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ENTREPRENEURSHIP MANAGEMENT
FUNCTIONING AND DEVELOPMENT OF AN ORGANIZATION

PERSPECTIVE
Experiences Entrepreneurial Spirit Challenge in School Education

ENTREPRENEURSHIP MANAGEMENT

FUNCTIONING AND DEVELOPMENT OF AN ORGANIZATION

CRACOW UNIVERSITY OF ECONOMICS
DEPARTMENT OF ORGANIZATIONAL BEHAVIOUR

ENTREPRENEURSHIP MANAGEMENT
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Scientific editors:

Tomasz Kusio, Marek Makowiec

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CONTENTS

PART IV
ORGANIZATION DEVELOPMENT

FOREWORD
FROM SCIENTIFIC EDITORS

Tomasz Kusio
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The book is a summary of the European project: *"PERSPECTIVES – Experiences Entrepreneurial Spirit Challenge in School Education"*, funded with support from the European Commission, EC Project Grant 540455-LLP-1-2013-1-IT-COMENIUS-CMP. The main objective of the project was to create European models of teachers' education in primary and secondary schools in order to promote the development of their skills. The premise of the project was the development of a methodology of entrepreneurship education and this knowledge practical implementation. The project was implemented by the international consortium, headed by an Italian organization TUCEP and CUE was one of the partners. The following organizations has formed the project consortium: TUCEP – Tiber Umbria Comett Education Programme (Italy) – Coordinator, CUE – University of Economics in Krakow (Poland), UPRC – University of Piraeus Research Center (Greece), RCE – Regional Centre of Expertise on Learning for Sustainable Development RCE Rhine-Meuse (Netherland), PRAGMA – Pragma Engineering srl (Italy), STVG – Styrian Association for Education and Economics (Austria), AEVA – Associação para a Educação e Valorização dos Recursos Humanos for Distrito de Aveiro, Escola Profissional de Aveiro (Portugal), JAH – Junior Achievement Magyarország Oktatási Informatikai Stratégia, Vállalkozásszervezési Alapítvány (Hungary), TAALUMA – Holistic education for social change (Belgium).

The publication contains studies useful for people interested in entrepreneurial management, in particular in the field of education sector. It should be emphasized that the functioning and development of modern organizations are, in the current new economy, directly related to entrepreneurship and innovation.

Development and functioning of organizations being so far perceived as those with completely different approaches to generate profits (for-profits vs not-for-profit) start to resemble, in particular, the not-for-profit organizations begin to increasingly use experiences of the traditional operating companies. Institutions of education sector tend to pay more attention to economic nature issues. Also, management principles referring to not-for-profit organizations use methods, techniques and management tools that previously were reserved exclusively for businesses. Entrepreneurship and resulting from it innovation, being indicators of knowledge based economy are at the same time indicators of modern organizations, those financial profit-oriented as well as those social profit-oriented.

Entrepreneurship, regarded in the personal categories, refers to the activity of the employee of an organization, both a company representative, as well as a public sector entity representative.

Good and active cooperation of researchers and academics with entrepreneurs is undeniably useful and necessary for the formation of systematic innovation and improvement of the competitive position of regions and economy of the whole countries. In a situation where it is possible to take close cooperation, there appears the improvement of information exchange between partners. Each party understands better each other problems that arise at the stage of cooperation, there is much more inspiring ideas, which could lead to implementation of projects directly related to the transfer of knowledge and technology at the enterprise level. Then, organizations can systematically build their competitive positions, taking into account changes in the preferences of customers, and of course they may implement innovations that arise both in their structures, as well as in research and development centers. It should be said that the scientific and business sectors should be in a permanent process of exchange of up-to-date information so that it would be possible to adjust the research results in a best way to the needs of markets. The important role in these processes refers to intermediaries such as transfer of knowledge and technology centers which facilitate the commercialization of research. The technology transfer centers, business incubators and science parks function at universities and their task is to support both researchers and entrepreneurs at every stage of research and implementation of R&D projects. Long-term business development policy should be fitted into the national development strategy, which the State should indicate, respectively defining the actions and systematically supporting the academics, businesses and institutions – mediators in the process of knowledge and technology transfer and commercialization of research.

The emergence and development of innovation consists of very important two human activities: work-linked directly with creativity, and therefore the ability to find an idea for better tackling concrete problems and entrepreneurship, through which ideas are materialized, thereby obtaining a place in economic, social and political reality. Innovation is very important, indeed essential, for the ability to meet the rapidly changing and increasing competition in the global world. It is desirable to strengthen all kinds of activities, aimed at their generation.

Human capital personified in educated, experienced, motivated and highly skilled workers should be the essence of innovation processes in enterprises. Proper management of human resources is of paramount importance for the growth of innovation of a company by increasing its ability to generate and then absorb innovation, and thus the use of emerging competitive advantage.

All of the above issues are discussed in the book sections gathered in four parts and divided thematically into: academic entrepreneurship, research commercialization, innovation management, organization development.

The book is addressed to people interested in the commercialization of research, broadly understood entrepreneurship, including academic and innovative activities in organizations. It is a compendium of knowledge of these areas and may be useful for students of all faculties, researchers and managers at all levels, working in various institutions.

INTRODUCTIONS

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MANAGING MODERN ORGANIZATIONS

Scientific research conducted in a number of academic centers as well as observations and practical business experience indicate that globalization processes and the impact of the new economy towards the surrounding reality evoke the need for a change of thinking and change of management strategies of different types of organizations. Thus, in the times of change, in the era of globalization and the new economy, the managers of various organizations, especially business organizations, are expected to primarily have the ability to adapt tasks and functions and methods of work organization and management to radically changing conditions of business as a result of still new challenges of a dynamic market.

In the new global economic reality the need of different organizations development, the reconstruction and modernization of the system of their structures, breaking stereotypes, exploration and development of methods, mechanisms and instruments of the executive management, and the implementation of innovative solutions are indisputable imperative of the market economy[1]. Modern organizations, in the face of crises and challenges of globalization and the requirements of the new economy, have therefore entered into a new stage of their operation – the stage of continuous fundamental changes, creating conditions to reference their success.

Global and the new economy – the dynamic change of economic conditions and the behavior of modern organizations

One of the most spectacular characteristics of contemporary times is the progressing globalization of almost all areas of human activities – economics, law, education, politics, sports and tourism as well as consumption patterns. It makes economies increasingly interdependent, leading to new economic relations between continents, countries and region, regional groups of countries,

[1] Cited arguments stem from numerous research and projects implemented in business practice by employees of the Department of Economics and Organization of Enterprises of the Cracow University of Economics. They are further verified within the framework of the Department's statutory grant „The Dynamics and Diversity of Changes in Basic Economic Relations Affecting the Development of Production Activities in Poland after 1990". This work is part of this undertaking.

institutions, organizations and companies. These relations result from the increasing freedom and speed of concluding and implementing international transactions, the trans-national movement of goods and services (especially in finance), new technologies, resources, production factors and information, becoming a leading indicator of dynamic change and development of modern economic organizations. Currently, therefore, it becomes increasingly important to consider management processes not through the prism of political boundaries, but through the prism of regional boundaries, designated by the range, size and intensity of links areas of the capital and transnational corporations, as well as direct and indirect relationships between different actors and economic institutions.

Globalization does not only affect the behavior of large transnational corporations, but also significantly affects the functioning and development, as well as direct and indirect relationships (relations) between different organizations. It forces the need to seek new tools to build adequate strategies to the requirements of the global market, creating flexible organizational structures and systems of work, and implement the principles of corporate social responsibility. Global thinking and activeness would not be possible without radical changes in the sphere of communications and flow of information – including the development of information technology and the emergence of the Internet. Thus, in the literature, the particular attention is paid to the development of ICT infrastructure as a factor of globalization. The development of information techniques and technologies made it possible not only to accelerate the flow of goods and capital but also to increase the volume and quality of information and its faster and wider access[2]. The information revolution omnipresent today, associated with the growing importance for building a competitive knowledge and intellectual property constituted the basic cause of the emergence of the term „new economy", which naturally becomes the next historical stage in the development of the economies, the industrial revolution and the scientific and technical revolution. Entering into the era of the new economy means, at the same time, the beginning of creating the new order based on knowledge, creativity, intellectual capital, progress in the field of telecommunications and computerization and new organizational structures and activities, resulting from other-than-previously perceptions of economic processes.

The need to change the profile of vocational education and training to face the challenges of globalization and the new economy

Increasingly, the environment of the organization goes beyond local or regional. Moreover, in the era of globalization shaping the inter-organizational

[2] See more: *Zarządzanie zasobami informacyjnymi w warunkach nowej gospodarki*, (eds.) R. Borowiecki, J. Czekaj, Difin, Warszawa 2010, p. 23 and next.

relationships has supra-local, cross-regional, and even more than national nature. Moreover, in some cases, across-national cooperation is a prerequisite for the existence of cooperation in order to carry out certain tasks (transfer of knowledge and technology). The greater the intensity of the need for inter-organizational relationships on the local level, the greater the importance of knowledge, skills and competences of people creating the organization. The activity of managers and animators of inter-organizational cooperation determines their entrepreneurial inclinations and attitudes.

Well-educated employees, representing a high level of skills and competencies are an important asset of the organization. They are defined in the literature as knowledge workers[3]. This definition describes knowledge workers as those who produce, disseminate and use knowledge in achieving the objectives of the organization in which they are employed. The term therefore refers to the effects of the work of these people.

Managers of organizations such as NGO's, universities, high schools and even elementary schools, in the process of managing organizations, should, in the current era, pay attention in the functioning of their organization, apart from the realization of basic social mission, also to the cooperation with the environment, of which the part these organizations are.

Entrepreneurship education is a necessary challenge in the current era of knowledge-based economy or new economy. The more intense this education is the greater is the effectiveness of entrepreneurship education. Thus, in the conception of education of entrepreneurial attitudes one should not only take into account the necessary classes on entrepreneurship in higher education, but also the use of teaching methods with entrepreneurial dimension (simulation games, interactive exercises, case studies, etc.), but also look at the issue of entrepreneurship education in the educational dimension. Shifting the burden of entrepreneurial attitudes education to the level of education prior to university, allows covering a wider group of people (there are pupils included who do not continue their education at the university level).

Summary

Modern economy poses to organizations and entrepreneurs still new challenges. They are associated with an ever increasing impact of globalization on the possibility of functioning and development of modern economies. Hence the survival and development of economic organizations of different sectors require not only understanding of global business and radically changed conditions of its maintenance, as well as new economic challenges, but above all to have the skills to adapt swiftly to changing economic realities by making

[3] S. Wiśniewska, K. Wiśniewski, *Knowledge Management in the Innovation Process*, (in:) *Knowledge-Economy-Society. Transfer of Knowledge in the Contemporary Economy,* (eds.) P. Lula, B. Mikuła, A. Jaki, Cracow University of Economics, Faculty of Management, Foundation of Cracow University of Economics, Cracow 2012, p. 32.

innovative projects adapting the operations of enterprises to the requirements of the market economy and the status, structure, complexity and dynamics of the environment.

This means that in the new global economy and a crisis conditions, economic organizations have been forced not only to constantly seek and create creative projects, adaptive and anticipatory towards an increasingly turbulent environment, but also to such the reconstruction of systemic and structural changes in their tangible and intangible assets which will allow them to acquire new features, procedures and actions necessary for transformation and expansiveness as well as breaking stereotypes, and implement modern management methods and innovative solutions.

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ENTREPRENEURIAL EDUCATION AND THE ENTREPRENEURING SOCIETY

Even though a few decades must pass before we have the necessary perspective to analyse the current situation of our society, there are many signs that point to that we find ourselves at an historical crossroads that we must not squander. The social values that sustain us are put at stake by a crisis which is multidimensional at the institutional, and very complex in the economic field. This is aggravated by the situation of the labour market, in which the paradigm of "a stable employment for life", as counterpart to the principle of "be loyal to your company and your company will be loyal to you" has not only ceased to be in force, in the same way as the big business model has given way to the role of SMEs and self-employment. As in other epochs in History, many things won't be the same, and we are facing a change of productive, economic and social paradigm that we can barely glimpse. The entrepreneurial capacity of the individual takes centre stage to meet this historic challenge. This attitude also extends to a society increasingly more critical with the patterns of living, Government, distribution of wealth and economic development. And at the heart of this dynamic of change is the role of training in competencies related to entrepreneurship, the economic logic and business management principles can play as a driving force towards a new model of society more prosperous, mature and cohesive.

Enterprising citizens and Entrepreneurial Society

There are three areas in which a major change is being emerging during the last decades, and, in particular, in recent years. The first is the globalization of markets and of all expressions of human relations, from music and culture, to the mobility of capital and persons in the four corners of the planet. This is due primarily in the liberalization of markets and the widespread access to information and instant communication that provides Internet, together with the greatest of ease to travel and meet other social models, and other economic environments.

Secondly, and in a parallel process to the previous phenomenon, improving communications and access to low-cost travel have blurred the localist perspective and have opened up a whole universe of stimuli and opportunities,

bringing openness of mind, versatility, flexibility and tolerance, encouraging entire societies and minority social groups to rethink their local realities in search of more promising schemes. In a prosperous and advanced society citizens have to necessarily have a global mindset, which means knowing several languages, have traveled or lived in different countries, have advanced training, and enjoy a wide social network all over the world. And education is a key spring to achieve this.

The differential factor of advanced societies lies beyond capital and technology: knowledge, as key to innovation and creativity is. But it's a knowledge that goes beyond the technical aspect, as it is everything related to emotional intelligence and other intangible skills related to creativity, social relationships, communication, etc. This points to a change of paradigm, because, while in the industrial era the predominant value on the labour factor was the submission for the sake of standardization and the routine, in the knowledge era dominated by creativity and innovation based on teamwork, organizational structures and working conditions diffuse with the aim of experimenting and doing things in a different way playing with intuition or fortune as it had not been done before. A knowledge which also spreads through cyberspace, or when it is necessary to work hand-by-hand, sharing ideas and implementing them, focuses on specialized "clusters", where the raw material is the network of contacts and the concentration of specialized infrastructures, human and technical resources, as well as a high quality of life. When it comes to working with people and knowledge, what matters is to be in the right place at the right time; take the initiative to act in a receptive and fertile environment for innovation. As economic activity based on the ideas, knowledge and personal relationships is able to create jobs, growth and social cohesion. And the sooner leaders will realize this and move in the right direction, the greater the prosperity of a territory.

And the third structural change in our social model is citizens' awareness of their identity as a collective, or as a sum of differentiated minorities, conscious of their helplessness before the public and economic powers, and their willingness to act. This emerging reality is based on the core values of the entrepreneur: initiative, autonomy and responsibility.

In recent decades we are witnessing an unstoppable process of awareness in advanced societies related to the shortcomings of his Government and coexistence models. Both the movement of "the indignant" and the "Arab spring" have in common the citizens' dissatisfaction and discontent for the problems of lack of social cohesion, the helplessness before the powers of the State, the inequity of Justice, the rights of minorities, and a long etcetera. The goal, ultimately, is to recover citizens' direct democracy as an intermediate step for the redefinition of a new model of Government and coexistence. At the bottom of this dynamic underlies a valuable entrepreneurial initiative whose purpose is not economic or business achievements, but to transform the models of coexistence for the sake of a better society. Multiple instruments of

communication and citizen participation are used to achieve this. Technology management and a minimum cultural and educational foundation provide identity and cohesion to this type of initiatives.

It can be deduced that entrepreneuring people and groups will be the best prepared to effectively face the challenges posed by the new socio-economic environment, looking for viable personal solutions, and developing business projects that mobilize people and resources, thus generating employment, wealth and development of the territory.

And this entrepreneurial process is driven by globalization, ease of transportation, communications, and access to education and shared spaces of interaction and knowledge fostered by former.

From the Welfare Society to the Entrepreneurial Society

On the other hand, this citizen's awareness is driven by the gradual, but already obvious and unstoppable, crisis of the Welfare State that we are witnessing for several decades now. Social complexity characterized by multiculturalism and immigration, the presence of minority groups with a significant power of call and the exercise of their rights, the ageing of the population, the rising unemployment rates that are difficult to solve due to the dynamics of globalization aforementioned, the pressure of public services on budgets together with the declining in tax revenues and the excessive bureaucratization and size of public administration, and, finally, the incapability that Governments have to anticipate these new demands of Society. All of this is leading to the collapse of the Welfare State.

This profound crisis of productive and social models shows no sign of immediate solution, and, when the time comes, the recovery will be more slow than is desirable, with the consequent impact on social cohesion, that it will only press further on the meager resources of the State. This scenario is developing a conscience citizenship that goes far beyond of the scope of the Third Sector. We refer to the mobilization of the Civil Society, on the one hand, calling for structural changes in the governance model, and, on the other hand, taking intervention initiatives to supplement the shortcomings of public services, or collaborating with them through cooperation or outsourcing models. These citizen organizations are already assuming functions of the welfare State, partly supplementing the role of the State.

In short, Civil Society is also impregnated by the values of entrepreneurship in so far as it moves to achieve certain objectives, in the social field, through the adoption of effective organizational forms, communicating its intentions and actions, and mobilizing resources that has at its disposal to achieve this.

As a result, we can see an evolution of the Welfare Society, in which the State was guarantor of services and social and economic stability based on prosperity and the collection of taxes to an occupied population and with a stable demographic equilibrium, towards a situation in which the lack of

public resources, the complexity of the social fabric and the economic crisis are pushing individuals and social groups to find viable solutions on their own, undertaking both economically and socially in an intense process of social innovation that will be analysed with a better perspective within a few years. We are therefore in the process of transition from a Welfare Society of toward an Entrepreneurial Society in which individuals, groups and institutions have to find their own permanence and prosperity by applying the same principles and values of the entrepreneur. This means that entrepreneurship becomes a backbone, a transversal element of the new model of society, becoming a facilitator of change, and, at the same time, improving the employability of citizens.

Because although it is true that a country, a territory, needs entrepreneurs and businesspeople to develop its productive fabric, it seems even more pressing the need for citizens to have values of commitment, effort, tolerance to failure, self-control, autonomy, initiative and responsibility enabling them to address the personal and collective challenges in a proactive manner, because nobody better than they know what their needs are.

Higher Education in the Entrepreneurial Society

It seems obvious that the educational system is a key element in this scenario. The values of the entrepreneur are mainly forged within his social family and social environment and throughout its formative process, from school to the University, whoever reaches it. And the family is a derivation of the educational system as long as those who were students ended up forming a family where they predominate the values and models of social relations in which those parents were educated, more or less evolved. This reinforces even more the role of the educational system, already considered one of the key pillars of how a society will evolve in the long term.

Although this value and knowledge dissemination task corresponds to the education system as a whole and is obvious that actions in the early stages of the same are fundamental to reach the maximum number of citizens and develop the values of entrepreneurship from an early age, this essay focuses exclusively on the perspective of the University, the higher education institution. After all the University is the provider of most business executives, senior officials as well as different professional bodies which operate an advanced society.

The first significant reform of the University model was driven by Alexander von Humboldt, founder of the Friedrich-Wilhelm University, at beginning of the 19th century in Berlin. His approaches were an evolution from the model of traditional University, which was an extension of religious institutions, to more open educational model, based on freedom of thinking, learning, intellectual exchange, and membership of the Academy as a distinctive sign. In this way the universities were constituted as drivers for the development of science and the values needed to build a democratic society. Its expansion throughout Europe

and a still emerging United States of America spurred Western civilization toward the levels of prosperity and development we are still enjoying. And the knowledge gained at the University is the basis of social development and economic growth of the past centuries. However, as Society become aware of how important the University is for the economy, it began to change.

Thus, the implementation of the von Humboldt model in North America incorporated a series of distinguishing features compared to Europe which can be summarized in: the presence of a significant number of public universities where students pay tuition at market price, inducing a competition based on specialization, differentiation and excellence; the diversity of sizes and degrees, to thus adapt to a complex and continually evolving labour market; the orientation toward research with access to the industry and markets; the competition amongst multiple universities, both public and private, large and small, to position in rankings of excellence to attract the best teachers, the best students and increase external funding.

In contrast, the European University evolved into uniformity and standardization, with a similar teaching offer in all centres and faculty policy determined by ministerial guidelines sometimes strongly conditioned by political perspectives. This means that the teachers have the expectation of having to develop certain content, with a very predictable and standardized dedication, with a uniform remuneration, and in which it just there is no room for the projection of personal initiative.

As it can be expected, graduates from both models show a radically different profile from the viewpoint of the labour market: while American workers show a highly specialized profile depending on the options they have chosen throughout their studies, European professionals have a highly standardized profile, which requires an additional adaptation to match a job. In most cases, it requires a specialization. And, what is worse still, the process by which American graduates is forged consists in a series of continuous professional decisions to choose the learning path (studies and universities they will attend) that will strengthen their career choices and keeping them in contact with the labour market, while the European student follows, in the majority of cases, a route traced by others, at the end of which there is an unknown labour market. In the first case we have an entrepreneurial education that trains entrepreneuring citizens, while in the second we have a mechanical educational system that generates standardized graduates for a labour market which no longer claims homogeneous profiles.

In times of globalisation the prosperity of a country depends on its ability to generate scientific knowledge and put it to value in increasingly dynamic and competitive markets. However, despite the volume of resources assigned to the University, its impact on prosperity will only occur if knowledge is transformed into innovation and useful products and services. This means it is keen to act decisively in two directions: first boosting and liberalizing, innovation in the University of all types of degrees, postgraduate courses, seminars, continuing

education, interdisciplinary studies, and other imaginative ways of providing education, training and acquisition of new values and capabilities by the students. St the same time it is necessary to foster creativity and entrepreneurship amongst the Faculty, whose impact will be more than the mere satisfaction or personal return, since it involves the development of new values and professional attitudes and a boost to the competitiveness of the University in which they are. This will not only increase and diversify their sources of funding, but it will also improve its academic prestige and that of his University.

The second direction of change responds to the function of transfer of knowledge to Society and industry, what is call the University's "third mission". And this is more than the generation of patents that can be sold or licensed, as this would be require an effective commercial capacity that is necessary to develop. The key is to get professors and researchers become entrepreneurs capable of transforming its knowledge into viable business projects that provide the best possible return on the resources deployed to charter them, and, at the same time improving both the professor and the University's prestige. This is not an easy task per se, because to do so professors have to leave their ivory tower to address the perspective of the practical application of their knowledge and convert it into workable solutions for the market. But we must recognize the existence of barriers, still formidable, like the lack of business experience and sensitivity towards the detection of business opportunities, attitude to risk, a professional language to address the business world, a promotion and reward system which does not reward entrepreneurship, and a legal framework still confusing and overly regulatory. Although valuable steps have been taken in several European countries to make this transformation, the road has barely begun, and the current situation crisis does not predict a significant change on the horizon.

It should also be added the limited capacity of professors and researchers to access investors, since their sole business project and scientific knowledge, not business knowledge, are very unlikely to attract the necessary funds to go through the "Valley of death" of the entrepreneur.

This means that an entrepreneurial faculty will encourage entrepreneurship amongst students, thus starting a virtuous circle with promising outcomes both for the people and the territory.

