EDUCATION FOR INNOVATIONS AND THEIR COMMERCIALIZATION

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Abstract

Many universities are expanding their educational curricula and programs to foster innovation and entrepreneurship. According to data on the key trends, specialization and contents, broken down by areas of education in social sciences, one of the key identified directions is the commercialization of innovation.

Therefore, the paper presents the new fields of study, like such as design thinking, value proposition and business model creation, intellectual property protection of products and innovative technologies, sources for financing innovation as well as the TOP500 innovators project successfully implemented in Poland. Thus complements discussion about educating the next generation of innovators.

Key words: *innovation, knowledge commercialization, education*

1. INTRODUCTION

The National Centre for Research and Development (NCBiR) final report entitled "The Analysis of Key Competences and Qualifications for Increasing the Chances of University Graduates in the Labor Market" is an effect of evaluation research conducted in 2014. The primary goal of the research was to prepare a list of recommended competences, qualifications and effects of education, areas and fields of study important in terms of Polish labor market, economy and society needs. According to the data on the key trends, specialization and content, broken down by areas of education contained in the evaluation study in social sciences, commercialization of innovation was identified as one of the key directions (NCBiR, 2014).

It is generally accepted that the commercialization of technology encompasses all activities related to the transfer of a technical or organizational knowledge and the related know-how to economic practice (any form of diffusion of innovation and technical education). In the narrower sense commercialization of technology is defined as a deliberate, targeted transfer of knowledge and skills to the production process for its marketability as a service or product (Głodek, 2005). Hence the purpose of training in innovations and their commercialization is to transmit knowledge based on commercialization strategies like sale of property rights, licensing, strategic alliance and joint venture.

Moreover, ability to quickly commercialize product innovations, organizational and new technology is extremely important from the standpoint of building and maintaining a competitive advantage in the rapidly changing environment of enterprises and organizations in both private and public sectors.

Our world has changed drastically due to time constraints, demands and the digital revolution. The world has shifted from industrial age into global knowledge base economy. As a result, we need to teach differently. The market is saturated with I-type professionals (I-shaped**)** who have very narrow skills in one specific area.

In new research conducted by Econsultancy, organisations identified a growing requirement for so-called 'T-shaped' people. Education at the university level is key to fixing this problem. Many times students graduate with little to no idea how an actual company or agency works. Universities are oriented on single subject education. For this reason, it is difficult to find the *right* talent—the one that we need for today's demands (Perkin, 2011).

Also, OECD Reviews of Tertiary Education in Poland suggest promotion of new teaching programs to develop entrepreneurial skills and matching them with industry requirements (Fulton et al., 2007). Therefore, the paper presents the new fields of study, like such as design thinking, value proposition and business model creation, intellectual property protection of products and innovative technologies, sources for financing innovation as well as the TOP500 innovators project successfully implemented in Poland.

2. DEVELOPING T-SHAPED PROFESSIONALS

There is a need for those who understand not only advertising but also technology. In the recruitment field, these individuals are called T-shaped people. According to Wikipedia (2016)**:** The concept of T-shaped skills**,** or T-shaped persons is a metaphor used in job recruitment to describe the abilities of persons in the workforce.

The vertical bar on the *T* represents the depth of related skills and expertise in a single field, whereas the horizontal bar is the ability to collaborate across disciplines with experts in other areas and to apply knowledge in areas of expertise other than one's own.

T-shaped people have two kinds of characteristics, hence the use of the letter "T" to describe them. The vertical stroke of the "T" is a depth of skill that allows them to contribute to the creative process. That can be from any number of different fields: an industrial designer, an architect, a social scientist, a business specialist or a mechanical engineer.

It can be also applied to the life-science scientists or even medical doctors. Regarding life-science the narrow specialization is also a problem, for examples biotechnologists and molecular biologists have deep narrow knowledge regarding genes regulation, transcription, DNA etc. but do not understand the function of the cell and the organisms. Medical students on the other hand do not have contact with science during studies, not in the curricula. Medical specialists tend to look on the selected patients problem, cardiologists concentrates on cardiovascular system, surgeon – on performing operations, etc. They are very skilled in their profession, but often the broader view or life-science knowledge is missing.

