Increasing Doctors' Employment in Companies by Tailored Teaching and Matchmaking Actions

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Increasing Doctors' Employment in Companies by Tailored Teaching and Matchmaking Actions

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Abstract: Active industry – academia interaction is of fundamental importance in addressing our global challenges. In this paper, we present two programs that lower the barrier between these two domains. The experimental educational program for doctoral students is an adaptation of top-level management training program to the academic environment. The matchmaking program between a company and a young doctor provides a low entry barrier to companies to test new ideas with the doctor and build new competences by hiring the doctor. In this program, the funding for the research phase is covered by a foundation and the development phase by the company.

Keywords: Doctoral education; teamwork; industry-academia interaction; top management training; business foresight; global challenges; global perspective; technological development; doctors´ employment.

1 Introduction

During the last few decades, significant research interest has been focused on the interaction between industry and academia. The research focusing on technology innovations has concluded that practically oriented academic research is able to help industrial firms to improve their competitiveness (Tseng, Huang and Chen, 2020). In this manner, effective knowledge transfer between academia and industry can be a powerful source of innovation (Perkmann *et al.*, 2013; Ankrah and AL-Tabbaa, 2015). Thus, collaborative relationships between industrial firms and academic institutions are nowadays considered an essential economic driver since they are expected to spur innovations and thus stimulate economic growth (Weckowska, 2015; Rajalo and Vadi,

2017). However, the actors on both sides need to develop trust and learning (Oliver, Montgomery and Barda, 2020) mechanisms to overcome barriers of collaboration (Dwyer, Filieri and Malley, 2022)

In most of the industrialized countries, governments and national innovation policy makers are actively facilitating and promoting the establishment and development of different kinds of collaborations between academia and society (Tseng, Huang and Chen, 2020). The societal actors can represent e.g. industry or other private sector organizations, the public sector, or non-profit organizations (Morlacchi and Martin, 2009; Perkmann *et al.*, 2013; Rajalo and Vadi, 2017). Thus, innovation policy makers emphasize so-called "third mission of universities", where societal contribution of universities is seen equally important with the fundamental goals of higher education and academic research. The societal contributions may include collaborative knowledge creation, transfer, and exchange between universities and external partners (Pennacchio, 2016). Thus, the national innovation policies and funding institutions are increasingly expecting that publicly funded research produces clear social impacts alongside with the scientific contribution (Kunttu *et al.*, 2021). In the United States, for instance, the National Science Foundation (NSF) requires grant applications to discuss the way the research will have broader societal impacts. In the NSF's Broader Impacts Criterion (BIC), societal impact is evaluated in terms of potential societal benefits, broad dissemination and outreach, as well as partnerships with societal actors (Woodson, Hoffmann and Boutilier, 2021).

Societal impact of the academic research plays a central role in transferring the scientific knowledge from academia to industrial domain. This can be done by formal or informal mechanisms (Schaeffer, Öcalan-Özel and Pénin, 2020). Industrial firms need to be capable of absorbing critical knowledge from universities. In the collaborative university relationships, the partners can create new knowledge that may be essential for their new product development and innovation (Kunttu, Huttu and Neuvo, 2018; Kunttu and Neuvo, 2020). Moreover, effective transfer of knowledge between academia and industrial domain can help companies to develop their skills, capabilities and competences (Kunttu and Neuvo, 2019). The ability of industrial companies to utilize the knowledge of a highly educated workforce is an important factor in improving its innovative capacity and the economy overall (Weckowska, 2015).

Mobility of university scientists to industry and vice versa is one central way of knowledge transfer between these two domains. Recruiting new employees with background from research has been found to be an effective method of transferring and integrating the latest academic knowledge for industrial purposes. This is particularly true in the case of newly graduated doctors, because they have valid and up-to-date scientific knowledge from their specialization areas (Kunttu, Huttu and Neuvo, 2018). However, despite the fact that the number of graduated doctors in Western Europe has rapidly increased during recent decades, relatively small share of them are actually employed in industrial sector (Auriol, Misu and Freeman, 2013). For example, in Finland and Sweden, only about 25–30% graduated doctors have been employed in private sector.