The University as generator of entrepreneurial skills

Thus, the University must also evolve from a position of knowledge repository to a more proactive role of in the move towards the Entrepreneurial Society. It must become an Entrepreneurial University, following the evolution of the aforementioned Humboldt model, which is more responsive to changing times.

The entrepreneurial University is concerned about the education and employability of its graduates, developing a training function that responds to market oriented training skills, and in the orientation of its teaching and research staff with a determined orientation to the Society and the Industry.

Because an Entrepreneurial University is an active agent in social and territory development, facilitates the exchange of knowledge with the rest of the economic and social agents, puts in value its resources through very specialized instruments of transfer to society and markets (contracts for services, applied research and continuing education, spin-off companies, etc.), designs curricula that facilitate the employability and employment of its graduates (which will be the business leaders, civil servants and social leaders of the future), and develops management and organization policies aimed to increase and diversify its funding sources to gain financial autonomy. An Entrepreneurial University innovates in its management, i and enriches their graduates providing them with attitudes and entrepreneurial skills. All this will have an impact on the development and the social cohesion of its territory. And an entrepreneurial territory creates wealth, prosperity and social cohesion.

An entrepreneurial University can not be understood without a strong symbiosis with its immediate environment, with its social, productive and knowledge ecosystems. It is this ecosystem the one who provides, on the one hand, the resources the University has to put in value, but also it is that very same environment the one that provides the opportunities and challenges that justify its role as a change agent in its Entrepreneurial Society.

Realistically, in Europe few are universities aware of this challenge, and even less those that are moving in this direction. The necessary adjustments to the new budget scenario, the adaptation to the European Higher Education Area altogether with an innovative effort on methods and teaching tools, all aimed to differentiate each university from the rest and be competitive in technology and knowledge transfer.

This change process poses a challenge for an institution like the University which is responsible for educating our future leaders ands managers, but a failure in achieving this task would also be a catastrophe to blame the rulers who did not know how to put the University on that track.

PART I

ACADEMIC ENTREPRENEURSHIP

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ACADEMIC ENTREPRENEURSHIP – A NEW CHALLENGE FOR BUILDING A THIRD GENERATION UNIVERSITY MODEL

Keywords:

third generation university, commercialization, spin-off company, management of intellectual property, innovation, academic entrepreneurship, entrepreneurial college

Summary

The text raises important and increasingly popular in recent years in Poland subject – entrepreneurship of research units, mainly universities, which are to be responsible not only for the dissemination of knowledge and scientific research, but also for putting their results to the market (commercialization).

The author discusses issues in the functioning of third generation universities, whose mission is to strengthen innovation of enterprises by providing them technological portfolio and unique knowledge (know-how). The text presents various forms of cooperation between science – business from the simplest like research commissioned, sale of intellectual property rights or licenses, to the creation of the spin-off companies.

The publication shows Polish ecosystem of innovation that is designed to enhance knowledge and technology transfer to business. On the other hand, it exposes the problems that for years they hamper the full potential of R&D located in the academic environment.

Introduction

The university is one of the most important institutions created and propagated by Europe in the world. Its heritage is to this day the basis of science and technology, but also, as the role of education in social and economic life increases, it is the most important public institution that drives innovation. The transformation of the currently dominating Humboldt model is a challenge

for the modern education system. The idea of a third generation university has appeared as a entrepreneurial university, defining a new type of relations between the university and the outside environment, especially applicable for polytechnics and medical schools[1]. The third generation university is an innovative combination of intellectual capital with market needs that exist in a knowledge society.

The starting point for this idea was the question: how should colleges work in a world that changes and is hard to predict to answer the needs of modern societies, governments, non-governmental organizations, and especially entrepreneurs. A characteristic trait of this model is the third goal of universities, after education and research – the practical use of know-how by the academic community. The university subordinated to knowledge in a conscious way it manages and transfers it to the environment. Such university treats its members (often called stakeholders) as co-creators of the educational, research and consulting offer, headed into commercialization[2].

Technology transfer – a challenge for the cooperation of the scientific and business environments

Boosting economic growth of a country should be based on creating conditions stimulating the growth of knowledge and mechanisms to move its results into industry. One of the key elements that increases the competitiveness of an economy is its innovativeness, which is defined as constantly introducing new and improved products (goods and services) into the market, innovative processes and system changes (organizational, marketing). Cooperation between educational institutions and entrepreneurs plays a great role in this ecosystem. The result should be new technologies and innovative products. The process is generally called technology transfer – moving the results of scientific research, developmental work or engineering studies from the creator(s) to the entrepreneur, increasing the use of these works in economic practice. The creators can be individual scientists (inventors), entire research teams, as well as high schools and research centers, including Polish Academy of Science institutes[3].

The process of technology transfer is usually composed of a few phases that occur one after another[4]:

- research work (including applied research),
- determining the use and economic traits of new products or innovative technologies,

[1] T. Kowalewski, W. Popławski, *Między tradycją a nowoczesnością. Wyłanianie się kapitału intelektualnego w uniwersytecie III generacji*, Instytut Wiedzy i Innowacji, Warszawa 2009, p. 7.

[2] *Uniwersytet Trzeciej Generacji. Stan i perspektywy rozwoju,* (ed.) D. Burawski, Europejskie Centrum Wspierania Przedsiębiorczości Sp. z o.o, Poznań 2013, p. 13.

[3] A. Tomtas-Anders, *Czy Ty know-how? – internetowy poradnik ochrony własności intelektualnej*, Fundacja ProRegio, Poznań 2009, http://www.proregio.org.pl/patenty/wlasnosc-w-transferze-technologii, [25.05.2015].

[4] *Finansowanie projektów innowacyjnych. Poradnik dla przedsiębiorców i przedstawicieli środowiska akademickiego*, (ed.) J. Skrzypek, Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków 2007, p. 19.

- verifying the possibility of securing intellectual property (action determined by the legal and factual status of the invention),
- market analysis (market research),
- looking for stakeholders of the project,
- selecting the most appropriate method of implementing the results of scientific research (commercialization path),
- finding a business partner to commercialize the project,
- determining the financial and legal rules for the company and scientific entity (contractual terms),
- starting production,
- reaping financial benefits of implementing the project.

The first key element of the market implementation process of the invention, which is to build guaranteed revenue for all participants of the transaction, is the protection of intellectual property especially on the basis of copyright laws, industrial property laws, but also know-how, understood as the effectively protected secret of the company. It is, on one hand, to secure the interests of people entitled to intangible goods that are a result of creative and cognitive activity, and on the other hand to be the basis of effective technology transfer from the creators (mainly scientists) to the consumers (mainly companies planning to implement the solution on the market).

The second fundamental stage of the process that determines its effectiveness is searching and analyzing stakeholders for the project, including business partners and financial investors. Scientific bodies must actively promote cooperation between entrepreneurs, especially:

- cooperation in the field of contracted research (including introductory research),
- commercializing intellectual property rights on the basis of patent sales, licensing and know-how transfer. A necessary condition is providing legal protection for it, intensifying marketing actions and an efficient (legal and financial) finalization of the contract,
- creating appropriate conditions that allow creation by scientists/ research centers , as well as students of spin-off companies, of which shares would be owned by a scientific body, creators, and also commercial operators, including investment funds and trade businesses.

The above elements are crucial for qualifying a scientific body as a third generation university, which puts emphasis on increasing entrepreneurship and self-employment of those representing the academic environment.

A new quality of thinking and acting within educational institutions is becoming a new practice of an open environment for the cooperation with business and creating new business skills among students, doctoral students and academic workers. The previous higher education model, based on education (first generation) and scientific research (second generation), will

be expanded with preparing for entrepreneurship, understood as forming active behaviors that allow independent acting in the market (the so called "third mission"). Activity in this area are also often determined with the term "second academic revolution". The world of science needs a closer relationship with the creative society and business practice. We are beginning to talk about entrepreneurial universities, third generation, creative, proactive and innovative[5]. At the same time the signaled process of academic transformation is very difficult because of traditions, the rules of management and mechanisms of internal and external relations.

An important aspect of the idea of the third generation university is also creating entrepreneurial (proactive, innovative and risk-taking) graduates, some of which will become "creative destructors" in specific areas of the economy[6]. It is important to encourage not only building dominance of one's own company based on knowledge gained from studying, but also to engage in ambitious projects which naturally assume a high return rate and added value, and also building intellectual potential to scaled progress.

For a few decades western universities and prestigious research institutes have attempted many activities to stimulate the creation of micro, small and medium-sized businesses in their orbits, which are founded by students and academic workers. They become a kind of showcase of the university as a spin-off and spin-out companies. In Polish conditions, this process can be the answer to the lack of interest from external companies, especially from the SME sector, conducting research activities and implementing its results into business practice, due to the associated high risk and high capital requirements.

Because of these factors, in recent years Polish universities have started expanding specialized bodies that provide innovation, technology transfer and entrepreneurship supporting programs: technology transfer centers, incubators and technology parks, academic incubators of entrepreneurship or seed capitals. Their activity is based on promoting and incubating innovative entrepreneurship, technology transfer, providing pro-innovative services and stimulating academic entrepreneurship and the science – business cooperation[7]. The above mentioned institutions are also called institutions of the business environment, which are to actively shape the growth of entrepreneurship in a wide spectrum: content-wise, infrastructure-wise and capital-wise[8]. These are usually non-profit institutions, which have a technical and material basis, human resources and expertise necessary to provide services for companies[9].

[5] K.B. Matusiak, *Budowa powiązań nauki z biznesem w gospodarce opartej na wiedzy. Rola i miejsce uniwersytetu w procesach innowacyjnych*, SGH, Warszawa 2010, p. 8.

[6] K.B. Matusiak, *Dictionary of Innovation – Lexicon*, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2011, www.pi.gov.pl, [25.05.2015].

[7] A. Bąkowski, M. Mażewska, *Ośrodki innowacji w Polsce (z uwzględnieniem inkubatorów przedsiębiorczości, Raport z badania* 2014, PARP, Warszawa 2014, p. 8.

[8] *Przedsiębiorczość akademicka – stan, bariery i przesłanki rozwoju*, (ed.) P. Plawgo, Państwowa Wyższa Szkoła Informatyki i Przedsiębiorczości w Łomży, Łomża 2011, p. 22.

[9] W. Burdecka, *Instytucje otoczenia biznesu*, PARP, Warszawa 2004, p. 5.

Academic entrepreneurship and spin-off companies

Academic entrepreneurship is a term commonly used in many types of publications, reports and analysis, however, it is not always interpreted in the same way. In a broad spectrum academic entrepreneurship is a commitment of any kind of scientific institutions, teaching staff and administration, as well as doctoral students and students in any form of economic activity. In this meaning entrepreneurship doesn't have to have a formal connection with the university or be based on its intellectual property. In a more narrow spectrum academic entrepreneurship is limited to engaging only scientists into creating new companies based on knowledge/ IPR (spin-offs). These types of companies are founded to explore intellectual property in practice, which was created by academic workers and students while conducting research and developmental work[10]. Spin-off companies can be thus defined as new, independent companies that have their beginnings in the center of activity of a different body (e.g. a university), which commercialize and implement the knowledge from their parent organization. They are usually financially linked with the university, which oversees the company's activity[11].

Academic companies, similarly to individual innovations, differ greatly between each other, however the fact that they are linked to development on a new system, process or product solution makes it possible to name a few stages when they are introduced into the market. They differ in the main goals of a company, the main difficulties of the company and the capital needs[12]. Therefore, we can specify the following stages of development of economic activity in the form of academic companies and the needs for recapitalization:

- research and development (seed) – expenses when the project doesn't generate any income,
- introduction (start-up) – the product is introduced into the market and generates little income, which are dwarfed by the costs of the investment,
- growth – a period of dynamic increase in the income generated by sales of the product that was accepted in the market. This is where the project becomes profitable and generates incomes that finance the operation costs of the project,
- maturity – a period when the product generates income greater than the total costs of production[13].

[10] A. Bąkowski, *Innowacyjna przedsiębiorczość akademicka – światowe doświadczenia*, PARP, Warszawa 2005, p. 11.

[11] *Spin-off jako sposób eksploatacji wyników badań*, article is part of the "IPR Helpdesk" coordinated by the University of Alicante with the support of Intellectual Property Law Institute of the Jagiellonian University, 2006.

[12] *ABC przedsiębiorczości akademickiej*, (ed.) A. Tomtas, Fundacja ProRegio, Poznań 2009, p. 10.

[13] P. Głodek, M. Gołębiowski, *Finansowanie innowacji w małych i średnich firmach*, VOLUME II, STIM - SOOIPP, Warszawa 2006, p. 7.

Spin-off companies in Poland

Working in processes of exchange of intellectual property, institutions that create spin-off companies do not have easy options for development. The nature of the market, difficulty in assessing the value of products, transparency of IP rights and the uneven knowledge of the buyer and seller can have a negative impact on motivating to create academic companies. Apart from that, there are many legal troubles in Poland that make it more difficult to create spin-off companies (e.g. the VAT act that creates the necessity to tax contributions in the form of IP rights moved to spin-off companies by public bodies). Only in recent years have universities and research centers received new system tools to create and take over shares in start ups.

The amendment of the higher education act from 2010 introduced a new entity (based on article 86a[14]) – special purpose companies, created mainly to support academic entrepreneurship through moderating the process of creating companies associated with higher schools, as well as actively participating in the activity of spin-off companies (coaching in business). Based on a contract signed with the parent body (university), special purpose companies can also maintain trust over intellectual goods that are developed in them. This is not charity work, the special purpose company should be paid according to the above mentioned contract.

Creating special purpose companies in universities, according to the latest amendment of the higher education act from 2014[15] that introduces the possibility of moving the rights to intellectual property to its creator within a public university, has a chance of creating significant changes in the Polish system of innovation (managing intellectual property), increasing its effectiveness in the process of implementing the results of scientific research or other projects that have commercial potential. The main aim of the Polish ministry of education and higher education was on one hand increasing the motivation to commercialize scientific work by its creators, who receive the rights to their work, conducted through fulfilling their responsibilities, and on the other hand to increase the flexibility of implementation processes thanks to omitting often complicated university procedures.

The main tasks of a university and a special purpose company in the process of commercializing through a spin-off company is preparing an organizational concept of the new body, through (among others):

- determining the stakeholders of the company along with their shares,
- determining the rules of providing the intellectual goods that belong to the parent body to the company (licencing),
- determining the rules of hiring the creator in the company to ensure

[14] Dz. U. 2012.0.572, Ustawa z dnia 27 lipca 2005 r. – Prawo o szkolnictwie wyższym z późn. zm.

[15] Dz. U. 2014 poz. 1198, Ustawa z dnia 11 lipca 2014 r. o zmianie ustawy – Prawo o szkolnictwie wyższym oraz niektórych innych ustaw.

their engagement in the project and determining the rules of further hiring in the university,
- determining the rules of providing infrastructure for the company and the trade mark of the university.

Creators who become stakeholders in a spin-off company created to commercialize intellectual goods or are hired by a spin-off company are not entitled to any benefits from the commercialization besides the right to a portion of the company's revenue, based on the contract with the company or the pay received as an employee of the spin-off company.

In the process of creating spin-off companies, the university should use transparent and non-bureaucratic procedures and decision processes, associated with introducing the know-how, acquiring shares in share-holding companies and execute their own powers as set in trade codes. These solutions are used in foreign universities (USA, Canada, UK) and are made more popular in EU countries (e.g. through Gate2Growth)[16].

Besides legal matters, it is important to remember that an essential element of building an effective system of commercializing innovative scientific projects based on creating new companies are actions associated with promoting entrepreneurship among students and academic workers. An important role in this area must be fulfilled by institutions (or those hired by them) of technology transfer and entrepreneurship incubators, whose task is to organize projects (e.g. subsidized by the EU), which are made for people from the academic environment interested in starting their own business. Usually the originators look for the possibility of using support like: trainings, consulting, coaching, familiarization with business practices or capital investment. A special emphasis must be put on selecting innovative economic ideas, which will give the best results when implemented in the market using the results of scientific research. Beside information associated with technical aspects of running and starting a business, it is equally important to promote positive effects of owning a company, especially based on new solutions.

Creating spin-off companies by scientific bodies is one of the hardest ways of commercializing scientific thought. The value of developed technology, which becomes the basis for the creation of a company offering a particular product or service, however, is much greater than selling the same idea or licensing a patent or know-how. Because of this, it is in the interest of scientific entities to promote creating economic activity by its employees through creating appropriate conditions for the growth of such initiatives, while protecting the public interest in such ventures[17].

[16] *Regulacje prawne, dobre wzorce i praktyki dotyczące korzystania przez podmioty gospodarcze z wyników prac badawczych i innych osiągnięć intelektualnych instytucji akademickich i naukowych*, (ed.) J. Woźnicki, Instytut Społeczeństwa Wiedzy, Krajowa Izba Gospodarcza, Warszawa 2006, p. 9.
[17] *Poradnik naukowca*, CITTRU Uniwersytet Jagielloński, Kraków 2011, p. 12.

The model of academic entrepreneurship using the Jagiellonian University in Cracow as an example[18]

The university actively supports the trade of intellectual property, both when realizing its mission for growth and progress, as well as technology transfer. One of the methods of realizing these goals is creating new companies with the scientists hired by the university, if this path of commercialization is deemed as potentially the most profitable and at the same time a scientist declares commitment to the future business.

Spin-off companies are created by employees of Jagiellonian University and the company being the property of the university (the special purpose company), whose objective is to manage the intellectual property of the university (now the company does not yet function). Third party (a private investor like a capital fund or business angel) can also participate in creating spin-off companies. When justified, the chancellor of Jagiellonian University can agree to grant, with an appropriate salary for the company created without cooperation from the university but in cooperation with its employee, a permission to use the intellectual goods in the creation of which such an employee was involved in.

When deciding to create a spin-off company the following things are considered:

- the interest of the university,
- the interest of the employee of the university applying to create the company,
- the area of market operation of the spin-off company,
- the influence on current and future time engagement of the employees of the university,
- the use of technologies that are the property of the university or a body dependant on the university,
- the use of the resources of the university,
- legal matters.

The decision to give permission to create a spin-off company belongs to the Rector of the Jagiellonian University on request by the head of Center for Innovation and Technology Transfer (CITTRU) and the bursar of the Jagiellonian University.

According to the regulations of the Jagiellonian University an employee can:

- have shares or the right to optionally acquiring shares in the spin-off company,
- participate in its organs,
- be a consultant in the spin-off company.

[18] On the basis of the regulations titled: *Zasady tworzenia spółek spin-off w Uniwersytecie Jagiellońskim*, Wydawnictwo Uniwersytetu Jagiellońskiego, Kraków 2007.

A full-time employee of the Jagiellonian University cannot, however, be hired by the spin-off company. In this case, it is possible to grant them a 2 year leave or decrease the number of hours worked in the university for 2 years, if the Rector grants his permission after consulting the head of of their unit (e.g. the institute or department).

A key role in founding a spin-off companies by the Jagiellonian University is played by the special purpose company, which is the property of the university and designated by the Rector of the Jagiellonian University. In practice, this will be a limited liability company center of technology transfer, whose mission will be participating in the commercial activities of the university.

The works to create such a body have been underway for a few years. The basis for the relation between the university and its company would be a trust act – managing intellectual property for the university, signed between the university and the special purpose company. On that basis it will be able to be a shareholder of every spin-off company based on the contribution of the university in the founding and functioning of the company, with shares not lower than 20%. Detailed conditions will be regulated by the deal between the university and the spin-off company. Besides the university company, shares in the new body will be offered to employees of the university (scientists), considering their contributions in the process of creating intellectual goods.

Regulations also consider a possibility of signing a deal between the spin-off company and the university for making its resources available to the company (at a price). This regulation makes it possible for the employees of the company to use the infrastructure of the university (rooms and labs) at preferential prices.

The Jagiellonian University was a precursor in Poland in codifying the laws and responsibilities of the academic environment, especially scientists associated with creating spin-off companies. The prepared wide range of regulations in terms of creating spin-off companies has not been, however, utilized in practice. There is no special purpose company associated with the Jagiellonian University, and no spin-off company based on the intellectual property of the university. This is because of selecting strategically easier ways of commercializing knowledge and technology through selling or licensing intellectual property and the insufficient promoting of the positive effects of owning a company. The experience of the university's technology transfer center also shows a low tolerance for risks associated with creating a new company for its founders and the university itself. This was one of the reasons for the lack of a decision to create a special purpose company responsible for indirect commercialization (academic entrepreneurship), despite owning a subsidiary company, whose mission is managing the technology park of the university.

The actual state of the Polish innovation system – barriers for academic entrepreneurship

The weaknesses of the process of taking advantage of intellectual property by academic bodies in Poland and the insufficient scale of cooperation with external companies and creating subsidiary economic bodies are conditioned by a number of problem groups, which can be categorized as follows:

- systemic and organizational barriers,
- competence barriers,
- awareness and mentality barriers.

We can definitely classify bureaucracy in the first group, especially in higher education, where universities often do not have transparent procedures of managing intellectual property that would ensure flexibility in cooperating with business, and on the other hand clear rules of commercialization for employees of those institutions. No clear agreements, or an insufficient awareness of their existence, in relation to paths of technology transfer, sharing the intellectual property rights or rights to benefits from commercialization greatly lowers the motivation of representatives of the academic environment to work on market implementation of scientific research, especially with founding companies by universities. It is also necessary to point out the imperfect structures of competence and organization of universities in terms of teams/units responsible for moderating the process of selecting innovative ideas from the academic environment, their analysis in terms of the possibilities of protection of intellectual property and chances of implementing them in the market, marketing, finding external financing, or business coaching. Another weak point of Polish academic entities is the lack of uniformity in their business offer considering research potential, including unique infrastructure, lead contract work or a portfolio of offered services by individual scientists, university employees. A good solution would be a database containing the above mentioned recommendations, completed by interesting master's and doctoral theses, which would have implementation potential. This last aspect is also seen in the context of low flexibility of conducted higher education for business needs. A response in this matter must be the growth of targeted fields of study and those that are related to growth businesses and have been indicated in intelligent specializations of specific regions and at a national level, as well as forming new business and professional competences in the academic environment. Programs promoting the mobility of academic workers are important (e.g. internships for academic workers in businesses), modifying indicators of grading effectiveness of the performance of public academic institutions (a higher emphasis on commercialization and entrepreneurship), or greater inclusion of academic institutions in local, regional and global web structures, like clusters or technology platforms. The role of regional governments is clarified here as the leaders responsible for forming the politics of innovativeness in the region and

initiators of projects that strengthen the academic-business relationship (e.g. in utilizing available European funds as part of the EU's 2014–2020 financial perspective).

