists to laymen (Wolpert, 2013). Politics may foster the KT process by creating funding initiatives for specific KT aspects that are not associated with exploitation or university-industry collaboration.

Despite the fact that researchers themselves view KT as an important component of academic affairs, it appears that the scientific community under-appreciates involvement in KT. Participants emphasized that only science-to-science achievements are important for advancement in an academic career, and this aspect seems particularly important considering the fact that half of our participants mentioned insufficient time availability as a main obstacle for KT activities. If KT requires great amounts of time and energy, but is not beneficial for career progression, only researchers with high levels of intrinsic motivation will take part. In the current study, a fifth of our participants stated that KT is not vital for career development and that this fact would limit their engagement in KT. It is important to remember that a sizeable portion of the sample had already experienced career progression and likely did not expect or desire further promotions. The present system seems to thwart the personal enthusiasm of investigators as it focuses almost exclusively on science-to-science achievements.

Overall, our findings verified our initial assumptions only to a minor degree. Although we found several key differences between SSH researchers and those of other disciplines, these differences were predominantly small in effect size. This indicates that the understanding and practice of KT is not as diverse as current research may suggest (Landry et al., 2001; Olmos-Peñuela et al., 2014a). Exploitation was the only issue where large effect sizes were found. This is likely due to the fact that SSH investigators opposed economic motivation of research and financial incentives more empathically. However, as non-SSH researchers also rejected such motivators, a dissent exhibited uniquely by SSH professionals cannot be established.

Limitations of our study were mainly related to the sample itself. First, some scientific disciplines were underrepresented in our study sample (law, economy, medicine). Second, all participants were employed at Austrian universities. It may be theoretically possible that a more balanced sample or a sample that included international researchers would have led to slightly different results. However, we did not find any significant differences within the non-SSH population that would suggest biases. We further assume that at least in other EU countries, results should be comparable, as academia is generally structured similarly. Furthermore, it is important to consider that several researchers in our sample possess international academic experience. Nevertheless, results of our study should be generalized with precaution. Intercultural aspects as well as differences in research traditions and university policy may lead to altered results in different countries. This applies to nations outside of the EU in a particular manner.

IMPLICATIONS

In light of our findings, we recommend the development of reliable indicators for KT that go beyond the current guidelines considering patents, licensing, and university spin-off establishments as vital to benchmark frameworks. We suggest a system that includes science-to-public and science-to-professionals achievement sharing, such as science

communication, lectures and presentations outside of academic environments, as well as workshops for professionals. Along with the advancement of appropriate indicators, research is needed that covers the entirety of the KT spectrum, rather than solely university-industry relationships. Our results indicated that researchers possess a much more sophisticated understanding of university KT that is inadequately covered by available scientific literature. Furthermore, the common practice of exclusively appreciating science-to-science achievements in the evaluation of occupational aptitude in an academic career should be reconsidered. While focus should be maintained on scientific accomplishments, KT activities should be explicitly taken into account as well. Finally, open access strategies should be fostered, in order to make research results accessible and effectively utilizable for different user groups. We conclude that these implications are valid for both the SSH as well as other scientific disciplines.

CONCLUSION

Our results clearly indicate that researchers themselves evaluate university KT as a mandatory and vital aspect of academic affairs that covers various aspects beyond collaboration between academia and industrial or economic entities. Issues of particular importance in science-to-public (such as science communication and public relations activities) and science-to-professionals (such as training for professionals, institutions, companies, etc.) interactions were frequently described as KT activities. Furthermore, participants emphasized university teaching as a topic of high relevance. Aspects commonly used as key performance indicators for KT, such as the number of patents issued or university spin-offs established in association with an academic institution, were only rarely associated with KT. Accordingly, the currently prevalent KT benchmarking system should be reconsidered. Researchers tend to be motivated by moral (personal and societal obligation as well as the utilization of research results) rather than by economic aspects (earnings, exploitation). Insufficient time availability and lack of occupational appreciation for KT practices were cited as hindering factors. Although differences between researchers of the SSH and other scientific disciplines were measurable, our results support a different understanding of university KT possessed by professionals from these two groups only to a limited extent. Overall, views of these two subsamples tended to agree.

ETHICS STATEMENT

This study was carried out in accordance with the recommendations of the American Psychological Association. Participation was voluntary and subjects gave informed consent about study participation by virtue of survey completion. Research participants were not subjected to harm in any ways whatsoever. Privacy and confidentiality were granted as far as possible. With the exception of two variables (level of academic progress; scientific discipline or -disciplines) participants did not have to give any sociodemographic variables. All information except for sociodemographic parameters were linked to personal opinions. In accordance with both national and institutional guidelines, no ethical approval had been requested.

AUTHOR'S NOTE

Some research data in this article have been presented in German in an open-access brochure on knowledge transfer (http://www.wtz-sued.at/projekte/gsk-wissenstransfer-broschuere/).

AUTHOR CONTRIBUTIONS

MH and DW designed and directed the study with assistance from AP and MW. All authors were involved in the promotion of the study, the dissemination of the questionnaires, and the recruitment of participants. AP and MW supervised and mentored the project. MH analyzed the data and wrote the first draft of the manuscript. All authors discussed the results and contributed to the final manuscript.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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