To address to the actual challenge of the difficulties related to the knowledge transfer by means of mobility, we present two teaching cases that focus on the mobility of doctoral graduates from academia to industry. These cases aim at familiarizing the students with an industrial way of working and by providing them with real industrial problems to

which they can apply their academic knowledge and problem-solving skills. The cases are the following: 1) Learnings and experiences from a full academic year course series called Bit Bang that is preparing doctoral students with the essential elements of a successful career in industry or academia and 2) Results of a matchmaking program called PoDoCo, that helps young doctors find jobs in the industry and supports long-term competitiveness of companies.

2 Teaching cases

Bit Bang Courses

The idea of these courses comes from corporate level executive training programs targeted to top managers with potential to move to the next level. This kind of programs are available from universities and specialized institutes like Stanford University (California), INSEAD (France) and IMD (Switzerland). Similar management training programs are also organized in house by big companies. We realized that somewhat similar training would also be advantageous for preparing doctoral students entering the working life in general, but especially for working in the private sector.

The Bit Bang doctoral training course adapts Nokia's top management training program to the academic environment. This full academic year long postgraduate course is built around a general theme specified every year. The course relies on multidisciplinary teamwork assignments from the area of the course theme, and on top-class guest lectures from industry leaders, Government officials and politicians. The course aims at facilitating collaboration across disciplines and, what is even more important, provides a bridge between academic post-graduate studies and real-world opportunities.

The key learning objectives of the Bit Bang courses are teamwork skills, multidisciplinary collaboration, global perspective, industry and business foresight, and scenario building. The first Bit Bang courses also served the objective of increasing cooperation between the different schools of Aalto University. Aalto University was just being created as a merger of three separate universities (Technology, Business, Art and Design). Students to the Bit Bang courses were selected based on written applications, where the student explains why this course would be of special value just for her/him. This selection method turned out to be quite a good one. In each course we had and interesting lively mixture of personalities.

The name "Bit Bang Courses" comes from the name of the first course "Bit Bang – Rays to the Future", reflecting the explosive growth of digitalization. Later the name was adopted as the "brand" name of the whole course series of nine courses. Key characteristics of a BB course are the following: length full academic year, 24 students accepted each year plus four tutors (students from the previous year), textbooks selected to fit the theme of the course and distinguished guest speakers. The highlight of each course was the one week long, intensive study tour to a global technology hot spot (Shanghai, Tokyo, Delhi, Bangalore, New York, and California) with visits to companies, universities and presentations of country´s R&D policy etc.

A major undertaking was team writing a Bit Bang book on the theme of the course with each student contributing to two chapters. The themes of the books are listed in Table 1. The Bit Bang books are freely available over the Internet and, in addition to the teamwork results, they contain a detailed description of all course activities.

The majority of the Bit Bang course attendees have been hired by industrial firms after their graduation. Papers produced by students during their Bit Bang collaboration have produced interesting results: many participants have gone on to write conference papers and journal articles based on the joint reports written in the class. In this manner, the course outcomes have also academic contribution. The intensive nature of the Bit Bang courses created a very strong team spirit between the students and with the teachers.

The idea of the Bit Bang Course series was to apply the essential elements of big corporations' top management training programs in doctoral education. It was part of the 20 M€ Multidisciplinary Institute of Digitalization and Energy (MIDE) research program (2008 – 2013) funded by Finnish companies to celebrate 100 years of engineering education in Finland. As the discussions to establish Aalto University were already ongoing, we decided to boost the development and make all Bit Bang courses from the very beginning to be Aalto Compatible. The first Bit Bang course was in 2008 – 2009 and Aalto University was established in 2010.

The question "Will there be more Bit Bang courses to come?" is still asked every now and then. Right now, it looks like that the original Bit Bang course concept may be too heavy and demanding to organize. However, there could be a series of lighter and shorter events focused on different aspects of doctors' career development, kind of "Bit Bang Light" events.