Important limitations of the innovation system, especially in the field of academic entrepreneurship, on the part of academic bodies and the business environment are competence and awareness and mentality problems. The low quality of human capital in institutions responsible for cooperating with business, high fluctuation of staff and the lack of business experience of employees of technology transfer centers cause problems with securing and maintaining clients that would be recipients of university inventions, or a potential partner for a spin-off company. The lack of competent staff responsible for evaluating and marketing innovation is also noticeable. Academic bodies in this aspect are often reliant on the help of capital funds (seed/ venture capital) or entrepreneurs who are interested in taking over an invention at the lowest possible cost. In this last aspect the situation is recently improving, thanks to the availability of public funding dedicated to implementing the proof of concept and proof of principle phases in National Center for Research and Development (NCBiR) programs like Innovation Incubator, Spin-Tech or before, the Creator of Innovativeness.

An important problem on the crossroads of science and business is finally the way of communicating between representatives of these sectors. Mutual stereotyping is not favorable for these relations. The education of scientists and students in the matter of commercializing ideas, managing research, creating spin-off companies, finding business partners, completing implementation projects or finding financing sources for innovation is necessary. This does not lessen the role of business environment institutions, whose mission is managing the intellectual property of their clients (universities, research centers, Polish Academy of Science institutes), thus also moderating the commercialization process of inventions. The actions taken to eliminate the above mentioned barriers should go in the direction of strengthening and stabilizing structures of innovation centers in higher education (mainly technology transfer centers and special purpose companies), strengthening the role of academic entrepreneurship and the commercialization of the know-how through including them in the official statute documents of the university, introducing programs of growth, professionalization and monitoring of human resources of business and science centers, building an external expert supply centers for commercialization (e.g. experienced businessmen), or finally, wider assistance for technology brokers. On the other hand, it is worth building a conscious partnership between science and business through creating an interesting offer of cooperation from the academic world, increasing the range of financing research and developmental work from public funds, starting integration programs of both environments with the participation of governments and supporting the internationalization of businesses

(especially micro and small businesses) thanks to the cooperation of universities and R&D entities[19].

Summary

The author has tried to present the challenges of academic entities, so that they may actively participate in the process of building an economy based on knowledge. Their role in this process is invaluable, because they are one of the necessary links that propel its growth. In the new conditions that universities function in, including a more demanding competitive environment, only a few of them will be able to effectively grow. Every university will have to create its own ecosystem of innovation and adapting it to the potential and environment in which it functions.

The last 10 years in the Polish system of innovation that involves knowledge and technology transfer between the science and business sectors and creating new economic bodies based on innovative solutions was a period of intense change and progress in terms of the effectiveness of the undertaken actions. However, there remains a lot to be done in the future, which is confirmed by Poland's position in the Innovation Scoreboard ranking for 2015[20]. The main aim of the development of the Polish economy must not only be chasing the European average in terms of the level of innovation, but also catching up to global leaders in innovation and making Poland a destination of native and foreign capital investments in the research and development market, high technologies and innovative start-ups.

From 2009 to 2015 higher education in Poland has gained considerable financial resources from the structural funds of the EU for realizing projects associated with the area of scientific research. Labs were built, highly specialized research equipment was bought and many research projects have been conducted, and many are still being conducted. The created resources demand commercial utilization. It seems that the novelized higher education act with the simultaneous distributing of European funds in the EU financial perspective for 2014–2020 aimed greatly at the R+D+I[21] sector is to provide better conditions for effective implementing intellectual property in the market generated in academic environments, as well as intensifying the cooperation of universities with business in the area of education, research projects and expert services. Creating special purpose companies and spin-off companies (especially the latter), which have been mentioned in this article, seems to be the proper and natural solution for leading an economically efficient operation.

[19] *Rekomendacje zmian w polskim systemie transferu technologii i komercjalizacji wiedzy*, (ed.) K.B. Matusiak, J. Guliński, Portal Innowacji, Warszawa 2010, p. 83.

[20] *http://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards/files/ius-2015_en*.pdf, [21.05.2015].

[21] *Research, Development, Innovation – compare with PARP report „Nowe kierunki rozwoju rynku B+R+I w Polsce"*, http://www.pi.gov.pl/PARP/chapter_86197.asp?soid=FE01CD7AFBCB4475BF5A798064E28164, [25.05.2015].

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ACQUISITION OF TECHNOLOGICAL COMPETENCES IN THE UNIVERSITY AS A DRIVER OF ENTREPRENEURSHIP

Keywords:

technological competences, entrepreneurship, entrepreneurial spirit, innovation, university

Summary

Technology enables to increase the competitiveness of companies and individuals. University is immersed in a world made up of companies where the application of technology is essential. Further, University is a main institution producing knowledge where the development of technology is essential to improve society so it requires developing technological competences by its students and workers. These competences enable the exploitation of technological opportunities to encourage the development of an entrepreneurial spirit and create competitive advantages in University and in any company.

However, entrepreneurial skills cannot be explained without studying the corporate entrepreneurship which should be analysed as a way to renew established organizations so that they can be innovative and increase their ability to compete in global markets.

It is in this context where the University plays a role that is essential in order to prepare workers that also need to acquire technological skills to be able to have a proactive behaviour and become entrepreneurs. Therefore this research

attempts to analyse the importance of the development of technological capabilities by university students and workers in order to get better outcomes and also to check if the entrepreneurial spirit influences these results getting them better or worse. Also, we analysed which components of entrepreneurship are the most influential for the students and workers.

Results showed that technology is characterized as an integral driver of innovation and entrepreneurship, so students and workers acquire technological skills that enables a proactive behaviour and become entrepreneurs. In this sense entrepreneurship is crucial to increase performance in organizations already established as the University. Our results also showed that the most common entrepreneurial skills and best suited are: capacity of innovation; proactivity; and tolerance/ appetite for risk and self-renewal.

Introduction

Nowadays, due to the implementation of new educational context, in which students are involved (the European space of education), we are witnessing an increasing transition from "education receptive" to "learning by doing" in which students have to develop a more deliberate autonomous work. This autonomous work is motivated by technological development that the University must face to be homogenized with this technological development in today's society[1].

With technology, companies can introduce some systems to reduce costs and evaluate the performance of your organization in order to improve their organizational systems[2]. Thus it seeks to improve the competitiveness of the company, which is generally unquantifiable and uncertain[3]. University is immersed in a world made up of companies, therefore the application of technology is essential[4]. Moreover, University is a great producer of knowledge where the development of technology by its members is crucial to improve society, so it requires developing technological skills by students and workers. These skills enable the exploitation of technological opportunities to encourage the development of an entrepreneurial spirit and create competitive

[1] G.K. Jones, A.Jr Lanctot, H.J. Teegen, *Determinants and performance impacts of external technology acquisition*, "Journal of Business Venturing", vol. 16, 2000, p. 255-283.
[2] J.W. Ross, C.M. Beath, D.L. Goodhue, *Develop long-term competitiveness through it assets*, "Sloan Management Review", vol. 38, no. 1, 1996, p. 31-42.
[3] Ibidem.
[4] M.S. Giarratana, M.S. Torrisi, *Foreign entry and survival in a knowledge-intensive market: emerging economy countries' international linkages, technology competences, and firm experience*, "Strategic Entrepreneurship Journal", vol. 4, 2010, p. 85-104, and: D. Leonard-Barton, I. Deschamps, Managerial influence in the implementation of new technology, *"Management Science"*, vol. 34, no. 10, 1988, p. 1252-1265.

advantages in the University and also in any company[5].

However, entrepreneurial skills cannot be explained without studying the corporate entrepreneurial spirit which must be analyzed as a way to renew established organizations so that they can be innovative and increase their ability to compete in global markets. Covin and Slevin[6] suggested the growing interest in the study of entrepreneurship is key to increase performance in established organizations, such as the University. In this context the University plays an essential role when preparing these workers that also need to acquire some technological skills to be able to have a proactive behavior and become entrepreneurs[7].

Therefore this research has as main objectives: Promote technology development, promote entrepreneurial culture (e.g. social networks such as university teaching tool) and explain the perception that students and workers have about the acquisition of a number of technological and entrepreneurial skills in University. To achieve these objectives the study is structured with a section of development proposals; then a methodology section and finally the conclusions section.

Theoretical proposals

Technological Competence and performance improvement

Technological skills, which have been described in terms of unique, distinctive or even inimitable resources or management skills[8], reflecting the skill or skills that allow the exploitation of technological opportunities for the development of corporate entrepreneurship and lead generation competitive[9].

In the case of the University should be distinguished from technological skills of its staff by approximation to the definition of Danneels[10] which refers to

[5] J. Woolley, *Technology emergence through entrepreneurship across multiple industries*, "Strategic Entrepreneurship Journal", vol. 4, 2010, p. 1-21, and S.A. Alvarez, J.B. Barney, Discovery and creation: alternative theories of entrepreneurial action, "Strategic Entrepreneurship Journal", vol. 1, no. 1-2, 2007, p. 11-26, and J.C. Real, A. Leal, J.L. Roldan, *Information technology as a determinant of organizational learning and technological distinctive competencies*, "Industrial Marketing Management", vol. 35, 2006, p. 505-521, and E. Autio, H.J. Sapienza, J.G. Almeida, *Effects on age at entry, knowledge intensity, and imitability on international growth*, "Academy of Management Journal", vol. 43, no.5, 2000, p. 909-924.

[6] J.G. Covin, D.P. Slevin, *A conceptual model of entrepreneurship as firm behavior*, "Entrepreneurship: Theory and Practice", vol. 16, 1991, p. 19.

[7] D. Leonard-Barton, *Core capabilities and core rigidities: a paradox in managing new product development*, "Strategic Management Journal", vol. 13, 1992, p. 111-125.

[8] E. Danneels, *Organizational antecedents of second-order competences*, "Strategic Management Journal", vol. 29, 2008, p. 519-543.

[9] S.A. Alvarez, J.B. Barney, *Discovery and creation: alternative theories of entrepreneurial action*, "Strategic Entrepreneurship Journal", vol. 1, no. 1-2, 2007, p. 11-26.

[10] E. Danneels, *Organizational antecedents of second-order competences*, "Strategic Management Journal", vol. 29, 2008, p. 519-543.

the technological ability of teachers to train students to deal with real situations of a group of individual companies. And in the case of students it refers to the technological capabilities that has the student to master the technology and technological applications to integrate new and existing knowledge, and thus recognize, evaluate and exploit business opportunities[11].

In this sense the technological skills may become institutionalized for long periods of time and be part of the system of knowledge creation in a company[12]. This enables more excellent entrepreneurial skills and abilities of each person. So entrepreneurs are able to invent their way out of the social difficulties using this technology promoted by exceptionality. Consequently technological skills make more flexible the individual's behavior in order to exploit more adequate opportunities for international growth[13]. Therefore, possession of technological capabilities has great value as an indicator of a company's reputation for producing workers, managers and ultimately high quality individuals who develop better business and get better results. Thus, when an individual acquires more specific knowledge, enhancing their technological skills, and he assimilates it, he can better identify the needs and market opportunities and he acts on them gaining a competitive advantage over others[14].

H1. The technological skills improve performance or outcome of students/workers.

Technology and Entrepreneurship Skills

The technical competence influences corporate entrepreneurial spirit. Corporate entrepreneurial spirit requires specialized knowledge that is achieved through a series of processes of organizational learning. Consequently entrepreneurial skills refer to the directed vision, in which the organization relies heavily on entrepreneurial behavior that contributes to the ongoing rejuvenation of the company and outlines the purpose of its operations by recognizing and exploiting entrepreneurial opportunities[15].

Teachers that encourages research, development and creation of new businesses in these areas not only boost productivity, but also help build the so-called knowledge economy. In this context, the shortage of skills is considered

[11] J.C. Hayton, D.J. Kelley, *A competency-based framework for promoting corporate entrepreneurship*, "Human Resource Management", vol. 45, no. 3, 2006, p. 407-427.
[12] D. Leonard-Barton, *Core capabilities and core rigidities: a paradox in managing new product development*, "Strategic Management Journal", vol. 13, 1992, p. 111-125.
[13] E. Autio, H.J. Sapienza, J.G. Almeida, *Effects on age at entry, knowledge intensity, and imitability on international growth*, "Academy of Management Journal", vol. 43, no. 5, 2000, p. 909-924.
[14] J. Woolley, *Technology emergence through entrepreneurship across multiple industries*, "Strategic Entrepreneurship Journal", vol. 4, 2010, p. 1-21.
[15] R.D. Ireland, J.G. Covin, D.F. Kuratko, *Conceptualizing corporate entrepreneurship strategy*, "Entrepreneurship Theory and Practice", vol. 33, no.1, 2009, p. 21.

essential to the creation of wealth and to maintain competitiveness[16]. Therefore, and in this context, the technological skills play an important role in promoting corporate entrepreneurial spirit.

Teachers seeking technological opportunities are especially important for modern entrepreneurs since they are taking advantage generating new scientific developments[17].

For the company, previous research have emphasized that the skills and abilities of the individual employees to promote corporate entrepreneurial spirit are essential to promote the ability of companies to fostered and sustained innovation and the creation of new businesses[18]. This is also the case of technological capabilities. In particular, it is expected that the accumulation of intellectual capital by high-tech companies, including skills as technology skills[19] was positively associated with corporate entrepreneurship level[20].

In sum, science and technology constitute a significant basis for the discovery of new opportunities which arise from the current market conditions as well as the resources and skills of companies[21]. So the learning process developed at the University is essential to achieve these technological capabilities and therefore a better entrepreneurial competition from students who can take you to train better and more productive firms[22]. In this scenario, we remark the importance of technological skills which enable the domain of technology and technological applications to promote corporate entrepreneurial spirit and integrate existing knowledge and new, and therefore, recognize, evaluate and opportunities business[23].

H2. Technological skills enhance the development of entrepreneurship.

[16] K. Herrman, *Stem the critical shortage of wealth creators: view from the top*, "Research Fortnight", vol. 22, 2008, p. 19.

[17] P.A. Wickham, *Strategic entrepreneurship*, Fourth edition, Financial Times, Prentice hall, Harlow England 2006.

[18] J.C. Hayton, D.J. Kelley, *A competency-based framework for promoting corporate entrepreneurship*, "Human Resource Management", vol. 45, no. 3, 2006, p. 407-427.

[19] L. Edvinsson, M.S. Malone, *Intellectual capital: realizing your company's true value by finding its hidden brainpower*, New York Harper Business, NY 1997.

[20] J.C. Hayton, *Competing in the new economy: the effect of intellectual capital on corporate entrepreneurship in high technology new ventures*, "R&D Management", vol. 35, no. 2, 2005, p, 137-155.

[21] S.A. Zahra, *Environment, corporate entrepreneurship, and financial performance: a taxonomic approach*, "Journal of Business Venturing", vol. 8, no. 4, 1993, p. 319-340.

[22] D. Leonard-Barton, *Core capabilities and core rigidities: a paradox in managing new product development*, "Strategic Management Journal", vol. 13, 1992, p. 111-125.

[23] J.C. Hayton, *Competing in the new economy: the effect of intellectual capital on corporate entrepreneurship in high technology new ventures*, "R&D Management", vol. 35, no. 2, 2005, p, 137-155.

Entrepreneurial Skills

Following many definitions of authors who analyzed entrepreneurship in the company[24] it can be noted that the most common elements of the analysis of students/staff are: innovation, tolerance/ appetite for risk, proactive and self-renewal[25].

Thus, an organization or even an entrepreneurial person is someone who takes risks, is innovative, proactive and constantly is renewing himself. At the other extreme it is a conservative organization that is risk averse, not innovate, it is reactive and therefore not renewed more than when the market forces[26]. Therefore, corporate entrepreneurial spirit is a behavioral phenomenon that all companies develop through a conceptual continuum where one end is occupied by companies or highly conservative people and another by businesses or highly entrepreneurial people[27].

Given the information in these researches the proposition 2 can be divided into four subdivisions considering the most appropriate and reliable variables for university members:

H.2.a. Improve the technological skills development – Innovation Capacity.
H.2.b. Technological skills enhance the development of proactivity of students/ staff.
H.2.c. Technological skills improve appetite/ risk tolerance of students/ staff.
H.2.d. Technological skills improve self-renewal or autonomy of students/ staff.

[24] R.D. Ireland, J.G. Covin, D.F. Kuratko, *Conceptualizing corporate entrepreneurship strategy*, "Entrepreneurship Theory and Practice", vol. 33, no.1, 2009, p.19-46; B. Antoncic, I. Prodan, *Alliances, corporate technological entrepreneurship and firm performance: testing a model on manufacturing firms*, "Technovation", vol. 28, 2008, p. 257-265; B. Antoncic, R.D. Hisrich, *Intrapreneurship: construct refinement and cross-cultural validation*, "Journal of Business Venturing", vol. 16, no. 5, 2001, p. 495-527; S.A. Zahra, D.M. Garvis, *International corporate entrepreneurship and firm performance: the moderating effect of international environmental hostility*, "Journal of Business Venturing", vol. 15, no. 5-6, 2000, p. 469-492; B.R. Barringer, A.C. Bluedorn, *The relationship between corporate entrepreneurship and strategic management*, "Strategic Management Journal", vol. 20, 1999, p. 421-444; G.A. Knight, *Cross-cultural reliability and validity of a scale to measure firm entrepreneurial orientation*, "Journal of Business Venturing", vol. 12, 1997, p. 213-225; S.A. Zahra, J.G. Covin, *Contextual influences on the corporate entrepreneurship-performance relationship: a longitudinal analysis*, "Journal of Business Venturing", vol. 10, 1995, p. 43-58; S.A. Zahra, *Environment, corporate entrepreneurship, and financial performance: a taxonomic approach*, "Journal of Business Venturing", vol. 8, no. 4, 1993, p. 319-340; W.D. Guth, A. Ginsberg, *Guest editors´ introduction: corporate entrepreneurship*, "Strategic Management Journal", vol. 11, 1990, p. 5-15; D. Miller, *The correlates of entrepreneurship in three types of firms*, "Management Science", vol. 29, 1983, p. 770-791; H. Schollhammer, *Internal corporate entrepreneurship*, (eds.) C.A. Kent, D.L. Sexton, K.H. Vesper, *Encyclopedia of Entrepreneurship,* Englewood Cliffs, NY: Prentice Hall, 1982, p. 209-223.

[25] B. Antoncic, R.D. Hisrich, *Intrapreneurship: construct refinement and cross-cultural validation*, "Journal of Business Venturing", vol. 16, no. 5, 2001, p. 495-527; S.A. Zahra, *Environment, corporate entrepreneurship, and financial performance: a taxonomic approach*, "Journal of Business Venturing", vol. 8, no. 4, 1993, p. 319-340.

[26] J.G. Covin, D.P. Slevin, *Strategic management of small firms in hostile and benign environments*, "Strategic Management Journal", vol. 10, no. 1, 1989, p. 75-87.

[27] B.R. Barringer, A.C. Bluedorn, *The relationship between corporate entrepreneurship and strategic management*, "Strategic Management Journal", vol. 20, 1999, p. 421-444.

Entrepreneurial skills and its relationship to performance

Innovation Capacity and its relationship to performance

At the organizational level innovation capacity or "innovativeness" has been broadly defined over the years[28] but all definitions agree that innovation capacity[29] provides a direction to expand the effort towards realizing the potential for innovation. If the company does not adequately address this effort, then the ability or potential for innovation seems a potential not fully developed, since no ability organization to innovate can invest time and resources in market research but will be unable to transfer their knowledge to the practice.

Therefore companies must adopt innovations whose greatest importance lies in enabling the company to improve the type of competitive advantage, contributing to their performance[30]. In fact, some authors see the "innovativeness" or capacity or orientation of innovation as driving ability that orientation-performance[31] relationship.

Likewise, at the individual level, innovations are usually risky, uncertain and imprecise and, therefore, have no guarantee of anticipated consequences, so that individuals with greater capacity for innovation and innovativeness will be who deal to higher levels of uncertainty and benefits[32]. Furthermore, Leonard-Barton and Deschamps[33] argued that these individuals are not so easily influenced by the environment or internal organizational variables, which will serve perfectly for setting the strategic company setup[34]. In this sense then Thatcher et al.[35] established that individuals tend to be innovative despite their environment because they have predispositions to develop exploratory behaviors that will lead them to be more likely

[28] D.I. Prajogo, P.K. Ahmed, *Relationships between innovation stimulus, innovation capacity, and innovation performance*, "R&D Management", vol. 36, no. 5, 2006, p. 499-515; R.F. Hurley, G.T.M. Hult, *Innovation, market orientation, and organizational learning: an integration and empirical examination*, "Journal of Marketing", vol. 62, 1998, p. 42-54; G. Zaltman, R. Duncan, J. Holbek, *Innovations and organizations,* Wiley, New York 1973.

[29] R.F. Hurley, G.T.M. Hult, *Innovation, market orientation, and organizational learning: an integration and empirical examination*, "Journal of Marketing", vol. 62, 1998, p. 42-54.

[30] M. Porter, *Competitive strategy: techniques for analysing industries and competitors*, Free Press, New York 1980.

[31] J.C. Narver, S.F. Slater, *The effect of a market orientation on business profitability*, "Journal of Marketing", vol. 54, 1990, p. 20-35.

[32] R. Agarwa, P. Prasad, *A conceptual and operational definition of personal innovativeness in the domain of information technology*, "Information Systems Research", vol. 9, 1998, p. 204-215.

[33] D. Leonard-Barton, I. Deschamps, *Managerial influence in the implementation of new technology*, "Management Science", vol. 34, no. 10, 1988, p. 1252-1265.

[34] R. Agarwa, P. Prasad, *A conceptual and operational definition of personal innovativeness in the domain of information technology*, "Information Systems Research", vol. 9, 1998, p. 204-215.

[35] J.B. Thatcher, M. Srite, L.P. Stepina, Y. Liu, *Culture, overload and personal innovativeness with information technology: extending the nomological net*, "Journal of Computer Information Systems", vol. 44, no. 1, 2003, p. 74-81.

to accept the changes and innovation[36] and thus improve business performance[37]. Therefore with this literature the following proposition is raised:

H.3.a. Innovation capacity improves performance in the University.

Proactivity and its relationship to performance

Proactivity is defined as a search for opportunities, a prospect to look forward characterized by the introduction of new products and services before the competition and an anticipated future demands action[38]. Therefore proactivity can be confirmed as an advance or preventive control of reality. That is, it implies a forward-looking perspective that can create a competitive advantage by being the first to move strategically and make changes on the market[39].

In this sense, Lumpkin, Cogliser and Schneider[40] and Smart and Conant[41] found that there is a positive relationship between the ability to identify the needs and desires of customers and company performance, as well as identifying opportunities. It may indeed be one of the most influential variables in improving the performance of the company or individual. So with all the information provided we propose that:

H.3.b. Productivity improves student/ staff performance.

Tolerance/ propensity to risk and its relationship to performance

Dess and Lumpkin[42] referred to the assumption of risk as the will to seize an opportunity although not clearly know its success and to act boldly without knowing the consequences.

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[36] J.B. Thatcher, M. Srite, L.P. Stepina, Y. Liu, *Culture, overload and personal innovativeness with information technology: extending the nomological net*, "Journal of Computer Information Systems", vol. 44, no. 1, 2003, p. 74-81.

[37] R. Agarwa, P. Prasad, *A conceptual and operational definition of personal innovativeness in the domain of information technology*, "Information Systems Research", vol. 9, 1998, p. 204-215.