There is need to increase understanding of the human body function in physiology and pathophysiology aspects, and teach the medical students integration of many subjects. Regarding biotechnology students in Medical University they also need to understand the human body function in physiologic and pathologic situations, to know what could be the consequences of their work.

The horizontal stroke of the "T" is the disposition for collaboration across disciplines. It is composed of two things. First, empathy. It's important because it allows people to imagine the problem from another perspective- to stand in somebody else's shoes. Second, they tend to get very enthusiastic about other people's disciplines, to the point that they may actually start to practice them. T-shaped people have both depth and breadth in their skills.

The term 'T-shaped' was first used by McKinsey & Company to describe the type of person they were looking to hire. The phrase was popularised by Tim Brown CEO of design and innovation firm IDEO (Brown, 2009).

Discipline-based education remains a vital role of modern universities. In order to close the skill gap, however, universities should also offer students the opportunity to gain qualifications in the interdisciplinary requirements of workforce. Such qualifications would equip graduates with the concepts and vocabulary to discuss the design and improvement of knowledge base economy with peers from other disciplines. Industry refers to these people as T-shaped professionals, who are deep problem solvers in their home discipline but also capable of interacting with and understanding specialists from a wide range of disciplines and functional areas.

The resources used for the development of knowledge base economy offer a useful starting point to form T-shaped professionals. They can be divided into four clusters (IfM and IBM, 2008):

(1) Whole businesses and organizations: Studied primarily by schools of management (marketing, operations management, operations research and management sciences, supply chain management, innovation management)

(2) Technology: Studied primarily by schools of science and engineering (industrial engineering, computer science, statistical control theory)

(3) People: Studied primarily by schools of social sciences and humanities (economics, cognitive science, political science, design, humanities and arts)

(4) Shared information: Studied primarily by schools of information (communications, management information systems, document engineering, process modelling, simulation)
The knowledge of T-shaped professionals benefits from academic disciplines, which study some or all of the four resource clusters. The list consists of 35 academic disciplines (Coevolving Innovations, 2008).

The idea of T-shaped professionals has taken on global significance in last few years due to the everchanging economic culture and how businesses are adapting. China is expecting a mini-revolution in seeking of T-shaped professionals in the workforce. In Spain, the advertising industry is suffering from a lack of qualified people to take up the positions available, even though the unemployment rate is at 25% (Garcia-Hierro, 2012).

Widely recognized academic disciplines teaching programs would help ensure the availability of a large population of T-shaped professionals with the ability to collaborate to create innovations. T-shaped qualifications would indicate that these graduates could communicate with scientists, engineers, managers, designers, and many others involved in corporate. Graduates with T-shaped qualifications would be well prepared to 'hit the ground running', able to become immediately productive and make significant contributions when joining an innovation project.

One of the reasons that so many people graduated from the D-school [The Hasso Platner Institute of Design] at Stanford could found lucrative jobs is because they are being taught to be T-shaped (Korn and Silverman, 2012). It now enrolls 700 students a year (Tischler, 2010).

Stanford University's d.school has gained recognition in recent years for introducing the trendy, problem-solving concept known as "design thinking" to executives, educators, scientists, doctors and lawyers. Chineses are ones of the most numerous participants. Now other schools are coming up with their own programs.

They already recalled list of academic disciplines related to T-shaped profesionals teaching consist 35 positions (Coevolving Innovations, 2008). From a Polish point of view it is possible to add a few other, like econophysics, economic computer science, commodity science, management and production engineering. No one of it is on the list of ordered disciplines established by Ministry of Higher Education (Ernst & Young and IBnGR, 2010)! On this list are educating disciplines educating specialists mostly of the type I – specialists only in one disciplines. Nobody checked, how many graduates of such disciplines like biotechnology, chemical technology, have difficulties to find job on Polish workforce. Whether Poland can afford for educating specialists which go abroad and for free support Western economies? The list of ordered disciplines should be actualized. Also should be on it disciplines which are educating T-type professionals.

3. NEW WAY OF EDUCATION

Higher education in Europe and in Poland have to adapt to the requirements of the job market, the market which will be developed by the modern educated professionals. Therefore, there is a demand for creative thinking, the ability to create new knowledge, innovative technical and organizational solutions and new cultural content (National Program for the Development of Higher Education, 2015).