Table 1 A summary of nine Bit Bang courses

Course number	*Academic Year*	*Theme of the Bit Bang Book*	*Intensive study tour*
1	2008-2009	Bit Bang: Rays to the Future	California
2	2009-2010	Energizing Innovation – Innovating Energy	Shanghai
3	2010-2011	Entrepreneurship and Services	Bangalore, Delhi
4	2011-2012	Future of Internet – Societal, business, governance and technological aspects	Tokyo
5	2012-2013	Changing Global Landscapes	Beijing
6	2013-2014	Future of Media	California
7	2014-2015	Future of Energy	Shanghai
8	2015-2016	Digitalization	Seoul
9	2016-2017	Entrepreneurship	New York, Boston

Post Docs in Companies Program

Post Docs in Companies, PoDoCo, is a program that aims to promote academic research supporting long term competitiveness and strategic renewal of Finnish companies, and the employment of doctors in industry. PoDoCo facilitates novel meetings and matches of post docs and companies and offers young scholars funding from one source for academic research having strategic importance for Finnish companies. PoDoCo program is aimed for doctors who have recently completed or will soon complete their doctoral degree. There are no limitations regarding the branch of science or branch of industry. Instead, PoDoCo program is aimed to all branch of industries and all disciplines, e.g. natural sciences, engineering and technology, medical and health sciences, agricultural sciences, social sciences and humanities (OECD, Field of Science and Technology Classification).

PoDoCo program is funded by PoDoCo foundation pool and companies participating in the program and operated by DIMECC Ltd. The core element of the PoDoCo is the collaboration project between a postdoc researcher and a company. The PoDoCo project consist of two periods, a research period that is followed by a targeted research period lasting altogether 1-2 years. The PoDoCo foundation pool offers research grants for the postdoc researchers to cover the costs of the research period. After the research period, the company hires the postdoc researcher to deepen the research results and to create company specific insight. The result is a win-win situation, where academic research is supporting the long-term competitiveness and strategic renewal of the companies and the young doctors obtain industrial experience. The program has now been operational for six years and it has funded 201 projects. More information about the program is available at www.podoco.fi.

The outcomes of the PoDoCo program are encoraging. Around 90% of the postdoc researchers who have completed the PoDoCo project have been employed in the collaboration companies. Unfortunately, all the PoDoCo projects are not reaching the goal, and they end before the targeted research period begins. There are multiple reasons for this, and the reasons are related to job offerings from other companies and changes in personal life. Share of the early ended projects is around 50%, which is rather high. On the other hand it should be taken into account that the researchers applying PoDoCo funding are actively seeking job opportunities broadly from inside and outside of the academia.

Among the collaboration companies, there are some companies that have had several or have simultaneously several ongoing PoDoCo projects. These companies are regarding PoDoCo project as a strategic instrument to recruit new talents and to explore new business opportunities. Among these companies is, for example, one telecommunication company looking for new business opportunities in manufacturing business and a company developing new kind of energy storage systems. Surprisingly, among these companies there are not only big enterprises, but also relatively young SME's which are seeking resources and competences for growth. The share of the SMEs of PoDoCo collaboration companies is currently about 75%.

The industry branches that most actively utilize the PoDoCo program have the tradition of university-industry collaboration. Therefore, natural sciences, engineering, technology, and medical and health sciences are covering 80% of all PoDoCo funded projects. The

distribution is relatively even between Finnish universities. When asked how the postdoc has found the collaboration company, we found that most of them had used their existing networks that they had created as PhD-students. From this viewpoint, PoDoCo strengthens existing collaboration networks. However, PoDoCo has created new collaboration connections as well. There are a number of successful cases, where the postdoc researcher has contacted a potential collaboration company directly after finding out that the company is developing a technology that postdoc has expertise in.

For companies, PoDoCo offers a low risk recruitment process, and low risk competence development because the first phase is funded by the foundation. Because of funding, the IPR that is generated by the postdoc in the first phase belongs to the researcher. During the second phase, when the researcher is an employee of the company, the IPR is owned by the company.

The PoDoCo program was established to alleviate the fact that Finnish companies employ less PhD's than companies in many other European companies. Lately around 450 fresh graduated PhD's from Finnish universities are annually hired by companies and PoDoCo grantees represent about 7 % of that amount.