[38] G. Lumpkin, C. Cogliser, T. Schneider, *Understanding and measuring autonomy: an entrepreneurial orientation perspective*, "Entrepreneurship Theory & Practice", vol. 33 no. 1, 2009, p. 47-69.

[39] S. Chang, R. Lin, F. Chang, R. Chen, *Achieving manufacturing flexibility through entrepreneurial orientation*, "Industrial Management & Data Systems", vol. 107, no. 27, 2007, p. 997-1017; M. Hughes, R. Morgan, *Deconstructing the relationship between entrepreneurial orientation and business performance at the embryonic stage of firm growth*, "Industrial Marketing Management", vol. 36, no. 5, 2007, p. 651-661.

[40] G. Lumpkin, C. Cogliser, T. Schneider, *Understanding and measuring autonomy: an entrepreneurial orientation perspective*, "Entrepreneurship Theory & Practice", vol. 33 no. 1, 2009, p. 47-69.

[41] D. Smart, J. Conant, *Entrepreneurial orientation, distinctive marketing competencies and organizational performance*, "Journal of Applied Business Research", vol. 10, no. 3, 1994, p. 28-39.

[42] G. Dess, G. Lumpkin, *The role of entrepreneurial orientation in stimulating effective corporate entrepreneurship*, "Academy of Management Executive", vol. 19, no. 1, 2005, p. 147-156.

To succeed through entrepreneurship, companies usually have to make riskier alternatives even if it means forgoing methods or products that worked in the past. In the relationship between risk taking and performance were found different results. Most of them showed a significant positive relationship between risk appetite and performance[43] establishing businesses and people who risk more earn more.

However, other authors confirm a statistically negative relationship between risk tolerance and performance[44]. It is in this field of study where we will focus this research since when dealing with students, not companies or other legal persons the idea or belief is that students are more risk averse and therefore those less propensity and risk tolerance would be who will achieve greater results in the university as they need to control all the changes happening around them. With this information it is proposed:

H.3.c. Risk appetite worsens the performance of students.

Self-renewal

The self-renewal[45] or autonomy[46] is the transformation of the organization through the renewal of clear ideas in the company[47]. Or it could be expressed as the guaranteed freedom of individuals and teams to enable them to exercise their creativity which is necessary to bring entrepreneurship[48].

In this sense, considering the definition has always taken into account the views of senior managers to establish the renewal of the company, however now being considered less experienced or more novice managers and even the operating core Company (University) as key drivers of innovative ideas that lead to a competitive advantage or just an advantage over competitors or colleagues.

[43] G. Lumpkin, C. Cogliser, T. Schneider, *Understanding and measuring autonomy: an entrepreneurial orientation perspective*, "Entrepreneurship Theory & Practice", vol. 33, no. 1, 2009, p. 47-69; A. Rauch, J. Wiklund, G. Lumpkin, M. Frese, *Entrepreneurial orientation and business performance: an assessment of past research and suggestions for the future*, "Entrepreneurship Theory and Practice", vol. 33, no. 3, 2009, p. 761-787; S. Chang, R. Lin, F. Chang, R. Chen, *Achieving manufacturing flexibility through entrepreneurial orientation*, "Industrial Management & Data Systems", vol. 107, no. 27, 2007, p. 997-1017; D. Smart, J. Conant, *Entrepreneurial orientation, distinctive marketing competencies and organizational performance*, "Journal of Applied Business Research", vol. 10, no. 3, 1994, p. 28-39.

[44] M. Hughes, R. Morgan, *Deconstructing the relationship between entrepreneurial orientation and business performance at the embryonic stage of firm growth*, "Industrial Marketing Management", vol. 36, no. 5, 2007, p. 651-661; L. Naldi, M. Nordqvist, K. Sjoberg, J. Wiklund, *Entrepreneurial orientation, risk taking, and performance in family firms*, "Family Business Review", vol. 20, no. 1, 2007, p. 33-47.

[45] G. Antoncic, R.D. Hisrich, *Intrapreneurship: construct refinement and cross-cultural validation*, "Journal of Business Venturing", vol. 16, no. 5, 2001, p. 495-527.

[46] G. Lumpkin, G. Dess, *Clarifying the entrepreneurial orientation construct and linking it to performance*, "The Academy of Management Review", vol. 21, no. 1, 1996, p. 135-172.

[47] G. Antoncic, R.D. Hisrich, *Intrapreneurship: construct refinement and cross-cultural validation*, "Journal of Business Venturing", vol. 16, no. 5, 2001, p. 495-527;

[48] G. Lumpkin, G. Dess, *Clarifying the entrepreneurial orientation construct and linking it to performance*, "The Academy of Management Review", vol. 21, no. 1, 1996, p. 135-172.

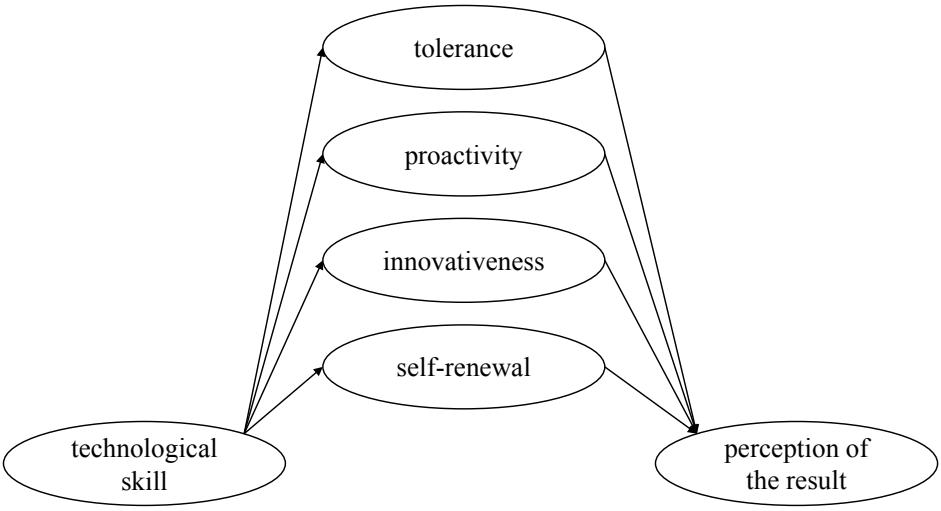
Therefore, increasingly, is promoting the delegation of authority and acceptance of new ideas for everyone in the company to achieve good results. Therefore, we intend to study a significant positive relationship between self-renewal and performance[49].

H.3.d. The self-renewal improves student performance.

Methodology

After finishing this section of literature should be noted that the proposed model (figure 1) and methodology (table 1) could be summarized as follows:

Figure 1. Proposed model



Source: own elaboration.

Table 1. Sample Procedure

Sector	Bachelor Students and University staff who received training
Geographic Location	Spain

[49] S. Chang, R. Lin, F. Chang, R. Chen, *Achieving manufacturing flexibility through entrepreneurial orientation*, "Industrial Management & Data Systems", vol. 107, no. 27, 2007, p. 997-1017; A. Rauch, J. Wiklund, G. Lumpkin, M. Frese, *Entrepreneurial orientation and business performance: an assessment of past research and suggestions for the future*, "Entrepreneurship Theory and Practice", vol. 33, no. 3, 2009, p. 761-787; D. Smart, J. Conant, *Entrepreneurial orientation, distinctive marketing competencies and organizational performance*, "Journal of Applied Business Research", vol. 10, no. 3, 1994, p. 28-39.

Methodology	Structured questionnaire
Population Universe	1.000 students/ staff
Response rate)	69,9%
Sample Error	5%
Confidence level	95% pq = 0.50, Z = 1.96
Data collection period	June 2014

Source: own elaboration.

The research performed an intensive analysis of information gathered from books and scientific publications on entrepreneurship applied to the field of Management and especially in the University. In this sense the scales used to analyze the different variables have been included in the table 2.

Table 2. Scales

Tolerance:	Zahra (1993; Adaptation)
Proactivity:	Santos et al. (2006)
Innovativeness:	Antoncic and Hisrich (2001; adaptation)
Auto Renew:	Bandura (2006)
Cognitive Style Index:	Allison and Hayes (1996)
Technological skills:	Real et al. (2006)

Source: own elaboration.

These scales were previously validated by these authors give adequate results.

Finally it should be noted that the final dependent variable is called "performance" and measures the result expected by the students at the time of completion of the questionnaire.

Results and conclusions

Results

Results showed a positive influence of the technological skills in the best performance of students in class (more participation, positive development of entrepreneurship). Specifically it has been shown that these technological skills make students more tolerant in class, implying that the more technology-based skills will dominate the more tolerant (see: table 3).

Table 3. Regression Analysis (Tolerance)

	Dependent variables
Independent Variables	Model 1
Constant	0,47 *** (5,726)
Technological skills	0,457 *** (3,033)
R2	0,088
F	4,979
Std. Error	1,108

Note: * p <.05; ** P <0.01; *** P <.001 (2-tailed); Values in parentheses are the T-Students of the variables.

Source: own elaboration.

Similarly, further development of technology skills lead to students need more tasks or complex tasks because sometimes the most technologically competent student seems to control the situation much better than those who are not competent (see: table 4).

Table 4. Regression Analysis (Proactivity)

	Dependent Variable
Independent Variables	Model 1
Constant	0,235 ** (3,033)
Proactivity	0,351 *** (4,721)
R2	0,203
F	9,820
Std. Error	0,800

Note: * p <.05; ** P <0.01; *** P <.001 (2-tailed); Values in parentheses are the T-Students of the variables.

Source: own elaboration.

It also reaches the same conclusion for the hypothesis 2c where students with more skills or technological skills show greater capacity for innovation than the rest (see: table 5). And more ability to work autonomously as other students what the 2d hypothesis is also confirmed (see: table 6).

Table 5. Regression Analysis (Capacity for Innovation)

	Dependent Variable
Independent Variables	Model 1
Constant	0,235 ** (3,033)
Proactivity	0,351 *** (4,721)
R2	0,203
F	9,820
Std. Error	0.800

Note: * p <.05; ** P <0.01; *** P <.001 (2-tailed); Values in parentheses are the T-Students of the variables.

Source: own elaboration.

Table 6. Regression Analysis (Auto-renewal)

	Dependent variable
Independent Variables	Model 1
Constant	0,356 *** (10,833)
Auto Renew.	0,237 ** (3,014)
R2	0,088
F	4,979
Std. Error	1,108

Note: * p <.05; ** P <0.01; *** P <.001 (2-tailed); Values in parentheses are the T-Students of the variables.

Source: own elaboration.

Finally, the following table gives the results obtained by relating all dependent variables with the performance of students (see: table 7). It should be noted that all influences are positive, logical development of adequate performance (best outcomes for students) aspect and as a focal point to draw attention to the negative relationship of tolerance that students are at risk, that means the best performing students have lower risk appetite, i.e. they would prefer to move to a stable environment without changes.

Table 7. Regression Analysis (Total)

	Dependent Variable	
Independent Variables	Model 1	Model 2
Constant	0530 (1,395)	0,421 (0,358)
Technological skills	0,284 *** (3,568)	0,247 ** (3,050)
Tolerance		-0043 (2,002)
Proactivity		0,453 *** (5,826)
Innovation Capacity		0,156 * (2,064)
Auto Renew		0,324 *** (3,720)
R2	0,523	0,585
Adjusted R2	0,504	0,564
Change in adjusted R2		0,062 *
F	27,778	24,854
Std. Error	0,800	0,792

Note: * p <.05; ** P <0.01; *** P <.001 (2-tailed); Values in parentheses are the T-Students of the variables.

Source: own elaboration.

Conclusions

Considering the survey results and literature analysis we could conclude that technology is characterized as an integral driver of innovation[50] and therefore entrepreneurial spirit not only plays a key role in creating new products or processes, but that is key to the basics of technological industrial structure by radical redefinition of the rules of competition[51]. One of the most important decisions of strategic direction facing the current competitive environment is the development of technology.

Over the last 20 years, the business environment and students has become more competitive due to globalization, rapid technological change and sophistication in the behavior of employees and customers[52]. Consequently, these changes affect both the organization internally and also the competitive

[50] D.I. Prajogo, P.K. Ahmed, *Relationships between innovation stimulus, innovation capacity, and innovation performance,* "R&D Management", vol. 36, no. 5, 2006, p. 499-515.

[51] Ibidem.

[52] G.K. Jones, A.Jr. Lanctot, H.J. Teegen, *Determinants and performance impacts of external technology acquisition*, "Journal of Business Venturing", vol. 16, 2000, p. 255-283.

development of the company (University in our case)[53]. Therefore, staff and the context in which the organization (the University Culture) moves are also determining the triumph of entrepreneurship[54] among workers and students. That is, students acquire technological skills to be able to have a proactive behavior and become entrepreneurs[55]. In this sense entrepreneurial spirit is key to increase performance in established organizations (University)[56].

To disintegrate entrepreneurship in entrepreneurial skills it should be taken in account that these refer to the objective of actions and initiatives that transform the University through renewal processes and improves business operations with new challenges, i.e. finding new market segments-products or new technological fields[57].

According to literature the most common entrepreneurial skills are: capacity of innovation, proactivity, tolerance/ appetite for risk and self-renewal[58].

Given these entrepreneurial skills and technological competencies we proposed a model which main aim was to check what is more relevant whether the entrepreneurial spirit of students in the University or one of four competitions, or if the technology is more important to succeed in education. Or on the contrary if there is an additive effect of both types of skills.

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[55] D. Leonard-Barton, *Core capabilities and core rigidities: a paradox in managing new product development*, "Strategic Management Journal", vol. 13, 1992, p. 111-125.

[56] B. Antoncic, R.D. Hisrich, *Intrapreneurship: construct refinement and cross-cultural validation*, "Journal of Business Venturing", vol. 16, no. 5, 2001, p. 495-527.

[57] J.C. Goodale, D.F. Kuratko, J.S. Hornsby, J.G. Covin, *Operations management and corporate entrepreneurship: the moderating effect of operations control on the antecedents of corporate entrepreneurial activity in relation to innovation performance*, "Journal of Operations Management", vol. 29, no. 1-2, 2010, p. 116-127.

[58] B. Antoncic, R.D. Hisrich, *Intrapreneurship: construct refinement and cross-cultural validation*, "Journal of Business Venturing", vol. 16, no. 5, 2001, p. 495-527; S.A. Zahra, *Environment, corporate entrepreneurship, and financial performance: a taxonomic approach*, "Journal of Business Venturing", vol. 8, no. 4, 1993, p. 319-340.

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BARRIERS TO ENTREPRENEURIAL ACTIVITIES AMONG STUDENTS – EDUCATIONAL IMPLICATIONS

Keywords:

entrepreneurship, education, innovation barriers

Summary

Entrepreneurship is the attitude and behaviour desired in the wider economy. Skills related to setting up and running a business should be formed among young people through the education system. The article is devoted to identifying entrepreneurial activities in the context of cultural and awareness changes among young people. In this light, we discuss the studies conducted on the students of different faculties of the University of Lodz. These studies have shown that among students there is visible quite large entrepreneurial potential, but at the same time the level of entrepreneurial skills is too low. One way to use this potential is to modify the subject area and the ways of teaching students towards the practical use of expertise knowledge and implementation of topics related to management of company.

Introduction

The development of higher education in Poland and an increase in the number of graduates has caused on one hand a substantial upgrading of the level of education among young people, on the other hand it has changed their aspirations and expectations for their future career. One of the ways to channel the needs and aspirations of young people is to encourage them to entrepreneurial activities related to the use of their skills acquired during their studies in running their own businesses. Such a solution is in line with

the global trends in the development of entrepreneurship which in recent decades has become a recognized area of research, an academic discipline, and the field of study, postgraduate education and counselling[1]. The policy of European countries, coordinated by the European Union, is directed to prepare an environment conducive to running own small businesses[2], and the entrepreneurship becomes an essential and indispensable component of a modern economy based on knowledge and operating under a "generalized uncertainty"[3]. The paper presents aspects of entrepreneurial activities in the context of changes in culture and awareness of young people, which should be in tune with changes in the field of education at tertiary level. Then we present the results of research on broadly understood barriers to the development of entrepreneurship and the conclusions and recommendations gained from them.

Entrepreneurial activity – an outline of the issue

According to the Encyclopaedia PWN entrepreneurship is: "ability to choose and engage in economic activities, carried out in conditions of uncertainty, factors of production in a way that ensures profit of one single entrepreneur or group of enterprising individuals"[4].

Uncertainty can have a paralyzing effect, but it is worth keeping in mind that it can become an opportunity and a source of benefits for those who can see them, since uncertain situations are full of new promising business opportunities[5]. Entrepreneurship is a kind of innovation, and this innovation is inherent in the subject: the entrepreneur's person who has designed and implemented a specific project. Entrepreneur therefore plays a role of a leader, manager, inventor and artist in one person[6]. The present day imposes on the entrepreneur a pro- innovative attitude, which is a function of personality traits, ambition, motivation and a strong desire to "make things better"[7]. In conditions of generalized insecurity, in which modern organizations came to operate, entrepreneurship is a prerequisite for survival in a competitive market, the condition for the development and success of both individual and collective

[1] A.K. Koźmiński, *Zarządzanie w warunkach niepewności. Podręcznik dla zaawansowanych*, Wydawnictwo Naukowe PWN, Warszawa 2004, p. 164.
[2] http://ec.europa.eu/languages/policy/strategic-framework/rethinking-education_pl.htm; http://ec.europa.eu/growth/index_en.htm, [10.07.2015].
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[4] *Encyklopedia*, Wydawnictwo PWN, http://encyklopedia.pwn, [01.05.2015].
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[6] A.K. Koźmiński, D. Jemielniak, *Zarządzanie od podstaw, Wydawnictwa Akademickie i Profesjonalne*, Warszawa 2008, p. 391-392.
[7] Cz. Sikorski, *Zachowania ludzi w organizacji*, Wydawnictwo Naukowe PWN, Warszawa 1999, p. 137.

interests. Research into the phenomenon of entrepreneurship has shown that the type of environment (e.g. cultural, social, political or economic) may favour or not the development of entrepreneurial skills, because entrepreneurship is not an innate quality, but it can be learned. The effectiveness of entrepreneurship education in academic centers (e.g. Babson College) and their impact on entrepreneurship in the real world, has been established beyond any doubt[8]. The basic functions of entrepreneurship include[9]:

- intensive use of resources and the appropriation of knowledge and intellectual capital,
- speed of response to market signals,
- flexibility of response to market signals,
- creating and testing innovation,
- protective buffer,
- blurring the borders between organizations and the environment.

Entrepreneurship is socially and economically desirable in a modern organization. Drucker[10] draws attention to the fact that the treatment of entrepreneurship as a natural phenomenon or a gift of the gods is a conviction based on false premises, because entrepreneurship is the work. Therefore, any company can be entrepreneurial and innovative provided that it will consciously and consistently strive for that. Each entrepreneurial activity, however, encounters various obstacles. This study, based on analysis of the literature, highlights the following apportionment of barriers to entrepreneurial activities: legal, market, psychological, economic, management skills, knowledge/ information, educational, social, cultural and ethical.

Students today – the new generation

In the new world, the world built on the phenomenon of uncertainty, the world that was built in a realm of the information revolution, which Drucker called: the Revolution of Knowledge and Values[11], there were generational changes. "Research has shown that young people neither expect, nor do they care especially for the feeling of job security that was provided by the traditional hierarchy of the organization literally from the cradle to the grave". Young workers care for the environment in which they can develop, acquire new professional skills and increase the value of their work. From another point of view, people want to participate in work requiring solving problems in the organization"[12].

[8] A.K. Koźmiński, *Zarządzanie w warunkach niepewności. Podręcznik dla zaawansowanych*, Wydawnictwo Naukowe PWN, Warszawa 2004, p. 163.
[9] Ibidem, p. 165.
[10] P.F. Drucker, *Myśli przewodnie Druckera*, MT Biznes, Warszawa 2002, p. 209-210.
[11] J. Kozielecki, *Koncepcje psychologiczne człowieka*, Wydawnictwo Akademickie „Żak", p. 230.
[12] D. Miller, *Organizacja przyszłości* [in:] *Organizacja przyszłości*, (eds.) F. Hesselbein, M. Goldsmith, R. Beckhard, Business Press, Warszawa 1998, p. 142.

Generation X was characterized by a desire for balance between work and personal life, the focus on teamwork, loyalty to the inter-relationships and reluctance to regulations[13]. The next generation – Generation Y – emphasizes independence, financial success, self-reliance, but also teamwork as well as comfortable life and a sense of freedom[14]. This is the generation of people born in the world, completely different from the one inhabited by their parents and grandparents[15], in the world which they could not even imagine. Generation Y is characterized by: flexibility of styles of behaviour, pragmatism, lack of recognition of external authorities, acceptance of reality, making the most of emerging opportunities as well as openness, consumerism, networking and digitization, lack of patience and frequent communication[16]. Representatives of the generation Y expect that their bosses will know the name of each employee and to each will devote personal attention – they want to be treated individually rather than collectively[17]. Young people proudly declare the fact of not having authority figures, which may result from a sense of strength and individualism and the need for a sense of perpetration and freedom in decision-making. The quest for emancipation of employees requires the acceptance of their values such as individualism (the right to develop and protect own lifestyle), freedom (the right to make choices), self-realization (the right to personal achievement) and adaptability (the right to create conditions that are conducive to self-realization and own development)[18]. The representatives of this generation have high expectations, e.g. after spending six weeks in the company they expect promotion[19]. The name of the next generation – Generation C[20] – derives from the English words characterizing it: connect, communicate, change). The notional date of creation of this generation is different in different parts of the world due to the fact that belonging to this generation is not determined by age, but the moment in which the Internet and social media have become an indispensable part of life for this generation. In Poland, this time falls on the years after 1990, but in the United States – after the year 1980[21]. Generation C are primarily people for whom modern technology is a natural part of life

[13] St. Robbins, *Zachowania w organizacji*, PWE, Warszawa 2004, p. 44.
[14] Ibidem, p. 44-46.
[15] Z. Bauman, *44 listy ze świata płynnej nowoczesności*, Wydawnictwo Literackie, Kraków 2011, p. 77.
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[19] M. Buckingham, *Engaging Generation Y*, "T+D", vol. 60, August 2006, p. 27-30.
[20] In Poland, the term generation "C" is used interchangeably with the term generation "Z" (created to mark the naming continuity with previous generations X and Y) or "network generation".
[21] K. Bodzioch, *Pokolenie C – nowa odsłona pokolenia Y?*, http://hrstandard.pl/2012/01/04/pokolenie-c-nowa-odslona-pokolenia-y/, [01.05.2015].

and who do not know a world without electronics as they have always been surrounded with it[22]. They have new technologies at their fingertips and are ready to conquer the world, because with friends all over the world and the knowledge of foreign languages, the political division of the world is not a barrier for them to crossing borders[23]. The ultimate goal in a career plan is for them autonomy and flexibility.