In this regard it is becoming primarily important to introduce courses on *design thinking.* It is a method of creating innovative products and services based on deep understanding of the problems and needs of the users. According to Brown (2008) it is "a methodology that imbues the full spectrum of innovation activities with a human-centered design ethos. Innovation is powered by a thorough understanding, through direct observation, of what people want and need in their lives and what they like or dislike about the way particular products are made, packaged, marketed, sold, and supported".

The search for innovation begins when problem which has to be solved is defined and the interdisciplinary team is established. While working with *design thinking* method it is important to undertake observations of user behavior and to use the method of brainstorming, to finally find the solution and proceed to prototyping. Based on Fraser (2009) in designing business it is important to follow three steps:

1. The first step is to look beyond direct use of product or service and gain deeper insight and broader behavioral and psychographic perspectives (empathy and deep user understanding).
2. The second step is a Concept Visualization which means ideation, prototyping, and user evaluation in multidisciplinary team.
3. The last step is a strategic business design (activity system design and evaluation).

In agreement with the National Center for Research and Development (NCBiR, 2014) in Poland a lot of research is conducted with insufficient knowledge of the market and, moreover developing in a direction that does not guarantee the possibility of commercialization. Therefore, it becomes extremely important to understand the *value proposition*, that is focusing on the market and customer needs.

Value proposition, which defines a set of benefits so far unparalleled on the market and a description of innovation, can be characterized by a few basic questions:

- Who is the target customer of a product / technology / solutions?
- What problems or need it satisfy? Statement of customer needs.
- What are the benefits?
- What is a category of product or service?
- What are the competitive products or services? Main differentiations.

In the end, they are referred to the basic advantages and differences. Properly defined target market defines who can be a buyer of technology, where it is geographically located and what is the need and requirements in relation to the offer (Trzmielak, 2013). As reported by Klincewicz (2012), it is also important to describe the expected benefits in a transparent manner, taking into account the figures and presenting financial profits.

Value proposition is a reason why customers chose an offer over competing one. It seeks to solve customer problems and satisfy their needs. Each *value proposition* consists of specific sets of products or services which enables to meet specific customer segment. In this sense, the value proposition is a unit or a set of benefits offered by a company to its customers (Osterwalder and Pigneur, 2012).

In the era of globalization, the base of every business is knowledge in the field of intellectual property protection. Knowledge of the basic issues in practice translates into a more effective transfer of technology from science to the economy.

Agreeable to World Intellectual Property Organization: "Intellectual property refers to creations of the mind: inventions; literary and artistic works; and symbols, names and images used in commerce. Intellectual property is divided into two categories: Industrial Property includes patents for inventions, trademarks, industrial designs and geographical indications. Copyright covers literary works (such as novels, poems and plays), films, music, artistic works (e.g., drawings, paintings, photographs and sculptures) and architectural design" (WIPO, 2016).

The aim of protection of intellectual property products and innovative technologies is to ensure the exclusivity on achieving material benefits from the object of protection, that is, intellectual property (eg. the innovative technology, innovative software etc.). On the other hand, it has to guarantee the rights of creators to identify him as the author. Consequently, there is a need for training in the protection of intellectual property, taking into account legal regulations and building competitive advantage.

Teaching courses on financing innovation becomes particularly important due to the increased number of new capital sources like high risk capital. It is also vital to learn about valuation, and to explore the relationship between earnings, growth and market capitalization.

Unavailability of financing in Poland is one of the main barrier for generating innovation. There are traditional ways of financing as leasing or bank loan, however, new financial EU perspective and high risk capital create new opportunities. Also there are new mechanisms of public-private participation capital funds, such as the BRIDGE program of the National Center for Research and Development, which aims to promote successful launch of scientific and research achievements on the market.

Therefore, proposed way of teaching should include the definition of seed capital, start-up capital, early stage capital, expansion capital. It should also present different sources of capital like crowdfunding, crowdsourcing, creative or hybrid.

