Knowledge Transfer Between Academia and Industry

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INTRODUCTION

Many policy makers and researchers consider knowledge transfer between academia and industry as one of the most promising measures to strengthen economic development. The idea of linking academia and industry is not new. Back in 1910 *research universities* were established, which strongly emphasized industry-related research as part of their activities and were funded by enterprises in order to tap this knowledge (see Matkin, 1990, for the history of technology transfer at four U.S. research universities—MIT, U.C. Berkeley, Penn State, and Stanford). Knowledge transfer has increased considerably during the last few decades. Many universities have established offices aimed at improving relations with industry. The performance of these offices varies considerably. One example for a quantitative performance indicator is license revenues of U.S. universities (Artley, Dobrauz, Plasonig, & Strasser, 2003). Only a handful of examined universities actually draw profit from it. The majority pay more for legal advice and fees than they earn from license income. It is obvious that the performance variances depend on many factors like staff resources at the transfer offices, type of university research (basic vs. applied, technical vs. nontechnical domains), the *brand* of the university as well as prior industrial relationships, to name just a few. Not all of these factors can be changed in the short run, but knowing them and streamlining actions towards their improvement can lead to sustainable changes, in the end positively influencing economic performance. Despite the long history and recent efforts to improve university-industry collaborations, the full potential does not yet seem to be exploited (Starbuck, 2001). Jankowski (1999) and Clough (2003) confirm the decrease of federal funding for universities and point to increasing collaborations between academia and industry, which in their view comprises the danger of leaving *fundamental frontier research*, vital for breakthrough innovations, behind. At the same time, industry increasingly relies on external knowledge sources to keep up with the pace of their competitors (Business-Higher Education Forum, 2001; Tornatzky, 2000). In many cases, these external sources are customers and suppliers (Adametz & Ploder, 2003; Dachs, Ebersberger, & Pyka, 2004). This may be due to similar rationales, profit, and already-existing customer-client relationships. However, industry more and more turns to universities when looking for support. According to Godin and Gingras (2000), universities are still one of the major producers of knowledge, despite an increase of other R&D institutions. Collaborations between academia and industry bring partners with different competencies together and cover the whole range of the R&D chain, from basic research to application. By fulfilling the needs of both partners, universities as well as enterprises, and building up trust, knowledge transfer leads to knowledge flows and production of new knowledge, and thus creates a fertile environment for innovation. The article at hand examines motives as well as barriers related to knowledge transfer out of a systemic as well as a process-related view and provides some general suggestions for further improvements.

BACKGROUND

The earlier focus of knowledge transfer between academia and industry was on technology, in the sense of technological processes and artifacts inhibiting technological knowledge without paying much attention to the soft facts important for the success or failure of the transfer. Nowadays, technology transfer often comprises more than technological knowledge, including data as well as technology-related organizational knowledge (Abramson, Encarnacao, Reid, & Schmolch, 1997). As Schumpeter (1912) explained, technology is not exclusively the base of innovations. Using the term knowledge transfer instead of technology transfer reinforces Schumpeter's view of innovation, which additionally includes, for example, social innovations like new organizational structures or incentive systems (see Hofer, Adametz, & Holzer, 2004, for an example of a knowledge transfer program implemented by a university of technology in collaboration with a *classical* university). Knowledge transfer schemes range from regional programs and initiatives to national and international ones. Besides the different geographical focus, also the target group, at which knowledge transfer measures are aimed, can differ (broad approach vs. focus on specific industrial sectors). All these characteristics influence knowledge transfer at the operative level and require diverse additional partners and

processes. Knowledge transfer between academia and industry as understood herein refers to activities, aimed at enabling and facilitating industry to tap knowledge produced at universities. The article examines knowledge transfer in general without limiting it to certain geographic borders. Knowledge transfer does not only comprise large collaborative R&D projects, but also measures like informal consulting as well as diploma theses commissioned by enterprises. The primary objective of knowledge transfer is to strengthen the competitiveness of both partners, leading in succession to improved economic development.

MAIN FOCUS OF THE ARTICLE

The article addresses regional as well as national governments trying to provide the right framework for parties involved in knowledge transfer—universities' managers, who would like to establish closer links with industry, as well as representatives of industry, who plan to or already use external knowledge sources like universities. The first part of this article deals with motives at different organizational levels of the parties directly involved; the second part discusses barriers negatively influencing knowledge transfer. The article concludes with some suggestions for future actions in order to amplify motives and overcome barriers, thus increasing the performance of knowledge transfer initiatives and programs.

What are the Driving Forces in Knowledge Transfer?

In order to improve knowledge transfer between academia and industry, it is not sufficient to examine solely existing barriers; one must also examine possible motives, as the driving power must be identified and intensified. This is not only important at the agency but also the individual level, where knowledge transfer ultimately takes place (Lipscomb & McEwan, 2001). The following comments are based on the results of a literature study performed for a paper presented at the 2004 *Exploiting Change in the 21st Century* international conference (Hofer, 2004). Motives for universities to get involved in knowledge transfer are mainly financial as well as legal ones. At many universities, the share of industrial funding already makes up a substantial part of the total budget. Without the financial commitment of industry, these universities would have to cut their expenses dramatically. The trend of increasing industrial funding of universities is likely to grow even more in the future, with governments stabilizing or even cutting resources and increasingly interdisciplinary R&D projects demanding researchers from various professional areas. But universities are involved not only for financial reasons, but also because they are legally bound to perform knowledge transfer with industry. For example, the Austrian *Universitaetsgesetz 2002* [University Law 2002] lists "support to practically use and apply universities' R&D results" as one of the primary tasks of Austrian universities. Etzkowitz (2003) calls this additional task the *third mission* of universities besides doing research and educating students. Despite all perils like stronger emphasis on applied research, universities at the agency level are committed to perform knowledge transfer with industry and thus offering their knowledge. The commitment at the individual level does not always reflect this opinion. This is comprehensible if one considers that legal claims at this level do not exist as part of contracts between universities and their employees. Usually, there are no financial benefits, which recompense researchers for efforts to perform knowledge transfer with industry, except for researchers, whose jobs directly depend on external funds. Knowledge transfer does not seem to be perceived as important as other tasks (Kremic, 2003). If the researcher's employment does not depend directly on industrial funding, that person is free to decide whether or not and to which degree to get involved in knowledge transfer. Therefore the issue of what motivates researchers at universities to invest some of their time budget in projects with industrial partners is of particular interest. The majority of literature referred to in the following regards individuals in public laboratories. It is assumed that governmental scientists and their universities' counterparts are motivated by similar factors because of the similar framework such as public funding and similar kinds of R&D. Differently from their colleagues, university researchers must also teach their students, thus having even more time constraints. Studies performed by Large, Belinko, and Kalligatsi (2000), Schartinger, Schibany, and Gassler (2001), and Spivey, Munson, and Flannery (1994) identified personal interest and satisfaction as the primary motives of researchers to deal with industry. They do not seem to be motivated by extrinsic factors like additional income. Frey and Osterloh (2000) describe researchers as people typically motivated by intrinsic motives, which additionally confirms the results of the various studies. The main objective of private industries is to make profits, to be profitable for their owners, and to be a better investment than other corporations (Kremic, 2003). Industry collaborates with universities because it promises to be profitable. However, large-scale enterprises (e.g., in the life science industry) in some cases are funding blue-sky research at universities; they do not do it for the sake of basic research, but because this gives them the right to be first to exploit possible inventions and to recruit high potentials before others get a hold of them. Challenges like fast and highly specialized knowledge production, shorter product lifecycle due to increasing