The choice of a representative of a new generation will fall on such an employer who will primarily provide them with development opportunities, good working atmosphere and flexible organization of work (both in terms of time and work place)[24]. **They do not care for stability at work, they look for diversity, they escape from routine.** *They willingly communicate with other cultures, they want to leave for international internships, constantly change and improve established processes and try new ways of working. More than independent work, they appreciate the work in a group*[25]. Booz & Company report shows that thanks to generations Y and C on the labour market by 2014 more than half of the workforce in the world has become flexible[26]. This is an instant generation – everything has to happen immediately. This generation needs speed and is accustomed to immediate response and if it will not happen immediately it is ready to break clichés, seeking solutions beyond formal ways provided in the organization. Generation C can contribute to changing the communication system in companies, because C is characterized by transparency[27]. The study revealed eight characteristics for network generation. These include[28]:

- freedom,
- adjusting to their needs
- attentive observation,
- reliability,
- cooperation,
- entertainment,

[22] J. Koc, *Pokolenie Z na rynku pracy. Jakie jest i czego oczekuje nowe młode pokolenie pracowników*, http://www.polskieradio.pl/42/275/Artykul/1372752,Pokolenie-Z-na-rynku-pracy-Jakie-jest-i-czego-oczekuje-nowe-mlode-pokolenie-pracownikow, [01.05.2015].

[23] M. Skorupa, *Pokolenie Z – generacja nastoletnich milionerów?,* http://zdrowie.gazeta.pl/Zdrowie/1,105806,16550329,Pokolenie_Z___generacja_nastoletnich_milionerow_.html, [01.05.2015].

[24] A. Klonowska-Szałek, *Żegnaj X i Y. Witaj C! Nowe pokolenie zmienia rynek pracy*, http://hrstandard.pl/2011/09/21/zegnaj-x-i-y-witaj-c-nowe-pokolenie-zmienia-rynek-pracy/, [01.05.2015].

[25] P. Rusak, *Czy należy bać się pokolenia Z?*, http://kariera.pracuj.pl/porady/czy-nalezy-bac-sie-pokolenia-z/, [01.05.2015].

[26] D. Tapscott, *Cyfrowa dorosłość. Pokolenie sieci zmienia nasz świat*, Wydawnictwa Akademickie i Profesjonalne, Warszawa 2010, p. 287.

[27] M. Pawłowska, *Generacja Z., Młodzi, otwarci, wychowani w dobrobycie, żyjący w świecie wirtualnym, skazani na kryzys*, http://natemat.pl/55617,generacja-z-mlodzi-otwarci-wychowani-w-dobrobycie-zyjacy-w-swiecie-wirtualnym-skazani-na-kryzys, [01.05.2015].

[28] D. Tapscott, *Cyfrowa dorosłość. Pokolenie sieci zmienia nasz świat*, Wydawnictwa Akademickie i Profesjonalne, Warszawa 2010, p. 140-175.

- fast pace,
- innovativeness.

Entrepreneurship among students – the results of own research

The survey in an electronic form was sent via the central system of University of Lodz and delivered to all the students at both degrees of study. The study involved 596 students. The aim of the study was to learn about entrepreneurial attitudes among students, their plans for starting their own business, and awareness of the barriers existing in the environment and their own limitations resulting from lack of knowledge and skills. Of this number, four-fifths were women and one-fifth were men, slightly less than three-fifths were the students of the first degree studies.

It should be noted that 90% of respondents did not conduct currently own business activity (table 1), which may have an impact on respondents' answers which are to a large extent based on the belief rather than experience.

Table 1. Distribution of respondents responses depending on conducting or not economic activities

Response	%
I run my own or non-governmental business activity	3,97%
I work on managerial position in the business founded by my family	0,66%
I work in the business founded by my family but I do not have the managerial position in it position	3,14%
I am in the process of starting my own or non-governmental business activity	2,15%
I do not run my own or non-governmental business activity	90,08%

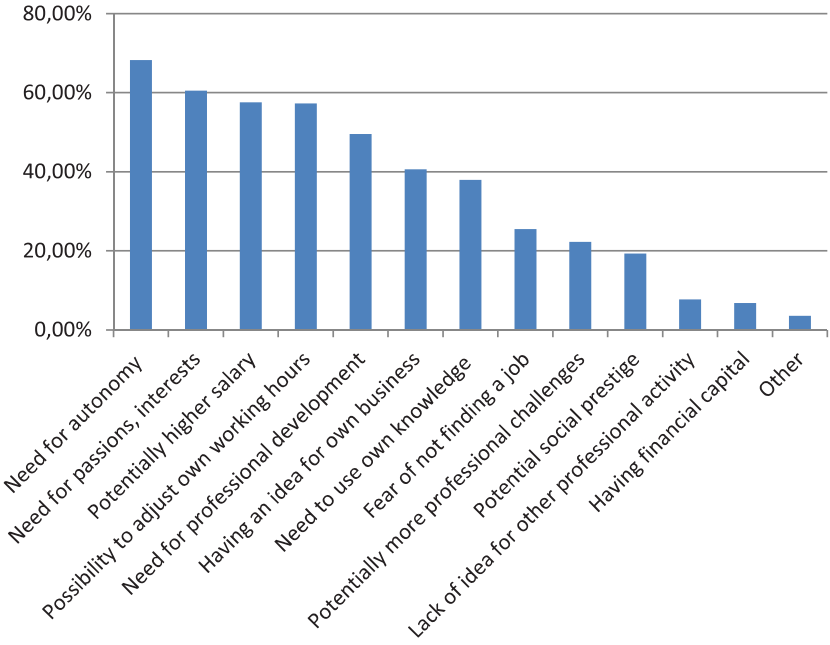
Source: own research.

However, it should be noted that 35% of respondents plan in the course of their studies or up to three years after their completion to set up their own or non-governmental business. In addition, an interesting observation is the distribution of answers to questions about the professional experience, as many as 77% of students undertook in the past or undertake currently professional activity.

Students who already conduct or just intend to conduct business activity in the vast majority want to realize the need for independence (almost 70% of responses) and the need for their passions, interests and aspirations (just over 60%), and the half of them say it is a good opportunity for their own professional development. This demonstrates the high potential of entrepreneurship which is present among young people. The full distribution

of answers to the question about the motivation to start their own business is presented on figure 1.

Figure 1. Factors motivating to undertake professional activities (question with the ability to provide multiple answers)



Source: own research.

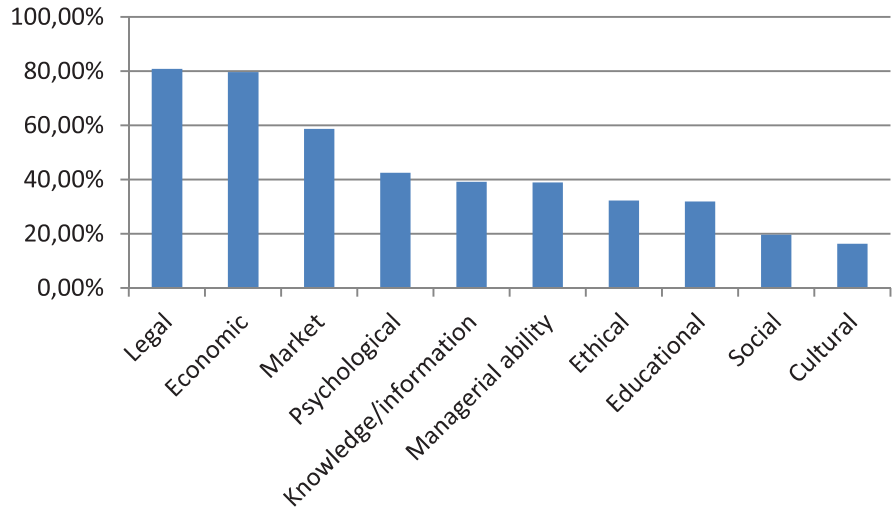
When asking students about existing barriers encountered by the entrepreneur opening and running his own business, most of the students pointed out the legal and economic barriers[29] as the main barriers to entrepreneurial activities (489 and 482 replies respectively). The least significant barriers from the standpoint of respondents included cultural and social barriers[30] (99 and 119 replies). Such a distribution of responses can result both from the characteristics of generations Y and C, which have neither social nor cultural borders, hence such barriers are not a problem for them, and at the same time from the educational system

[29] The legal barriers include: fiscal system, permits and licenses, the subjective decisions of officials, environmental restrictions, etc.; the economic barriers include: fierce competition, competitors better offers, better products at the same price, etc.

[30] The cultural barriers include: reluctant attitude of the environment to conduct own business activity, lack of family traditions, safer to work for someone, etc.; the social barriers include: difficulty to build relationships, lack of ability to create teams, working with difficult partners, conflicts, etc.

and greater awareness of the principles of social functioning on the one hand and the lack of knowledge of the law or lack of ability to interpret the relevant provisions and the lack of knowledge of basic economic issues, which could become a source of concern and anxiety. Responses to the question about the barriers to entrepreneurship are shown in figure 2.

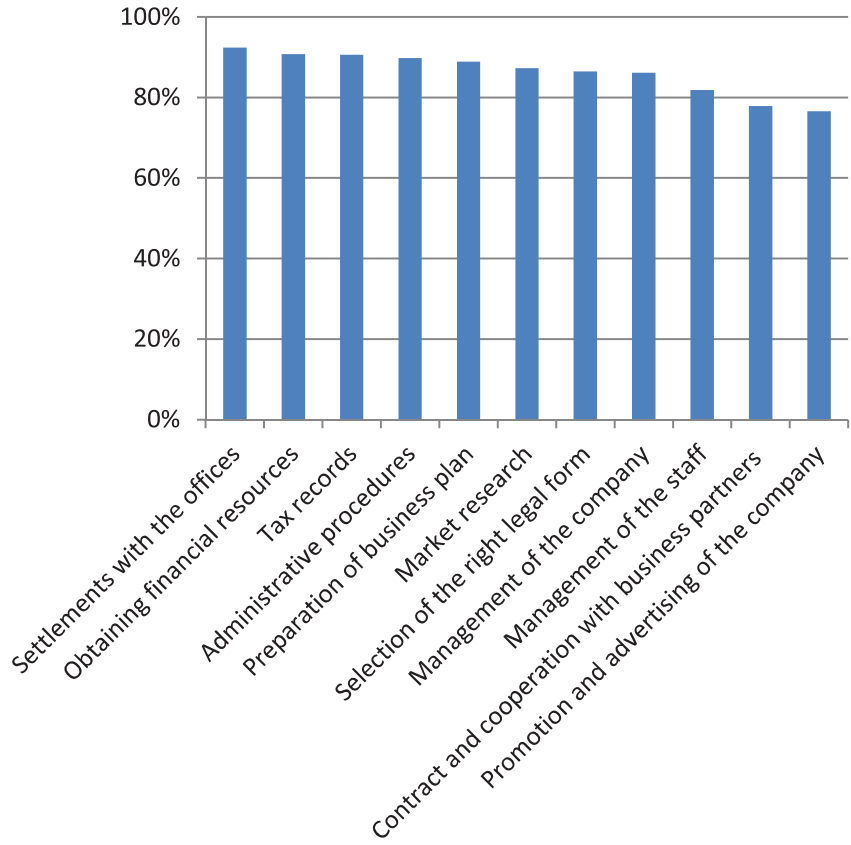
Figure 2. Barriers to entrepreneurship indicated by the respondents (question with the ability to provide multiple answers)



Source: own research.

Respondents were asked about their knowledge and skills associated with running a business. The overwhelming majority pointed to deficiencies in most aspects raised in the question, the biggest in matters related with the formal requirements and knowledge of rules and procedures. These deficiencies can be called barriers associated with the preparation of students to start and run a business. Figure 3 shows the full distribution of answers.

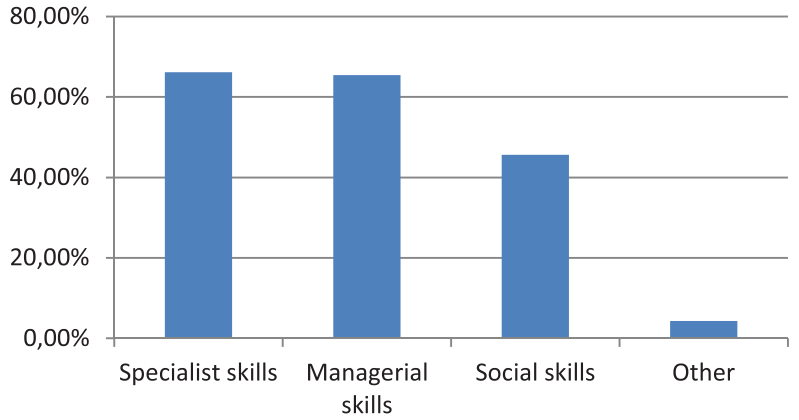
Figure 3. Lack of knowledge and skills related to conducting business activity among the surveyed students (the figure shows total response for 'I have no knowledge' and 'I have average knowledge')



Source: own research.

An interesting distribution of answers appeared in the case of another question related with education needs beyond the basic profile of studies. Respondents would like to develop both specialist skills (use of tools, methods, technology) and managerial skills (co-ordination of work and integration of different interests and conducting business activities), to a lesser extent, social skills (communication, conflict resolution, teamwork, motivating self and other people). The distribution of responses is shown in figure 4.

Figure 4. Skills which the surveyed students would like to develop during their training and are beyond the basic profile of their studies



Source: own research.

Conducted on a group of students, a study on entrepreneurship clearly demonstrates quite important trends. The vast majority of respondents is trying to gain work experience during their studies. Although few people start their own professional career while studying, as many as one third of respondents entertain this idea. Conducting own business activity they would relate mainly to obtaining independence and pursuing their own passions and interests. The respondents are aware of the barriers which they perceive in the external environment, as well as in the framework of knowledge and skills.

Conclusions

The conducted research confirms the general trends in cultural and awareness changes of young people. Their needs for independence, liberty, opportunity to realize their own passion and to develop which very well refers to the traits associated with entrepreneurship. However, there are barriers perceived by the respondents, both in the external world and in themselves, which can, at least to some extent, be overcome in the educational process at the level of higher education. Since the introduction of legal changes and the related new style of education, oriented on competencies and skills, the space has been created to introduce new or modify existing subject area and style of teaching. The study confirms the need to focus on the practicality of specialist skills, the implementation of the subjects associated with entrepreneurship and management (perhaps as optional) and to a lesser extent social skills. The potential of young people gives great opportunities to promote the teaching of entrepreneurial activities, which requires continuous enhancement of the

programme offer, and cooperation between faculties representing different disciplines.

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THE HUMAN CAPITAL ACCUMULATION IN KNOWLEDGE-BASED ECONOMY IN RELATION TO THE PHENOMENON OF ACADEMIC ENTREPRENEURSHIP[1]

Keywords:

technological change, human capital, productivity growth, economic growth, knowledge economy, academic entrepreneurship

Summary

The paper presents the problem of accumulation of human capital in the knowledge-based economy from the perspective of academic entrepreneurship phenomenon. The analysis begins with theoretical justification – from the perspective of contemporary economic thought – the concept of a knowledge-based economy. Subsequently, the author indicates the need to design models of human capital in the knowledge economy. At the end of the analysis considerations come to isolate the relationship between human capital accumulation and the development of academic entrepreneurship. The discussion centered around the thesis that human capital is an essential production factor creating added value within the academic enterprise in knowledge economy. Thus it sets new functions for modern universities, which should be universities connecting Humboldt's educational pattern with the spirit of entrepreneurship education.

Contemporary justification for knowledge – based economy and its measures

Our economic success depends on how well we exploit our most valuable assets: our knowledge, skills, and creativity. They are at the heart of a modern,

[1] The paper was prepared within the research grant of National Science Centre entitled: "Stochastic and deterministic human capital modeling in knowledge – based economic growth", No. 3861/B/H03/2011/40.

knowledge driven economy. The comparative advantage of the industrialized world lies in more knowledge-based goods and services. Within EU partners – committed itself as part of the Lisbon 2010 agenda was agreed to making Europe "*the most competitive and dynamic knowledge - based economy in the world*"[2]. Indeed, the notion is in fact a central frame of reference in wider thinking, arguing that "*Third Way politics... is concerned with restructuring social democratic doctrines to respond to the twin revolutions of globalization and the knowledge economy*"[3].

Unfortunately, while the notion of a knowledge economy is prominent in political debate, there is little agreement in the academic literature over its definition. Generally the term refers to activities involving the use of information – its production, transmission, and application to creating both information services or goods which may be termed *"knowledge products"*. For some thinkers, a knowledge economy is synonymous with research, higher education, and the production of knowledge products that may or may not follow the classical laws of economics. For others, knowledge-based economies use knowledge as a tool or process to generate wealth or increase efficiencies. The lack of a concrete, widely agreed upon definition, may in fact be politically desirable, since governments which adopt the knowledge economy rhetorically, can be seen by citizens as moving forward, modernizing, and becoming competitive in global marketplaces[4].

Knowledge products possess distinct oddities which define them in contrast to traditional material products – knowledge products have high research and development costs, but often low to negligible material costs. Instead of manufacturing and physical production of objects, effort is expended in know-how and mechanisms and processes for creating and controlling knowledge and information. ITC and pharmaceuticals exemplify knowledge products an due to the ease of piracy and reproduction, rights management and intellectual property laws (including enforcement) become a key element in knowledge economies. Other oddities include: knowledge products do not necessarily diminish in value due to classical laws of supply and demand; on the contrary, they can be amplified by higher usage and social networks, increasing their value[5].

Neef[6] emphasises the heightened significance of the 'weightless economy' – the shift from the production of goods to intangibles – a view echoed by

[2] European Council, 'Presidency Conclusions', Lisbon European Council, 23–24 March 2000, http://ue.eu.int/ueDocs/cms-Data/docs/pressData/en/ec/00100-r1.en0.htm, [21.03.2015].
[3] A. Giddens, *The Third Way and its Critics*, Cambridge: Policy Press, 2000, p. 163.
[4] A. Weber, *What is a Knowledge Economy?: Oil-rich Nations Post-oil*, "International Journal Of Science In Society", 2, 2, 2011, p. 161-162.
[5] *Knowledge Policy: Challengesforthe 21 st Century*, (eds.) G. Hearn, D. Rooney, Cheltenham: Edward Elgar, 2008, p. 1.
[6] D. Neef, *A Little Knowledge in a Dangerous Thing: Understanding our Global Knowledge Economy*, Woburn, MA: Butterworth-Heinemann, 1999.

Leadbitter[7] and Quah[8]. On the other hand Mokyr[9] locates the knowledge economy alongside the growth of what he dubs 'useful knowledge' and, more specifically, the development of institutions that generate theoretical knowledge and seek to apply such knowledge in commercial settings. Others like Lever[10] see the "knowledge economy" in even narrower terms, being simply the high-technology elements of the economy – albeit elements with high growth rates and a special role to play in promoting economic competitiveness. Though located within the same broad rhetorical sweep, each suggests a subtly different range of indicators for capturing the essence of the knowledge economy.

Given this, the investigation of Hudson[11] utilizes measures under three broad headings that build on these distinctions:

- Those relating to the weightless economy. It implies the proportion of the workforce employed in the financial and business sector and the value added share produced by this sector.
- Those relating to knowledge development. It results the proportion of those broadly of working age (16–74) with a degree-level qualification or above and the amount spent per capita on research and development activity in higher education institutions and private companies.
- Those relating to technological intensity. It refers to the amount of scientists and engineers as a proportion of the workforce. The proportion of the workforce employed (or self-employed) in the IT sector and the number of high-tech patents per 1.000.000 of the population.

Some quantitative measures of a country's knowledge capacity include: ratio of researchers per inhabitant, annual R&D expenditure, annual output of peer-reviewed science and technology articles and patents, Foreign Direct Investment (FDI) per inhabitant, Internet Penetration Rate, computers/fixed lines/ISP providers per inhabitant, student-teacher ratios, adult literacy and annual education expenditure. The World Bank has developed a widely used Knowledge Assessment Methodology (KAM), consisting of 109 variables to create a Knowledge Economy Index (KEI), and Knowledge Index (KI) for each country[12] (World Bank 2010).

In knowledge economy if one company can control patents or rights, companies can monopolize knowledge markets, creating a *'winner takes it all'*

[7] C. Leadbitter, *Who will own the knowledge economy?*, "Political Quarterly", No. 69, 1998, p. 375-385.
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[11] J. Hudson, *Inequality and the Knowledge Economy: Running to Stand Still?* "Social Policy and Society", No. 5, 2006, p. 209.
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economic scenario[13]. In addition, *"innovation is a permanent feature….Human capital plays a decisive role, and the capacity to learn matters more than the level of knowledge. While secondary school certificates were the trump cards of industrialization, higher degrees are those of the knowledge economy. Lifelong training is essential"*[14].

Why we need human capital in knowledge-based economy

On a theoretical front, new growth theory predicts that physical investments should have a greater impact on productivity growth than traditional growth accounting would suggest, due to the positive externalities associated with such activities. The relevance of human capital accumulation to the process of economic development results from its potential beneficial impact on macroeconomic productivity and on the long-run distribution of incomes. The concept of ***total factor productivity*** (TFP) growth dates back to Tinbergen's work[15] which was followed by several others. However, these studies considered a non-frontier approach to calculating TFP growth. The frontier approach was introduced by Farrell[16]. It includes a parametric estimation (stochastic frontier or Bayesian) as well as a non-parametric estimation (data envelopment analysis or DEA). The non-parametric analysis of TFP will reveal which of TFP's components, efficiency change or technical change drives TFP for each country[17].

Boskin and Lau[18] find technical progress to be the most important source of growth for the developed world in the post-war period. Others, while accepting technological change as an important factor, attribute capital augmentation as the main force behind growth[19].

[13] *Knowledge Policy: Challengesforthe 21 st Century*, (eds.) G. Hearn, D. Rooney D., Cheltenham: Edward Elgar, 2008, p. 2.

[14] B.A. Lundvall, *The Learning Economy: Challenges to Economic Theory and Policy,* [in:] *Institutions and Economic Change*, (eds.) K. Nielsen, B. Johnson, Cheltenham, U.K.: Edward Elgar Publishers, 1998.

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Elsadig[20] demonstrates the role of TFP in achieving ***sustainable economic growth***[21] as has been described in the following studies. Firstly Rao and Preston[22] explained that the use of total factor productivity overcomes the problems of single productivity indicators such as labour productivity and capital deepening by measuring the relationship between output and its total inputs – a weighted sum of all inputs – thereby giving the residual output changes not accounted by total factor input changes. Being a residual, changes in TFP are not influenced by changes in the various factors which affect technological progress such as the quality of factors of production, flexibility of resource use, capacity utilization, quality of management, economies of scale and the like. The sustainability of higher economic growth is likely to continue to be productivity driven through the enhancement of TFP. Such enhancement needs to put an emphasis on the **quality of workforce**, demand intensity, economic restructuring, capital structure, technical progress and environmental standards.