3 Discussion

Well-functioning industry-academia interaction is of fundamental importance in addressing our global challenges. There is space for several mechanisms and instruments to enhance collaboration between companies and universities. In this paper, we have provided two examples: the Bit Bang courses for doctoral students and the PoDoCo program for employing doctors in companies. The common factor between these two programs is the focus on fresh PhD students and utilization of their skills and competences outside academia. Although the volume of these programs is relatively small, if compared to big research projects, the importance is longer lasting because both these instruments create new connections and network between universities and companies.

References and Notes

Ankrah, S. and AL-Tabbaa, O. (2015) 'Universities-industry collaboration: A systematic review', *Scandinavian Journal of Management*, 31(3), pp. 387–408. doi: 10.1016/j.scaman.2015.02.003.

Auriol, L., Misu, M. and Freeman, R. A. (2013) 'Auriol, L., Misu, M., & Freeman, R. A. 2013. Careers of Doctorate Holders: Analysis of Labour Market And Mobility Indicators.', *OECD DSTI Working Paper DSTI/DOC(2013)4. Paris: Organisation for Economic Co-operation and Development (OECD), Directorate for Science, Technology and Industry (DSTI).*

Dwyer, M. O., Filieri, R. and Malley, L. O. (2022) *Establishing successful university – industry collaborations : barriers and enablers deconstructed*, *The Journal of Technology Transfer*. Springer US. doi: 10.1007/s10961-022-09932-2.

Kunttu, L. *et al.* (2021) 'Developing Social Impact Evaluation Methods', *Technology Innovation Management Review*, 11(5).

Kunttu, L., Huttu, E. and Neuvo, Y. (2018) 'How Doctoral Students and Graduates Can Facilitate Boundary Spanning between Academia and Industry', *Technology Innovation Management Review*, 8(6). doi: 10.22215/timreview/1164.

Kunttu, L. and Neuvo, Y. (2019) 'Balancing learning and knowledge protection in university-industry collaborations', *Learning Organization*, 26(2), pp. 190–204. doi: 10.1108/TLO-06-2018-0103.

Kunttu, L. and Neuvo, Y. (2020) 'The role of academics, users, and customers in industrial product development', *Technology Innovation Management Review*, 10(3). doi: 10.22215/timreview/1337.

Morlacchi, P. and Martin, B. R. (2009) 'Emerging challenges for science, technology and innovation policy research: A reflexive overview', *Research Policy*, 38(4), pp. 571–582. doi: 10.1016/j.respol.2009.01.021.

Oliver, A. L., Montgomery, K. and Barda, S. (2020) 'The multi-level process of trust and learning in university–industry innovation collaborations', *Journal of Technology Transfer*, 45(3), pp. 758–779. doi: 10.1007/s10961-019-09721-4.

Perkmann, M. *et al.* (2013) 'Academic engagement and commercialisation: A review of the literature on university-industry relations', *Research Policy*, 42(2), pp. 423–442. doi: 10.1016/j.respol.2012.09.007.

Rajalo, S. and Vadi, M. (2017) 'University-industry innovation collaboration: Reconceptualization', *Technovation*, 62–63(December 2015), pp. 42–54. doi: 10.1016/j.technovation.2017.04.003.

Schaeffer, V., Öcalan-Özel, S. and Pénin, J. (2020) 'The complementarities between formal and informal channels of university–industry knowledge transfer: a longitudinal approach', *Journal of Technology Transfer*, 45(1), pp. 31–55. doi: 10.1007/s10961-018-9674-4.

Tseng, F. C., Huang, M. H. and Chen, D. Z. (2020) 'Factors of university–industry collaboration affecting university innovation performance', *Journal of Technology Transfer*, 45(2), pp. 560–577. doi: 10.1007/s10961-018-9656-6.

Weckowska, D. M. (2015) 'Learning in university technology transfer offices: Transactions-focused and relations-focused approaches to commercialization of academic research', *Technovation*, 41, pp. 62–74. doi: 10.1016/j.technovation.2014.11.003.

Woodson, T. S., Hoffmann, E. and Boutilier, S. (2021) 'Evaluating the NSF broader impacts with the Inclusion-Immediacy Criterion: A retrospective analysis of nanotechnology grants', *Technovation*, 101(May 2020), p. 102210. doi: 10.1016/j.technovation.2020.102210.