Particular attention should be devoted to venture capital/private equity and angel investing as they are the basics of innovation ecosystem and a driving force behind entrepreneurship and innovation. According to the definition of the Polish Association of Capital Investors, venture capital (VC) investments made in the early stages of business development, for the start of the company or its expansion. VC funds, as a variety of private equity (PE) may be used for the development of new products and technologies, increasing working capital, acquisition of companies or for improving and strengthening the company's balance sheet (PSIK, 2014). According to Faria and Barbosa (2014) more efficient financing of VC occurs in the later stages of investment, which in turn indicates the role of the VC funds in the commercialization of innovations, not in creation.

It is worth pointing out that venture capital firms possess large sums of money to deploy, provide recruiting assistance and other services, enhance venture’s reputation and credibility immediately, while business angels create little dilution for the venture, can move fast because of minimal negotiation and due diligence requirements (Byers et al., 2015).

Presenting different ways of financing innovation will explore the critical aspects of negotiation strategy and a comprehensive overview of the investing cycle to build a successful investment strategy. All of the proposed courses should be supported by case studies of local businesses, games, projects, simulations, action embedded in the surrounding, internships in start-ups and other companies actively engaging activities that take into account interactions with entrepreneurs.

Moreover, entrepreneurs and professionals in the field can provide practical knowledge and act as coaches and mentors, thus strengthening entrepreneurship at the university and linking with a local community. The use of active learning methods requires the skills and gain the confidence to make more engaged in a learning process students, encourage innovation and creativity, and at the same time should be encouraged to learn from the successes and mistakes (Huovinen and Tihula 2008).

4. TOP 500 INNOVATORS – SCIENCE – MANAGEMENT – COMMERCIALIZATION PROGRAM

Attempts to make changes in education in the field of innovation and commercialization of research has been undertaken by the Ministry of Science and Higher Education, through the organization of the program “Top 500 Innovators – Science – Management – Commercialization”. The essence of the program was to improve the skills of polish university and tech transfer offices employees by organizing two-months trainings and internships at one of the ten of Shanghai’s highest-ranking universities (Academic Ranking of World Universities), i.e. UC Berkeley, Stanford and Cambridge.

Program participants (155 at UC Berkeley, 270 at Stanford and 75 at Cambridge) attended lectures, seminars, workshops and courses on topics ranging from the commercialization of research to innovation management, design thinking, business strategy, value proposition and financing innovation. They were given opportunities to visit top companies such as Google Inc., Facebook Inc., NASA, Intel Corp., leading venture capital funds, university incubators and successful startups. They are also exposed to the latest technology transfer practices (e.g. the Sky Desk at UC Berkley or the Office of Technology Licensing (OTL) offered by Stanford University) and led to explore the development of new business models in and out of the academia.

The aim of Top 500 Innovators was to raise skills of polish scientists and tech transfer representatives in cooperation with the economy, marketing and commercialization of research results, but also to increase the capacity of universities and technology transfer centers to cooperate with the economy using highly qualified scientific personnel. Based on Goryczka et al. (2014), investing in 500 young individuals will probably not build another Silicon Valley in Europe. But it will certainly lead to promising new initiatives in the Polish academic environment such as Top 500 Innovators Association.

5. CONCLUSIONS

In the long term cooperation of universities and business on scientific projects is enhanced by adjusting the educational offer to the needs of the market and a high level of doctoral studies. In other words, it is important to build capacity, which transfer to the business sector enabling to increase their innovation (NBP, 2016).

Studies by Organization for Economic Cooperation and Development (OECD) has also shown that in order to develop entrepreneurship at polish universities and strengthen the practical side of teaching, it is necessary to involve entrepreneurs in commercialization of R & D results, establishing new businesses such spin-off and spin-out, as well as to introduce in curriculum subjects of entrepreneurship. Therefore, universities need to develop an integrated model supporting entrepreneurship and business, combining incentives for business development and establishment (OECD, 2013).

In respond to these data, the aim of this paper was to present new ways of teaching about innovation and knowledge commercialization at polish universities introducing new related courses. Also, it was described how T-shaped professionals should be introduced and how to educate students ready to solve problems, having communication and interpersonal skills as well as being effective in collaboration within teams. In this way it becomes possible to educate future innovators necessary in the process of building knowledge-based economy.

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