Secondly, it has been documented in empirical work on economic growth by Solow[23] that after accounting for physical and human capital accumulation, "something else" accounts for the bulk of output growth in most countries. Both physical and human capital accumulations are certainly critical for economic growth. The process becomes more complicated with the role of knowledge in the economic growth process. Knowledge obviously accounts for a part of the growth that is not accounted for by the other factors of production; namely capital and labour. In growth theory, the Solow residual is an unexplained residual of labour and capital it is attributable to the growth of TFP[24]. TFP refers to the additional output generated through enhancements in the efficiency accounted for by such things as **advancement in human capital, skills and expertise, acquisition of efficient management techniques and know-how, improvements in an organization, gains from specialization**, introduction of new technology, innovation or upgrading of present technology and enhancement in information and communication technology (ICT). TFP can explain the growth in a knowledge-based economy (K-economy) because it captures endogenous technical change and other characteristics of the K-economy, including diffusion of knowledge,

[20] M.A. Elsadig, *The impact of ICT and human capital in achieving knowledge-based economy: applications on Malaysia's economy*, "World Review of Science, Technology and Sustainable Development", No. 3 (3), 2006, p. 270-283; M.A. Elsadig, *ICT and human capital role in achieving knowledge-based economy: applications On Malaysia's manufacturing*, "Journal of Information and Knowledge Management", No. 5 (2), 2006, p. 117-128.

[21] It's quite different than sustainable development idea.

[22] P.S. Rao, R.S. Preston, *Inter-factor substitution, economic of scale, and technical change: evidence from Canadian industries*, "Empirical Economics", No. 9 (4), 1984, p. 247-262.

[23] R.M. Solow, *The production function and the theory of capital*, "Review of Economic Studies", No. XXIII, 1956, p. 101-108; R.M. Solow, *Technical change and the aggregate production function*, "Review of Economic Statistics", No. 39, 1957, p. 312-320.

[24] The notion of TFP is interpreted as an index of all those factors other than labour and capital not explicitly accounted for but which contribute to the generation of output.

organization, restructuring, networking and new business models that would contribute to market efficiency and productivity. While intellectual capital can be gauged to some extent and incorporated into capital, there are many factors that explain growth in the K-economy that are not measurable at present. The size and performance of the TFP provide a clue to the extent of the performance of the K-economy. When growth accounts fail to consider improvements in the quality of labour inputs due to education, these improvements would be assigned to TFP. Unmeasured improvements in the stock of physical capital would also be assigned to TFP[25].

Relationships between human capital and academic entrepreneurship in knowledge-based economy

Let's start our considerations from entrepreneurship defined as the discovery, evaluation and exploitation of future goods and services[26]. Then knowledge-based entrepreneurship expresses itself through high-technology startups, corporate spinouts, and university spinoffs, constitutes an especially important subset of entrepreneurship. New knowledge-based enterprises have a high propensity for survival[27], attract early stage finance[28] and create new jobs while accelerating productivity[29]. Contributions of knowledge-based enterprises are based on the premise that new knowledge is a critical source of innovation, economic dynamism and growth[30].

While knowledge-based enterprises typically undertake little R&D they are particularly adept at tapping into knowledge created by universities and

[25] A. Elsadig, K. Geeta, *Human Capital Investment to Achieve Knowledge-Based Economy in ASEAN5: DEA Applications*, "Journal of Knowledge Economy", No. 4, 2013, p. 332-333.

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large corporations[31]. Policymakers have therefore sought to encourage the formation and growth of university spinoffs through numerous policies and programs[32].

The salient feature of the endogenous growth model introduced by Romer[33] and subsequently refined by Lucas[34] was the explicit inclusion of knowledge in the model rather than leaving it as an undetermined residual, as had been the case in the Solow model. Romer and Lucas, and others argue that knowledge was a key factor of production which, along with the traditional factors of physical capital and labor had a substantial impact on economic growth. Knowledge was considered to be particularly potent as a driver of economic growth because of its inherent propensity to spill over from the firm or university creating that knowledge to other firms and individuals who could apply that knowledge and enhance their productivity.

As the Romer economy replaced the Solow economy, or as the factor of knowledge became more important while the role of physical capital receded, the role of universities in the economy shifted from being tangential and marginal to playing a central role as a source of knowledge. Universities e.g. in the United States became not just viewed as institutions promoting social and cultural values but as key engines driving the growth of the economy. In the Solow economy where economic growth was achieved by combining unskilled labor with physical capital, the economic contribution of universities was marginal. As the Romer economy replaced the Solow economy a new role for the university emerged as an important source of economic knowledge[35].

The assumption implicit in the endogenous growth models that investments in new knowledge, either by firms or universities, would automatically spill over for commercialization resulting in innovative activity and ultimately economic growth has not proven to be universally valid. In fact, new knowledge investments must penetrate what has been termed "the knowledge filter" in order to contribute to innovation, competitiveness and ultimately economic growth. The knowledge filter is defined as the barrier or gap between the

[31] D. Audretsch, E. Lehmann, S. Warning, *University spillovers: Does the kind of science matter?*, "Industry and Innovation", No. 11 (3), 2004, p. 193-205; D. Audretsch, E. Lehmann, S. Warning, *University spillovers and new firm location*, "Research Policy", No. 34 (7), 2005, p. 1113-1122; A. Link, J. Rees, *Firm size, university based research, and returns to R&D*, "Small Business Economics", No. 2 (1), 1990, p. 11-24.

[32] R. Lowe, C. Gonzalez-Brambila, F*aculty entrepreneurs and research productivity*, "Journal of Technology Transfer", No. 32 (3), 2007, p. 173-194; S. Shane, *Academic entrepreneurship: University spinoffs and wealth creation*, Edward Elgar, Northampton, MA 2004.

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[35] D. Audretsch, *From the entrepreneurial university to the university for the entrepreneurial society*, "Journal of Technology Transfer", Vol. 39, Issue 3, 2014, p. 313-321.

investment in new knowledge and its commercialization[36].

The existence of the knowledge filter suggests that investments alone in research at universities will not suffice in facilitating the spill-overs that are requisite to generate innovative activity and economic growth. The universities needed to become more entrepreneurial in that they pro-actively engaged in entrepreneurial activity to facilitate knowledge spillovers for commercialization out of the universities[37].

Part of the response to creating the entrepreneurial university was the development of academic fields and areas of research that were not just focused on "*knowledge for its own sake*", which is the gold standard of scholarly inquiry under the model of the Humboldt University but rather oriented towards knowledge for the sake of solving specific and compelling problems and challenges confronting society. Thus, relevance and applicability emerged as the key guiding values in these new, externally oriented fields and areas of research, such as biochemistry, informatics and bioengineering.

The core of the university remains the basic disciplines, fields and academic traditions comprising the Humboldt University. However an additional strand of academic activity is added around that core with the primary focus on and mandate for providing solutions and applications to major problems confronting society or particular aspects of society.

The role of the university in the entrepreneurial society is broader than just generating technology transfer in the form of patents, silences and university-sanctioned startups. Rather, the mandate of the university in the entrepreneurial society is to contribute and provide leadership for creating entrepreneurial thinking, actions, institutions and entrepreneurship capital which is kind of human capital in this area.

The entrepreneurial university leaves the core Humboldt disciplines and research areas untouched, as well as all other parts of the universities that are not engaged in generating knowledge that might have a commercial application. Thus, something of a dichotomy emerges for the entrepreneurial university with certain parts of the university contributing to the commercialization mission while other parts alienated or at least not participating in this mission[38].

Conclusions

Our economic success depends on how well we exploit our most valuable assets: our knowledge, skills, and creativity. The comparative advantage of

[36] Z. Acs, D. Audretsch, P. Braunerhjelm, B. Carlsson, *The missing link: The knowledge filter and entrepreneurship in endogenous growth*, "Small Business Economic", No. 34 (2), 2010, p. 105-125; D.B. Audretsch, M. Keilbach, E. Lehmann, *Entrepreneurship and economic growth*, Oxford University Press, Oxford 2006.

[37] R. Lowe, C. Gonzalez-Brambila, *Faculty entrepreneurs and research productivity*, "Journal of Technology Transfer", No. 32 (3), 2007, p. 173-194.

[38] D. Audretsch, *From the entrepreneurial university to the university for the entrepreneurial society*, "Journal of Technology Transfer", Vol. 39, Issue 3, 2014, p. 313-321.

the industrialized world lies in more knowledge-based goods and services. Knowledge products possess distinct oddities which define them in contrast to traditional material products – knowledge products have high research and development costs, but often low to negligible material costs. Instead of manufacturing and physical production of objects, effort is expended in know-how and mechanisms and processes for creating and controlling knowledge, information and human capital.

The relevance of human capital accumulation to the process of economic development results from its potential beneficial impact on macroeconomic productivity and on the long-run distribution of incomes. Being a residual, changes in TFP are not influenced by changes in the various factors which affect technological progress such as the quality of factors of production, flexibility of resource use, capacity utilization, quality of management, economies of scale and the like. The sustainability of higher economic growth is likely to continue to be productivity driven through the enhancement of TFP. Such enhancement needs to put an emphasis on the quality of workforce, demand intensity, economic restructuring, capital structure, technical progress and environmental standards. TFP refers to the additional output generated through enhancements in the efficiency accounted for by such things as advancement in human capital, skills and expertise, acquisition of efficient management techniques and know-how, improvements in an organization, gains from specialization, introduction of new technology, innovation or upgrading of present technology and enhancement in information and communication technology (ICT).

The salient feature of the endogenous growth model introduced by Romer and subsequently refined by Lucas was the explicit inclusion of knowledge in the model rather than leaving it as an undetermined residual, as had been the case in the Solow model. Romer and Lucas, and others argue that knowledge was a key factor of production which, along with the traditional factors of physical capital and labor had a substantial impact on economic growth.

As the Romer economy replaced the Solow economy a new role for the university emerged as an important source of economic knowledge. The assumption implicit in the endogenous growth models that investments in new knowledge, either by firms or universities, would automatically spill over for commercialization resulting in innovative activity and ultimately economic growth has not proven to be universally valid. In fact, new knowledge investments must penetrate what has been termed "the knowledge filter" in order to contribute to innovation, competitiveness and ultimately economic growth. The knowledge filter is defined as the barrier or gap between the investment in new knowledge and its commercialization.

The existence of the knowledge filter suggests that investments alone in research at universities will not suffice in facilitating the spill overs that are requisite to generate innovative activity and economic growth. The universities needed to become more entrepreneurial in that they pro-actively engaged in

entrepreneurial activity to facilitate knowledge spill-overs for commercialization out of the universities.

The role of the university in the entrepreneurial society is broader than just generating technology transfer in the form of patents, silences and university-sanctioned startups. Rather, the mandate of the university in the entrepreneurial society is to contribute and provide leadership for creating entrepreneurial thinking, actions, institutions and entrepreneurship capital which is kind of human capital in this area.

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PART II

RESEARCH COMMERCIALIZATION

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COMPLEXITY OF ANALYSIS OF RESEARCH COMMERCIALIZATION IN THE EUROPEAN UNION

Keywords:

public research organization, technology and knowledge transfer, metrics of commercialization

Summary

Commercialization is an urgent issue in the European Union. Universities and other public research organizations try to commercialize their research, which is often funded from public sources. Then, an evaluation of performance of transfer of technology and knowledge from academia to market is needed. Presented paper investigates metrics of commercialization (i.e. transfer of technology and knowledge from academia to business). First step is desk research – several indicators were elaborated in database (of 117 records). Then, two sets of quantitative and qualitative indicators were selected as well as two case studies were prepared to examine if indicators are suited to measure performance in transfer of technology and knowledge of public research organizations in the European Union, which are not universities.

Case studies analysis resulted in an emergence of a problem, i.e. absence of data. It is an effect of inactivity or an absence of evaluation in commercialization. The paper concludes that these metrics are not suitable for specific types of research organizations, as they cannot measure their performance in transfer with them.

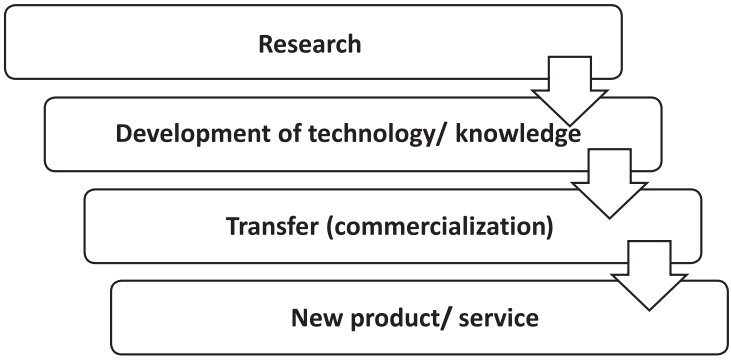
Definition and measurement of transfer of knowledge and technology from academia to industry

Technology and knowledge, developed at universities and other research organizations, play essential role in the growth of the economy due to business activities of entities, which commercialize technology and knowledge in a form of new products and service available for customers, or more broadly, for citizens. The paper focuses on public research organizations, which can be

defined as specialized technology research organizations and higher education institutions that engage in research, development and research training activities with main funding support from public and quasi public-sources[1].

For the purpose of the paper definition of knowledge and technology, elaborated by Holi, Leeuwen and Wickramasinghe, was used[2]. The analysis for United Kingdom framed knowledge and technology as subjects of transfer. Then, knowledge transfer (KT) is described as the process of the application of *knowledge, expertise and intellectually linked assets of Higher Education Institutions* beyond higher education. Technology transfer (TT) was presented as *the process of developing practical applications for the results of scientific research*, identified and commercialized by technology transfer offices and other dedicated bodies in universities, governmental organizations and companies. Commercialization is a long-term process, in which the crucial phase is an introduction of a new product or service to a market. This moment is preceded as well as followed by a number of other steps e.g. development of research project, preparation of technology prototype, licensing-out[3]. Balkin *et al.* reason then that foundations of commercialization are: a familiarity of new technologies and an acquaintance of market needs[4].

Figure1. Process of elaboration, development and commercialization of technology and knowledge



Source: own elaboration.

[1] P. David, S. Metcalfe, *Universities and Public Research Organizations in the ERA. Fulfilling universities' critical societal roles in the advancement of knowledge and the support of sustained innovation-driven economics growth in Europe, Third Draft of The Report prepared 8th June 2007 Brussels Meeting of the EC (DG-Research) Expert Group on "Knowledge and Growth"*, http://ec.europa.eu/invest-in-research/pdf/download_en/metcalfe_report5.pdf, [15.06.2015].

[2] M. Holi, M. Leeuwen, R. Wickramasinghe, *Metrics for the Evaluation of Knowledge Tranfer Activities at Universities*, Library House Cambridge 2008.

[3] K. Klincewicz, *Zarządzanie technologiczne. Przypadek niebieskiego lasera*, Wydawnictwo Naukowe Wydziału Zarządzania Uniwersytetu Warszawskiego, Warszawa 2010.

[4] D.B. Balkin, P.T. Gianiodis, G.D. Markman, Ph.H. Phan, *Innovation speed: Transferring university technology to market*, Research Policy, no. 34, 2005, p. 1058-1075.

Four main models of technology and knowledge transfer from academia to industry (university technology transfer, abb. UTT) can be distinguished[5]:

- push model – proposed by J. Schumpeter, focused on supply factors of technology and science, which has a linear character,
- pull model – created by J.A. Schmookler, emphasizing the demand for technology,
- dynamic models – technology transfer is seen as a continuous process from the invention of the idea to its implementation and dissemination. It is not a single act, but a complex activity,
- interactive models – these models emphasize the role of product, planning and management, and focus on particular phases of innovation process.

Bradley, Hayter and Link reflect traditional process of technology and knowledge transfer from universities to market and discuss their efficacy, concluding that there is possibility to introduce alternative process management of university technology transfer[6]. Traditional model of UTT embraces seven main phases, from invention by scientist through an acquisition of patent and negotiations with companies to finally a creation of spin-off entity or an adaption of technology by one of the existing market enterprises. Authors enumerate limitations of such model, separating them into two major categories: inaccuracies (*in. a.* strict linearity, overemphasis on patents) and inadequacies (*in. a.* organization culture, reward systems).

Transfer of technology and knowledge between academia and business embodies its evaluation and measurement of effectiveness of diffusion. In such case, problem of its measurement is present. A review of literature proposes principally quantitative indicators such as the latest list of OECD for benchmarking of knowledge transfer and commercialization[7]. It embraces four categories with quantitative indicators *in. a.*: business-funded R&D in higher education sectors, invention disclosures, licensing income, commercialization activities by academics, cross-sector mobility of authors. Analyses of the European Commission[8] or UNICO[9] for the government of the United Kingdom embrace also quantitative indicators, even if they propose some

[5] *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, (ed.) K. Santarek, Polska Agencja Rozwoju Przedsiębiorczości, Seria Innowacje, Warszawa 2008.

[6] S. Bradley, Ch. Hayter, A. Link, *Models and Methods of University Technology Transfer*, Now Publishers Incorporated 2013, http://bae.uncg.edu/assets/research/econwp/2013/13-10.pdf, [15.06.2015].

[7] OECD, *Benchmarking knowledge transfer and commercialisation, in Commercialising Public Research: New Trends and Strategies*, OECD Publishing 2013, http://dx.doi.org/10.1787/9789264193321-6-en, [15.06.2015].

[8] European Commission, *Metrics for Knowledge Transfer from Public Research Organisation in Europe*, Luxembourg 2009.

[9] M. Holi, M. Leeuwen, R. Wickramasinghe, Metrics for the Evaluation of Knowledge Tranfer Activities at Universities, *Library House* 2008, p. 1-33.

metrics related to quality of transfer of technology and knowledge. However, in such a case, it is analysed relatively, usually expressed as percent or rate.

Several reports focused on measurement of transfer of technology and knowledge emphasize primarily quantitative aspects. Presented systems of metrics of transfer allow to measure and estimate results of commercialization. As they use mainly numerical values (e.g. outcome of an agreement, total expenditures of an organization), then results are usually reduced to a single number or a group of numbers, e.g. average revenue of commercialization. Grant presents it as a conflict between income and effectiveness[10].

Research design

In order to meet the main goal of the paper, two sets of metrics were prepared. Indicators needed to validate the following conditions, to be:

- scalable – from analysis of single unit up to overview of organization,
- applicable – to every entity, i.e. there are not any indicators, which could not be used to any type of entity,
- comparable and,
- verifiable – irrespective of quality of data (not competed, different information) metrics allow to compare cases and verify their activity.

Desk research was done by identification of metrics by systematic literature review, elaboration of set of strings and searches in academics databases and collection of metrics (raw data embraced 117 indicators). Then, by expertise of author, organization, analysis and selection of databases of metrics were done.

Two sets of metrics were finally selected, which offered different angles of measurement of technology and knowledge transfer, i. e. quantitative and qualitative (table 1). As first set were used metrics proposed by European Commission (core and supplementary) and as second – by UNICO (only *measures of quality*), which were aforementioned in previous section of the paper. Both sets of indicators met requirements of validation. Both, UNICO and EC, has recognized nine main groups of methods (channels) of transfer of knowledge and technology from research organizations to business. Metrics were primarily designed to evaluate TT and KT of universities.

EC has confirmed that measurement of all transferred knowledge is *virtually impossible*[11]. It concludes it can be evaluated by price or/and by a number of activities. Also, EC is aware that it can be difficult to monitor a flow of knowledge. Metrics of EC embodies a proposition of survey, which should be conducted by research organizations (e.g. by Knowledge Transfer Office), to identify transfer as well as size, costs, revenues, etc. of technology and knowledge.

[10] G. Grant, *Benchmarking University Technology Transfer Programs*, University of North Texas Health Science Center, Office of Research and Biotechnology, Fort Worth 2010.

[11] European Commission, *Metrics for Knowledge Transfer from Public Research Organisation in Europe*, Luxembourg 2009, p. 7.

Table 1. Selected metrics for performance analysis of technology and knowledge transfer

Methods of knowledge and technology transfer	Core and supplementary indicators of Euroepean Commission	Measures of quality of UNICO
Networks and knowledge transfer	Knowledge transfer involving SMEs, knowledge transfer involving domestic firms, knowledge transfer involving the research organisation's own region1	% of events held which led to other Knowledge Transfer Activities
Continuing Professional Development (CPD)	Not defined	% of repeat business, customer feedback
Consultancy	Number of consultancy contracts for SMEs	% of repeat business, customer feedback, quality of client company, importance of client relative to their company
Collaborative Research	Research agreements	% of repeat Business, customer feedback, # of products successfully created from the research
Contract Research		% of repeat Business, customer feedback, # of products successfully created from the research
Licensing and patentins	License income earned , licences executed, patent grants, patent applications, exclusive licenses, share of valid patent portfolio that has ever been license, patent share of license income, technology areas for patenting	Customer feedback, quality of licensee company, % of licenses generating income
Spin-outs and innovation	Spin-offs established, invention disclosures, research expenditure in the last year, research personnel in the last year	Survival rate, quality of investors, investor/ customer satisfaction, growth rate

Teaching	Not defined	Student satisfaction (after subsequent employment), employer satisfaction of student

Source: elaboration on European Commission, Metrics for Knowledge Transfer from Public Research Organisation in Europe, Luxembourg 2009 and M. Holi, M. Leeuwen, R. Wickramasinghe, Metrics for the Evaluation of Knowledge Tranfer Activities at Universities, *Library House*, 2008, p. 1-33.

Case study analysis

For the goal of the paper, to *test* quantitative and qualitative metrics, two case studies were developed. Data for elaboration of case studies was obtained by semi-structured interviews in 2013[12]. Desk research, which completed the investigation, was conducted in 2015. Both cases are public research organizations, however, they are not universities. They can be used as examples of commercialization in the European Union.

Center Health Policy and Public Health plays a role of public research organization and business support institution. It is focused on research of social problems (e.g. health of society) and provides solutions or recommendations to public bodies. It does not work directly for business, however, companies are not restrained to contact with research organization and cooperate if they would like to make contract with national and local government. In such a case, the organization commercializes research by partnerships with business to introduce them to citizens, e.g. developed software application. Entity is located in Cluj-Napoca in Romania. Performance of technology and knowledge transfer of subject was presented in table (table 2).

Table 2. Assessment of technology and knowledge transfer of Center Health Policy and Public Health

	EC	UNICO
Networks and knowledge transfer	Not-defined by EC	Participated in 55 conferences (2007–2012)
Continuing Professional Development (CPD)	Not-investigated by EC	Not-identified or inactivity
Consultancy	None	Not-identified or inactivity
Collaborative Research	33 research agreements (2015)	Realizing five projects with goal of developing products from the research
Contract Research		

[12] Used data was obtained during research in 2013 for PhD thesis, named *Transfer of knowledge and technology between small and medium enterprises and academia in the European Union*. Planned publication of PhD thesis is Q4 2015.

Licensing and patentins	None	Not-identified or inactivity
Spin-outs and innovation	No established spin-outs and invention disclosures 25 employers, 40 collaborators research budget: 2.079.292 Euro (for 2007–2012)	Not-identified or inactivity
Teaching	Not-investigated by EC	Not-identified or inactivity

Source: elaboration on research data.

Cluster de Biomedicina y Salud (Cluster of Biomedicine and Health) can be framed as soft facilitator of transfer of knowledge and technology between university and business. Then, it plays a role between cluster, technology research center, technology transfer office and knowledge supplier. It is project-oriented specialized intermediary organization. The entity cooperates with public organizations as well as with business. Research is commercialized, if possible, as spin-offs. The subject focuses on sharing information (workshops, conferences, newsletter) and supporting collaboration of networked groups of researchers and companies providing *in. a.* prepared technology transfer platform It is located in Oviedo in Asturia in Spain. Performance of technology and knowledge transfer of subject was presented in table (table 3).

Table 3. Assessment of technology and knowledge transfer of Cluster de Biomedicina y Salud

	EC	UNICO
Networks and knowledge transfer	Not-defined by EC	Four events held (to 2012)
Continuing Professional Development (CPD)	Not-investigated by EC	Not-identified or inactivity
Consultancy	several	Not-identified or inactivity
Collaborative Research	several	a number of technology platforms for spin-offs
Contract Research		
Licensing and patentins	No data available	Not-identified or inactivity
Spin-outs and innovation	9 companies a number of employers and over 100 networked research groups Other data not available	Not-identified or inactivity
Teaching	Not-investigated by EC	Not-identified or inactivity

Source: elaboration on research data.

Comparison of two systems of metrics – quantitative and qualitative

The first goal of analysis of case studies was to explore primary issues of mismatch of metrics and transfer of technology and knowledge itself. As used indicators were designed for public research organizations, then they should be applicable to any entity, which plays such a role. Over the case studies analysis, two problems can be noticed:

- absence of evaluation of transfer processes by subjects in some areas,
- absence of activity of subjects, in some areas.

Therefore, question should be stated: how to measure transfer of technology and knowledge, if entities do not monitor a part of effects or are not active in some areas? This problem could be solved by introduction of assessment of technology and knowledge transfer in order to measure every component of area activity. On the other hand, it can result in increase of costs of entity – expenses of evaluation of transfer can be higher than revenue of transfer itself if it would be necessary to adapt complex system.

The second problem, concerning incomparability of entities with various processes, can be solved by focusing on core and supplementary indicators, as was proposed in metrics of European Commision. Core indicators, however, should not embrace only quantitative results, e.g. patents or licences. They are not applicable to every entity as presented case studies and other small public research organizations. Despite that these small research public organizations can be effective as research units, they cannot be ranked due to incompatibility of metrics.

Present metrics should be completed with indicators to measure the effectiveness of transfer, which would be distinguished from quantitative and qualitative analysis of outcomes and revenues. This allows to consider transfer of technology and knowledge as complex process, which can be framed in three major groups of indicators: scope of transfer, competence of management and value of cooperation. A proposal of such metrics can include indicators as mode of transfer (active, passive)[13] or variance of channels and methods of transfer of technology and knowledge[14] and collaboration[15].

[13] L.N. Mogavero, R.S. Shane, *What Every Engineer Should Know About Technology Transfer and Innovation*, Marcel Dekker Inc., New York 1982.

[14] A. Lilles, M. Seppo, *Indicators Measuring University-Industry Cooperation*, "Discussions on Estonian Economic Policy", vol. 20, issue 1, 2012, p. 204, http://ssrn.com/abstract=2194394, [15.06.2015].

[15] A. Comacchio, S. Bonesso, *Performance Evaluation for Knowledge Transfer Organizations: Best European Practices and a Conceptual Framework*, INTECH Open Access Publisher, 2012, http://www.intechopen.com/books/management-of-technological-innovation-in-developing-and-developed-countries/performance-evaluation-for-knowledge-transfer-organizations-best-european-practices-and-a-conceptual, [15.06.2015].

Conclusions

Quantitative measurement of transfer of technology and knowledge between academia and business is basis for assessment of quality of development of innovation. Conducted study indicates that quantitative assessment of technology and knowledge transfer is not difficult, however, yet elaborated metrics do not meet requirements of some of public research organizations, as presented case studies. The absence of data is the major problem. Even if it would be present, then it might not represent quality of innovation diffusion. It can be paraphrased as: *nobody really wants twitter followers* as research unit.

Another issue is concerned within the effort to evaluate technology and knowledge transfer by qualitative indicators. It requires deep-depth analysis, which cases, and probably other similar entities, do not do. To conclude, present metrics of TT and KT should be redefined as they do not fill the planned role – it is very difficult to measure transfer with them, if entity is not an university.

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PRE-COMMERCIAL PROCUREMENT IN THE PROCESS OF RESEARCH AND DEVELOPMENT (R&D) COMMERCIALIZATION

Keywords:

pre-commercial procurement, commercialization, Research&Development, Innovation, public procurement of innovative solutions

Summary

There is a variety of the rationales for PCP. It shall be emphasized, that thanks to the PCP the activity in the sector of R&D is stimulated. It may create positive externalities, which are potential spin-offs and leakages of knowledge that benefit other entities in the market. PCP shall especially support small and medium entrepreneurs, which usually do not have enough capital for exploring new, innovative ideas. It is worth mentioning, that the entrepreneurs are solely responsible for a possible commercialization.

PCP and other policy instruments stimulating innovation could lead to create new firms what means new jobs. PCP is one of the tool for stimulating technological or service solutions and at the same time boosts he competitiveness of SMEs and European industry. PCP is an instrument, which should be popularised in Poland. The pilot project is running by the National Centre for Research and Development, but the progress in the project is rather insignificant[1].

Introduction

Regardless of the geopolitical and macroeconomic situation there are three topics, which are the backbone of each edition of the strategy regarding the action of all the EU states. These are: support for small and medium-sized enterprises, cooperation of science and business, searching for the recipes for important societal challenges. Actually knowledge is the main source of social prosperity and replaces labor and capital. The ability to create knowledge and

[1] http://www.ncbir.pl/zamowienia-w-procesie-pcp, [10.05.2015].

transform it into new products, services and technologies determines the market success of enterprises and the whole economy. Under these conditions, creativity, innovation and entrepreneurship are the core of the business development strategy.

Innovation is a mean to support the above mentioned areas and at the same time to strengthen the competitiveness of the European Union in the world. Buying innovative products, goods and services plays a key role in improving the efficiency and quality of public services while addressing major societal challenges. It contributes to achieving best value for public money as well as wider economic, environmental and societal benefits in terms of generating new ideas, transforming them into innovative products and services and thus promoting sustainable economic growth.

Terms

According to the literature the term "the commercialization of results of scientific research and development works" or shortly commercialization of the knowledge should mean: "to ensure that something that has potential value and ability to generate profit, it will be sold, manufactured, made available or used for profits or create a capital"[2]. According to the definition included in the dictionary commercialization means: something which is based on a commercial rules, setting profits[3]. Other literature definition of the cited term refers to the term as to "all activities related to the transformation of knowledge into new products, technologies and organizational solutions"[4]. Consequently there are two meanings of the term commercialization. According to a broad sense it means moving all activities related to the knowledge into economic practice. In the narrow sense it is the transmission of the knowledge and skills to the production process, which aim is creating a successful product[5]. Commercialization starts with a creation of an invention and ends at the moment of its implementation and generating profits. Therefore subsequent invention can be financed. Commercialization should be a permanent strategy element of the companies[6].

In the Polish and European Law there is no legal definition of the Pre-Commercial Procurement (PCP). The European Commission defines the PCP

[2] *Komercjalizacja wyników badań naukowych – krok po kroku*, (ed.) D. Markiewicz, CTT Politechnika Krakowska, Kraków 2009, p. 39.

[3] *Cambridge advanced learner's dictionary,* Cambridge University Press, 2003.

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[5] M. Makowiec, J. Ortyl, *Komercjalizacja innowacyjnych rozwiązań opracowanych w ramach prac badawczo-rozwojowych na przykładzie branży chemicznej*, Zeszyty Naukowe Uniwersytetu Szczecińskiego, No. 786, Finanse, Rynki Finansowe, Ubezpieczenia, No. 64/1, 2003, p. 583.

[6] M. Cupiał, A. Szeląg-Sikora, M. Makowiec, *Znaczenie zaufania w procesie komercjalizacji badań naukowych*, p. 113, http://zif.wzr.pl/pim/2012_4_1_8.pdf, [10.05.2015].

as procuring research and development of new innovative solutions before they are commercially available. It should allow public authorities to steer the development of new solutions directly towards their needs[7]. It means that public sector should stimulate the researchers who can be the small and medium entrepreneurs. The form of running a business is indifferent from the point of view of the PCP. It is important to have ability to create innovative solutions. PCP is open only to the participation of firms as suppliers, i.e. other agents, who are excluded in the innovation system[8]. In PCP projects the universities are able to take part as experts in a technology evaluation.

In 2004 the French, German and British governments issued a position paper to the European Council calling for the use of public procurement across Europe to spur innovation. This movement was continued and manifested in various reports, which identified several application areas where innovation plays a key role: e-Health, pharmaceuticals, energy, environment, transport and logistics, security and digital content[9]. The term PCP was firstly mentioned in the statement of the European Commission dated 2007. After that date started the procedure to work up the solutions needed for applying innovative products connected with improving of the public services. In 2010 a first competition was published (7 call) on joint ventures PCP in several specific areas (remote access service information care for patients and solutions in the field of robotics for the elderly). Eighth competition referred to the area of increasing the quality of public services using the knowledge in the field of photonics[10]. The basis for the commencement of the PCP's procedure is to recognize the need to resolve significant socio-economic problem or need which are impossible to solve with the products existing on the market. PCP means ordering the development of the prototype's concept or narrow part of the products being the results of earlier taken R&D. As the example of PCP is the project Smart@Fire. Its aim is to reduce the risks associated with fire fighting, innovative ICT-solutions need to be developed and integrated in the smart Personal Protective System. It is emphasized, that the current ICT-solutions available on the market do not yet provide full satisfaction[11].

Taking into consideration the meaning of commercialization and the definition of the pre-commercial procurement it is clear that that pre-commercial procurement can lead to commercialization, but it will always be the instrument, which "involves the purchase of research by a contracting authority which the contracting authority undertakes with the objective of stimulating innovation that the contracting authority or some other party may

[7] http://ec.europa.eu/digital-agenda/en/pre-commercial-procurement, [10.05.2015].

[8] Ch. Edquist, J.M. Zabala-Iturriagagoitia, *Why Pre-Commercial Procurement is not Innovation Procurement*, (unpublished), paper no. 2012/11, CIRCLE Lund University 2012, p. 6.

[9] Ibidem, p. 3.

[10] S. Sawin, *Przedkomercyjne zamówienia publiczne – zagadnienia praktyczne i uwarunkowania prawne*, [in:] *Innowacyjne i przedkomercyjne zamówienia publiczne*, Warszawa 2012, p. 8, 9.

[11] See more: http://www.smartatfire.eu/.

benefit from at a later stage when goods or services not currently available are developed from the outcomes of the research"[12].

Pre-commercial procurement – regulation

According to the Directive 2004/18/EC and the new Directive 2014/24/EU of the European Parliament and of the Council of 26th February 2014 on public procurement[13] and repealing Directive 2004/18/EC pre-commercial procurement are out of the scope of mentioned directives. In the new directive it was emphasized, that research and innovation, including eco-innovation and social innovation, are among the main drivers of future growth and have been put at the centre of the Europe 2020 strategy for smart, sustainable and inclusive growth[14].

There is no obligation of using public procurement law on the level of the EU and also on the national level to PCP. The Polish Procurement Law Act (dated 29th January 2004)[15] states, that it does not apply to services within the subject-matter and scope of research and development and provision of research services that are not wholly remunerated by the contracting entity or whose results are not the exclusive benefit of the contracting entity's own business (article 4 point 3 letter "e"). Firstly we have to answer the question if the subject of the order are services within the subject-matter and scope of R&D. Therefore there is a need to analyze every case separately and in accordance with legal definitions included especially in legal act considering rules on financing of science (dated 30th April 2010). The scope of PCP is R&D services only. R&D can cover activities such as solution, exploration and design, prototyping, up to the original development of a limited volume of first products or services in the form of a test series. R&D does not include commercial development activities such as quantity production, supply to establish commercial viability or to recover R&D costs, integration, customization, incremental adaptations and improvements to existing products or processes[16].

One of the advantage and essential feature of PCP is that the public purchaser does not reserve the R&D results exclusively for its own use: Public authorities and industry share risks and benefits of the R&D needed to develop new innovative solutions that outperform those available on the market. It indicates, that the statutory requirements are fulfilled and the use of directives

[12] J. Rigby, *Review of Pre-commercial Procurement Approaches and Effects on Innovation*, Manchester Institute of Innovation Research Manchester Business School, University of Manchester, 2013, p. 7.

[13] The Directive 2014/24/EU replaced the Directive 2004/18/EC, dated 31st March 2004. Its validity ends 18th April 2016.

[14] Point 47 of the preamble of the Directive 2014/24/EU.

[15] Consolidated text: Dz. U. 2013, position 907 with changes, further called as: PPL Act.

[16] European Commission's communication: *Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe*, (Brussels, 14.12.2007 COM 2007:799 final), p. 2, 3.

and PPL Act is excluded. It is worth noting, that also the second requirement is fulfilled, because the public authorities do not wholly finance the R&D services and the firms receive only partly the financial support for running the R&D.

Phases of the PCP

There is a pre-phase before starting the PCP procedure, which is public market consultations. It should help finding the real need solving the existing problem. In practice, it could be workshops[17] or market consultations involving many entities all over the Europe[18]. In the project called Smart@fire the first phase of the whole procedure was market consultations, which took place in Brussels, Marseille and Dortmund. Project implementers indicate that the suppliers acquire knowledge about the needs and intentions of the procurers. On the other side the procurers obtain the necessary information to evaluate whether their own innovation needs can be developed by the suppliers and which technological R&D efforts remain. Thanks to the consultations the bridge is created between the demand and supply side, and therefore an opportunity for a structured interaction between the market and contracting authority. There should be made an evaluation which enables to answer the question, if there is a potential to create innovative solutions tailored to public sector needs.

After the consultations the proper first phase of PCP process starts. It may involve a pre-study or "solution exploration" where several different solutions are explored (e.g. solutions presented by supplier A, B, C, D). A second phase may include prototype development of the solutions that are judged as the most promising (e.g. solutions presented by the supplier A, B, C). This can be followed by the development of a limited volume of first products/services of the remaining solutions.

The procurement directives and also PPL Act are not applicable to these phases. It is important to retain at least two participating firms until the last phase of PCP. It ensures a future competitive market. "Maintaining a positive competitive pressure on suppliers enables public purchasers to extract the

[17] The National Health Resources Service Blood &Transplant – the entity in the United Kingdom who manages the Blood Donating Service had a problem in running the service efficiently. Every day over 300 blood donors fainted during the process, turning them from a donor into a patient. The treatment of these patients was complex because the ideal position for blood donating is the opposite of that for treatment of the fainted donors. It impacts on the other waiting donors. The entity organised a „Wouldn't it be Great If...?" seminar to capture the real need. The undiscovered before need was the modification of donating chair, which could be rapidly converted to a recovery position bed. R. Lucas, A. Vulcano, B. Jacobsen, *Innovative PROcurement techniques to support the GRowth of competitivness for public services in EASTern Europe*, 2013, p. 33.

[18] The entities can be the representatives of public and private sector, for example universities, small and medium entrepreneurs.

best solutions the market can offer while avoiding single supplier lock-in"[19]. The public procurement law (directives and PPL Act) refers to the phase of commercialization of products/services, which means that public procurement shall be carried out for commercial roll-out of the products/services. This implies that the private supplier will share the risk of the R&D, and that the public authority will not be required to purchase the result of the R&D. It should be emphasized that not every innovation and new technological solution, while desirable from a scientific point of view, will be used on the market[20].

Benefits of PCP

One of the most advantageous remarks of the PCP is ordering R&D without the exclusive assignment of the rights to the public authority. It allows the firms to invest in further commercialization. Procuring non-exclusive developments leads to widen the competitiveness, because the public authorities can cooperate with many potential suppliers. Therefore it does not lead to locking public authorities to one supplier. If benefits shared include intellectual property rights (IPRs), it should be regulated in a way that does not give the firms any form of an unfair advantage in possible future procurements and that enables the public authorities to access a sufficiently large and competitive supply chain, e.g. the public purchaser can demand a free licence to use the R&D results for internal use, or IPRs left to firms in return for royalties on future sales[21].

Public purchaser involvement from the early R&D phases is likely to deliver better value for money. The public purchasers are able to influence the all phases of R&D, e.g. assessing the performance of working prototypes and test products in a real operational customer environment. The other important reason is that an earlier reality check of industry R&D against concrete public purchasing needs maximizes the effectiveness of the R&D process and optimizes R&D spending[22].

PCP is a tool challenging the market in a transparent and equal way. The firms are invited to develop the best possible solution fulfilling public needs. PCP is a long-lasting process, e.g. in the practice there is a SILVER project which is a development project funded by the European Commission under the Seventh Framework Programme for research and technological development

[19] *Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe*, (Brussels, 14.12.2007 COM 2007:799 final), p. 9.

[20] M. Cupiał, A. Szeląg-Sikora, M. Makowiec, *Znaczenie zaufania w procesie komercjalizacji badań naukowych*, p. 113-114, http://zif.wzr.pl/pim/2012_4_1_8.pdf, [10.05.2015].

[21] *Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe*, (Brussels, 14.12.2007 COM 2007:799 final), p. 7. See also presentation of: S. Bedin, *The economic rational of PCP in practice: Lombardy Region implementation under the spotlights*, Kraków 2013.

[22] *Pre-commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe*, (Brussels, 14.12.2007 COM 2007:799 final), p. 8.

(FP7). The project started in January 2012 and will run for 56 months. PCP is a stepwise process, including evaluations after each R&D phase, in order to select progressively the best solutions[23].

Using PCP's tool enables exploring and comparing pros and cons of alternative solutions, for example about functional needs and performance requirements on the demand side, and the capabilities and limitations of new technological developments on the supply side. The process of learning is very important, because the results of the PCP's process shall be satisfactory for both sides. In the procedures regulated by the procurement directives and PPL Act, which also can guarantee innovative solutions, usually the emphasis is on the learning of the public purchaser and collecting as much information as possible from the suppliers.

In PCP approaches the essential elements are, that "the contracting authority must not acquire exclusive rights to the development; and the contracting authority must not bear all the costs of the procurement." Bearing the costs of R&D also by the firms participating in the PCP projects should stimulate the engagement in running the R&D and also is a justification for the regulating the IPR's in a way that guarantee the flexibility - the public authority do not have exclusive IPRs.

Difference between PPI and PCP

It is worth noting, that the term PCP does not mean procurement of actual goods and services. PCP is often mixed up with another policy instrument, namely public procurement of innovative solutions (PPI)[24].

According to the definition of the European Commission the PPI implies stimulation of innovation by bringing innovative commercial end-solutions earlier to the market. Contracting authorities, acting as the first buyer or lead customer, can purchase innovative goods or services which are not yet available on large scale commercial basis and may include conformance testing. It should be emphasized that PPI is a procurement of innovative products or services so the directives on public procurement apply to PPI unlike PCP. The public entities have to answer the question, if they wish to acquire innovative products or services on a commercial scale, as part of the same procedure. When the answer is "no" then PCP should be chosen and if "yes" then the PPI should be used. The new directives on public procurement open up a number of opportunities for PPI, while maintaining the basic requirements of competition, transparency and equal treatment[25]. Three new procedures are likely to be particularly relevant for

[23] http://www.silverpcp.eu/project-overview, [10.05.2015].

[24] Read more about mixing the terms of PPC and PPI: Ch. Edquist, J.M. Zabala-Iturriagagoitia, *Why Pre-Commercial Procurement is not Innovation Procurement*, (unpublished), paper no. 2012/11, CIRCLE Lund University 2012, p. 4.

[25] The basic requirements of competition, transparency and equal treatment should be also guaranteed in PCP procedure.

authorities who wish to purchase innovative goods, services or works, which are: the innovation partnership, the competitive procedure with negotiation and the competitive dialogue.

PCP does not involve the procurement of goods that currently exist, which is why the approach has been viewed as not belonging *per definitionem to the family of demand side policies*[26]. For sure the PCP can be regarded as demand-side policy instrument in relation to R&D. In contrast, PPI is considered as demand-side instrument in relation to products, services and works[27]. PPI takes place in situations, where products or services exist or are close to existing. The example of PPI in Poland, which is well known all over the Europe, is procurement on bio-based fibre boosts uniform performance where the public purchaser was Rawicz County Hospital[28].

Findings and conclusion

EU countries, including Poland, aim to develop effective methods for the implementation of innovative solutions, that are designed to stimulate the economy, as well as give impetus to the development of SMEs. Pre-commercial procurement is a tool for procuring R&D, which can result in creating innovation solutions used in public and private sector. However, they do not necessarily lead to commercialization. Commercialization and pre-commercial procurement are defined in the first part of the article. The regulations relating to pre-commercial procurement and the benefits of using PCP were also presented. The key differences between PCP and PPI were pointed out.

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COMMERCIALIZATION OF INNOVATIVE SOLUTIONS DEVELOPED UNDER RESEARCH AND DEVELOPMENT ON THE EXAMPLE TOURISM, RECREATION AND WATER SPORTS[1]

Keywords:

commercialization of research, intellectual property protection, commercialization models, spin-offs, spin-outs, third generation university

Summary

This article presents the path of scientific research commercialization with an emphasis on technology research and research conducted in the field of tourism and recreation area and water sports. Especially in this day and age, scientists should work closely with the business environment units, with teams specialized in legal activities, marketing and economic. It was not until the creation of the appropriate team for the commercialization and taking into account many different aspects concerning. Among others, intellectual property rights, choosing the most optimal method of commercialization can decide for achieving success on the difficult path of implementation research into economic practice. In this paper the authors present the main aspects related to the protection of intellectual property and the methods of commercialization of research results carried out in collaboration with universities, which include, among others the appointment of spin-offs and spin-outs.

Introduction

In the era of rapid progress of civilization and the development of new

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generation technology, it is becoming increasingly common to improve the competitiveness of production, as well as the importance of modern technologies implementation and appropriate resource management expertise and capital to stimulate innovation and to improve the functioning of enterprises. These phenomena are increasingly being perceived in Poland.

Very often the continuous development of modern technological and industrial fields owes its origin to hundreds of thousands of scientists working around the world[2]. It is often in small laboratories, often far away from the hustle and bustle of cities and everyday life, where promising ideas are produced, and for a while they can see the light of day – it will be possible to make a purchase at nearest shop, in the form of eg. a new mobile phone model that would shortly thereafter become such a critical innovation.

As an example we can present beacon – i.e. sensors that communicate with mobile phones. These sensors, transmitters are small microcomputers that use Bluetooth technology to communicate with smartphones. These devices enable precise location in places where typical GPS is not accurate enough, or does not reach for example indoor[3].

Beacons may have hundreds of uses, both those affecting the sale of products and services (promotion and marketing), as well as those non-profit that solve specific problems, making it easier for people to arranging everyday affairs.

Identifying other examples of very interesting innovations that arise and develop in our country, what is important, in research centers or research units, it should be noted, for example a new method for the rapid detection of sepsis which was developed by researchers at the Jagiellonian University. Thanks to this, six hours is sufficient to detect blood fungi and bacteria that may lead to a systemic inflammatory response syndrome, infection-induced or sepsis. This greatly speeds up the application of effective therapy by physicians. The new method has already been patented but it is not yet been used in the diagnosis. Clinical studies are conducted on a large group of patients. This unfortunately costs a lot, so scientists are looking for entrepreneurs ready to give funds. Then the method could hit medical practice for two or three years[4]. It should be noted that this method has already been recognized as the best in the competition "Eureka! – Polish discover inventions" and its creators received prizes of 30 and 50.000 PLN for an advertising campaign.

You could say that the link between innovation policy research and development is obvious. The essence of innovation or invention boils down to trying to deploy it in industry or in the market because only there it can become really useful.

[2] B.M. Marciniec, *Rola parków naukowo-technologicznych w rozwoju małych i średnich przedsiębiorstw*, Wydawnictwo Poznańskie, Poznań 2007, p. 15.

[3] *Beacony lepsze niż GPS*, [in:] „Rzeczpospolita", of 07.07.2015 r., p. B7.

[4] *Polski wynalazek pomoże lekarzom*, [in:] „Rzeczpospolita", of 07.07.2015 r., p. A 10.

Entrepreneurial Universities and their impact on innovation in the economy

Universities, next to the main task – the education of students, are undoubtedly creators of many solutions and innovative ventures (patents, expertise, know-how). Often, they have a unique research resources (specialized laboratories, machine access to extensive and thematic databases and knowledge bases), in the end they have often unique workers, researchers, scientists, often very well educated and experienced knowledge workers. This allows to have direct impact on the development of cities, regions and the whole country in which it is possible to use the described potential through the implementation of various projects and initiatives. It is also possible to obtain the indirect effect through the establishment of academic enterprises that while engaging in the manufacture innovative products and provide specialized services, may affect the improvement of innovation in the economy.

Thus modern universities and the world of science become the driving force of economic development but within the XXI century university a compromise between innovative mechanisms of academic centuries-old traditions and science sector is needed (freedom of research, impact on market and culture development). Thus, the construction of a modern university should not rely on the university conformed to profit-oriented enterprises.

There was a notion of "third generation university", which means a new model of higher education, active in the area of academic entrepreneurship[5]. Entrepreneurial Universities much better activate the processes of development based on creativity, innovation and entrepreneurship. Universities are also often building flexible social, economic and regional relationships with the environment that contributing into academic and economic partnership and innovation networks. The traditional functions of the university (Education and Research) in a dynamic knowledge economy are extended to entrepreneurship in relation to the same university (professional management), the learning process (entrepreneurship education and preparing graduates to changing market conditions) and technology transfer (commercialization of possessed know-how). Moreover this is the active support by the university of entrepreneurship and the creation of academic spin-offs (spin-off and spin-out) allowing to overcome many of the limitations in the early stages of the innovation process, significantly increasing its efficiency. Research are carried out mainly transdisciplinary or interdisciplinary, instead of being monodisciplinary as it is in the case of research-based universities. There are network universities collaborating actively with industry, private research and development (R&D), financiers, suppliers, professional services and other universities. They finally are to commercialize the results of research carried out in their walls, actions for

[5] *Transfer technologii z uczelni do biznesu. Tworzenie mechanizmów transferu technologii*, (ed.) K. Santarek, Polska Agencja Rozwoju Przedsiębiorczości, Warszawa 2008, p. 141.

technology transfer to SMEs, entrepreneurship incubation and signing contracts[6].

The commercialization of knowledge on the basis of cooperation between science and business/industry

Commercialization of research results is the foundation of cooperation between the science and business/ industry. Its proper structuring, based on proven international experience in best practices is often necessary to successfully carry out projects involving both representatives of science and business industry. Identifying the key determinants of the process of commercialization of research results, it should be noted that the choice of methods to carry out commercialization and to determine the form of intellectual property protection will be most important from the point of view of proper planning of all activities leading to the successful commercialization and its proper implementation.

The commercialization of knowledge, broadly, encompasses all activities related to the transfer of the knowledge into economic practice while, in the narrow sense, it is the transfer of knowledge and skills to the production process, in order to successfully marketization as a product/ service.

The choice of method of commercialization is primarily determined by the objectives which the holders of the intellectual property want to achieve as a result of cooperation with representatives of business/ industry. Selecting an appropriate model of cooperation with a business partner will also be very important as well as taking into account all the constraints and opportunities.

Depending on goals, financial capacity, as well as the specifics of owned research results it is necessary to choose the appropriate path to market or to start cooperation with a business partner. Basic methods of commercialization of knowledge derived from institutions of higher education generally include four ways[7]:

- **Sale of property rights to the invention or technology to another entity (trade or capital investor)** or transfer the rights in order to business use; as well as the transfer of copyright. The biggest downside

[6] Based on: T. Kowalewski, W.T. Popławski, *Między tradycją a nowoczesnością. Wyłanianie się kapitału intelektualnego w uniwersytecie III generacji*, [in:] *Kapitał Intelektualny i jego ochrona*, (eds.) E. Okoń-Horodyńska, R. Wisła, Instytut Wiedzy i Innowacji, Warszawa 2009; http://www.sila-wiedzy.pl/start-up/id.Uniwersytet-III-Generacji/i.html, [20.04.2013].

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of selling the full copyright is the fact that after their withdrawal, an inventor will have no impact on the further process of how to use and commercialize the results of their scientific work;

- **Licensing**, i.e. granting a license to another entity, granting the right to the business use of the invention, technology or track. In this case, the researcher retains full ownership of the results of their research, and an external entity only grants the right to use them. The mechanism of commercialization of research results through licensing is very common. This is due to the fact that in the case of licensing scientist relatively quickly can obtain significant financial inflows without incurring large expenditures. In addition, the risks for the commercialization of research results is largely passed on to the business partner. The basic weakness of the licensing mechanism is primarily lower financial benefits than in the case of commercialization of research based on their own business and difficulties in obtaining the relevant licensees;
- **Strategic alliance** is a relationship between the company and the institution (university) which leads to implementing the common objective of both partners. One can also mention making up the implementation of joint research contracts which may be financed by the industry. Creating the conditions of good cooperation between enterprises and scientists and research laboratories require clear procedures for the flow of information and intellectual property protection, which will allow to take swift action;
- **Independent implementation through setting up a business at the university in a form of spin-off or spin-out**, which will be independently sold products or provided services. Independent implementation through setting up a business at the university spin-off or spin-out, which will be independently sold products or provided services. In this case, the development and commercialization of technologies is taken independently by the person concerned. Creation of a new, prosperous company has many difficulties, and success in many cases is the result of factors beyond the control of the owner of the newly formed business. Despite the risks, running one's own business in order to commercialize research results has the greatest potential for financial gain. The main factors motivating the representatives of the scientific community to establish their own companies include[8]:
  - the ability to take full advantage of the market potential for the commercialization of own discoveries,
  - maximization of the financial benefits associated with the commercialization of research results,

[8] Based on: *Najlepsze praktyki w zakresie współpracy ośrodków naukowych i biznesu przy wykorzystaniu środków z UE*, (ed.) A. Gabryś, Fundacja AureaMediocritas, MultiPrint, Warszawa 2008, p. 17.

- opportunity to work with experienced representatives of the business community who declare to contribute to the company,
- possession of relations and contacts allowing the creation of business team and gaining access to adequate financial resources,
- lack of success of the commercialization of research results through the mechanism of the sale of copyrights and licensing,
- often the ability to combine scientific work (often a researcher is employed on a full-time university) with running your own business, and thus to facilitate the transfer of practical business knowledge to students.

Starting own business aimed at the commercialization of research results, however, requires a number of things and perform a number of preparatory activities that only then will well define business objectives and increase the likelihood of success.

In conclusion it could be said that any of the ways of commercialization of research results has its advantages and disadvantages that arise from the specific nature of research, personal predispositions of a scientist, as well as widely understood institutional and legal environment.

Commercialization starts with the creation of the invention and ends with the moment of its implementation and generating a profit that allows to fund next invention financing. Commercialization should not be a single event, it should be a permanent element of the strategy of a specific institution – e.g. universities are actively supporting in this process their scientists. It should be remembered also that not every innovation and new technological solution, although desirable from a scientific point of view, can be used in the market.

Protection of intellectual property in the course of commercialization of research results

Intellectual property is defined as a number of intangible assets created through the mental efforts of a man. This collection includes creations of different types, from strictly technical-industrial, such as inventions, to the purely artistic ones, for example musical or graphic compositions. Such a broad catalog of assets significantly impedes or even prevents their full identical treatment and applying to them identical legal regime[9].

All of them combine the following features:

- exceptionality and the uniqueness of a product,
- detachment from material medium,
- arise as a result of mental effort creator,

[9] Ł. Wściubiak, *Prawne narzędzia ochrony własności intelektualnej*, [in:], *Komercjalizacja wyników badań naukowych – krok po kroku*, (ed.) D. Markiewicz, Centrum Transferu Technologii Politechnika Krakowska, Kraków 2009, p. 7-8.

- their creation requires from a creator special attitudes, abilities or skills.

Ability to protect intellectual property rights is a key element of the process of commercialization of research and the promotion of cooperation between universities and business. They determine the manner of conducting the process of commercialization and establish model of cooperation between partners. The use of intellectual property protection mechanisms is necessary because it gives the knowledge of concrete and tangible form, so that it can be transferred, licensed or sold to business partners. In addition, selection of a particular form of intellectual property protection implies many consequences of the legal and financial aspects. Above all, it provides the generation of significant income for universities and their research staff, which is an important source of funding for further research and thereby increase the potential of scientific and economic innovation. A form of protection of intellectual property rights also determines the responsibilities of the scientific and business partners and the level of protection of research results[10].

Table 1 shows the possible types of protection of intellectual property rights.

Table 1. Types of protection of intellectual property rights

TYPE OF PROTECTION	WHAT IS PROTECTED?	MEAN OF PROTECTION/ TIME OF PROTECTION
Patent	Ideas, new solutions	Legal, official – up to 20 years
Industrial Design	Outside, form	Legal, official – up to 25 years
The Utility Model	Outside in connection with technical features	Legal, official – up to 10 years
Trademark	Brand	Legal, official – for 10 years with possibility of prolonging indefinitely
Copyright	Computer programs, studies, articles, movies, presentations, works	Legal, not official Copyright personal – indefinitely, Copyright property – 70 years from the date of author's death
Know-how	Procedures, plans, relevant business information	Real – indefinitely

Source: Developed basing on: *Nowa innowacyjna firma. Jak uruchomić własną firmę? Podręcznik dla pracowników naukowych, doktorantów, studentów i absolwentów szkół wyższych*, (ed.) K.B. Matusiak, Europerspektywa Beata Romejko, Lublin 2009, p. 35.

[10] *Najlepsze praktyki w zakresie współpracy ośrodków naukowych i biznesu przy wykorzystaniu środków z UE*, (ed.) A. Gabryś, Fundacja AureaMediocritas, MultiPrint, Warszawa 2008, p. 11.

According to the Act of industrial property law, in force in Poland, inventions must be new, have an inventive step and susceptible of industrial application[11].

Protection of Industrial Property to occur, it should be asked for its protection to the competent authority[12]. It is worth noting, however, that this protection is limited in time and geographically, and further, that depending on the time and area of protection requires incur various expenses.

An important issue when choosing the form of intellectual property protection is to define intellectual property rights, as indeed can be problematic if there are many authors of the invention, especially in the case, if a specific researcher is employed by the institution. Then the university will have exclusive rights to intellectual property rights developed by an employee/researcher. It is a consequence of the fact that the inventor's work is part of the duties arising out of employment. It will be otherwise when scientific works were carried out outside the home or not research unit created within the framework of their duties inventor. Rights to the new invention does not pass then to the property of the university which does not rule out the possible disciplinary responsibility of an inventor (eg. from the exploitation of the equipment entrusted to him, use of laboratory, university research facilities, misused). Do not deprive him the rights to his invention.

A division of intellectual property rights where there are several authors of the invention is problematic. To proper determine who is the inventor, as well as the correct description of intellectual property rights is in fact a matter of fundamental signification if a technology has been successfully transferred to the business environment. The standard procedure is the procedure to grant ownership rights depending on the degree to which an individual or others involved in scientific work contributed to the development of final solutions. It is necessary to clearly specify who participated in the testing and checking, whether an individual or institution has the right to obtain any financial benefits arising from the commercialization of the research.

In summary, the clear identification of property rights to the results of scientific research and the choice of the form of intellectual property protection should be of particular interest to individuals and entities involved in the commercialization of scientific knowledge. Because they play a fundamental role in the process of cooperation with business representatives in the field of commercial exploitation of research results and in a very large extent determine the success of co-operation of research centers and businesses. When considering what kind of protection of intellectual property would be suitable for a particular invention or work, one should consider what types of protection may be subjected and then

[11] Art. 24 of the Act of 30 June 2000. Industrial Property Law. Acts. Laws of 2003, No. 119, item. 1117, as amended. d.

[12] In Poland, Polish Patent Office provides protection of industrial property rights.

analyze the pros and cons of each of them – in terms of business, procedural and organizational issues.

Technology transfer is always related to legal protection solutions transferred. Still popular is the view that all solutions that have practical application should be protected by law. As a rule this is true, with one important subject only: legal protection is a part of the commercialization process, not a goal itself. Firstly, the legal protection costs, on the other hand, is strictly defined in time, secondly, it must be determined territorially, and thirdly, protection makes sense when it can be enforced.

The spin-off/ spin-out companies as affiliates of universities

A special category of small technology companies that are gaining in importance recently, are university spin-offs (spin-offs and spin-outs). These entities are using intellectual and organizational resources of the university for business purposes, as a result of entrepreneurial activities of academic workers and other persons associated with the institution of higher education. These terms are an important part of the analysis of the phenomenon of academic entrepreneurship. The creation of a new entity should be regarded as beneficial from the point of view of the inventor/ entrepreneur who obtained freedom of action liberating his energy and commitment while parent unit avoids the risks associated with starting work on a new product or technology. Thus the phenomenon of academic spin-offs (spin-off and spin-out) contributes to the transfer and commercialization of new technologies from science to economy[13].

The definition of spin-offs and spin-outs distinguishes companies[14]:

- spin-off company: equity affiliates usually with the parent (usually university),
- spin-out company: independent entity with capital from parent organizations/ universities, but usually indirectly cooperating with them and having independent sources of funding.

Unlike the spin-off company spin-out is a new entity formed by creation by an employee or employees of the parent research unit, using its capabilities (intellectual resources/ material), but operating independently (organizationally, formally, legally and financially) from the parent organization.

An important factor differentiating the two types of companies is the relationship which they have with their parent organizations. The parent

[13] G. Banerski, A. Gryzik, K.B. Matusiak, M. Mażewska, E. Stawasz, *Przedsiębiorczość akademicka (rozwój firm spin-off, spin-out) – zapotrzebowanie na szkolenia służące jej rozwojowi. Raport z badania*, PARP, Warszawa 2009, p. 32.

[14] J. Halik, T. Kusio, M. Makowiec, *Poradnik Spin Promotor. Przedsiębiorczość akademicka w praktyce*, Uniwersytet Rzeszowski, Rzeszów 2012, p. 6-7.

organization can be not only the university, but also other entities – e.g. a research and development units, business and other institutions.

In the case of a spin-off relationship between the company and the parent organization, they are usually friendly. It is difficult to imagine a situation in which the parent organization enters as a shareholder to the company spin-offs and taking hostile action against the company, limiting the possibility of its development. In the case of spin-outs, the situation is not so obvious. Spin-out companies of a nature of "university" are, as a rule, welcome and universities do not create consciously barriers to their creation. On the contrary – universities take action to disseminate the idea of creating spin-outs but they must also protect their rights and benefits arising from the commercialization of research results. Their self-use by entrepreneurs, however, may be considered as violation of the university powers and give rise to conflicts.

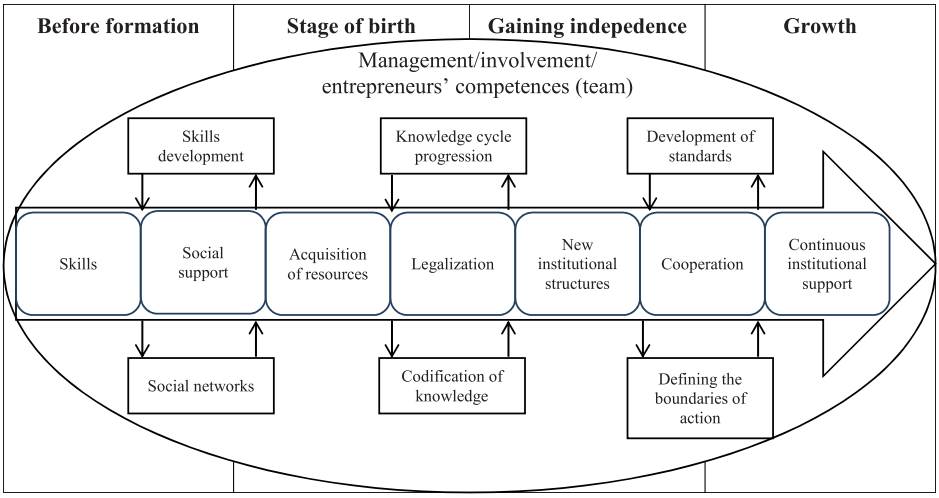
In the case of spin-out a number of conflicts over equitable sharing of benefits can occur arising from the commercialization of research results. The creator, starting the company of which he is the sole owner, deprives the university future benefits arising from the commercialization of knowledge which in fact was established at the university. Therefore, it is rare to build by spin-outs their competitive advantage solely on studies which the founder of the spin-out led or in which he participated. More often competitive advantage results from personal competence creator, his knowledge, experience, and what not is irrelevant – recognizable names in the industry and gained during research work contacts.

The specificity of spin-off is something different. The share of university or its purpose company in shareholder structure makes the spin-off can count on a very close cooperation with the university, which will be mutually beneficial because successful spin-off company is also a goal of the university. This cooperation should focus on aspects of research and development, the results of which can then be implemented by the spin-off.

The spin-offs more often takes the form of a legal corporate with limited liability rather than joint stock company. These legal forms allow for efficiently and equitably allocation the rights and obligations of owners with strong demarcation of the assets of the company's operations and other activities of owners. The involvement of universities in spin-off will also mean the need for the professionalization of the company management system by e.g. the appointment of the Supervisory Board in which should sit representatives of both academia and researchers who are shareholders of the company. In contrast, the company's management should be chosen from among persons who are independent of shareholders.

The next phase of the life cycle of the process of creating spin-off/spin-out includes the step before the formation of the company, the stage of birth, gaining independence and growth. The cycle of life, and key elements of the process of the emergence and development of spin-offs are shown in figure 1.

Figure 1. The life cycle of university spin-offs



Source: M. Pilegaard, P.W. Moroz, H. Neergaard, *An auto-ethnographic perspective on academic entrepreneurship: Implications for research in the social sciences and humanities, "The Academy of Management Perspectives",* Vol. 24, No. 1, 2010, p. 57.

The importance during the phase prior to the business and during its birth are gaining such factors as the degree of specialization in both the business sphere and in the sphere of research, business networks, applications and supporting institutions. These factors provide the occasion to explore the possibilities of adoption of business candidate to establish his firm, its evaluation and further development.

Phase of birth should be supported by the community in order to obtain sufficient resources, the validation, as well as the establishment of appropriate institutional structures. On the other hand, in the phase of gaining independence usually goes further process of validation and the creation of appropriate structures, as well as strengthen cooperation with stakeholders both internal and external[15]. At this stage the importance of co-shareholders and external consultancies/ advisory for the success and further development of the planned activities and projects particularly emphasize.

Growth stage is characterized mainly by the continuous need for change, agreeing standards and norms which take into account growth and expansion into new markets.

In conclusion it should be noted that the creation of spin-offs/spin-outs works well in the case of implementation of innovative projects. It is easier to

[15] A. Kwiotkowska, *Firmy odpryskowe jako nośnik przedsiębiorczej odnowy uczelni wyższych,* [in:] *Zmiana warunkiem sukcesu. Odnowa przedsiębiorstw – czego nauczył nas kryzys?*, Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu nr 128, (ed.) J. Skalik, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław 2010, p. 63.

implement new ideas under the new entity. Especially when the idea comes from the university – solution for complex organizational structures. "Output" commercialization beyond the basic structure of the university can give the discretionary powers of implementation to the team, it can also give the possibility of taking unconventional measures and in particular allow for rapid response to events occurring in the market. Many times the company's future depends on rapid and risky decision to take and it rather would not be possible in the operation in a formalized organizational structure of the university, which unfortunately away, often many incompatible apply to today's market realities procedures and regulations.

Commercialization of tourism, recreation and water sports step by step on the example of the Authors' experience

Globalization undoubtedly favors the economic growth. This process contributes to the expansion of international economic relations and international cooperation, being almost indispensable in many industries and sectors of the economy, including tourism and recreation and water sports. As a result common technical ventures and research are developing and it is possible to quickly verify and check the use of their effects. All this, however, requires knowledge of existing regularities, mechanisms and trends in innovation and development.

In this study the authors were not able to provide overall activities related to the decision-making innovation, as well as the consequences of the commercialization of research results. Clearly, however, there have been included the valuable tips useful in the process of commercialization. The authors believe that cited considerations will be the basis to answer many questions, pervading many scientists standing before a decision regarding commercialization of research results.

What is certain is that good/ innovative idea is the most important and obvious in the process of commercialization. Nevertheless, the very important aspects, which the scientist must face are issues of intellectual property rights, ensuring the financing of the project, especially in the first phase of implementation (start-up), and thus liquidity, business meetings with potential clients or investors, as well as marketing and sales of product/ service/ invention. While the ownership of ideas and innovative research ideas for a potential scientist often is not a problem, next steps related to the implementation of the research idea in life are associated with a number of difficulties and often making many problems to overcome the existing barriers or acquire new, usually unknown to the scientist skills so very useful and desirable in the business world.

In order to overcome the difficulties, both external as well as internal and those that may be encountered at the beginning of the commercialization process, concerning, among others, intellectual property issues, help with the preparation of a business plan, identifying your target market, etc., Centers

of Technology Transfer, Commercialization Teams Affairs, as well as Teams of Technology Brokers may offer invaluable assistance. These units support the first steps of a scientist and undoubtedly every scientist should go for help in the first place to these very offices. People associated with such units will often look at the idea/ invention in a critical and realistically way assess its implementation capacity. Through numerous business contacts they are able to assist the scientist in the early actions relating to the commercialization process. From experience, it is known that such units organize brokerage events and are often the first link in mediating between the worlds of science and business/ industry and through specific nature of their structure they gather people with varied skills and business experience who can contribute to the development idea invention on the path of commercialization.

When it comes to tourism and recreation industry and water sports, taking the actions related to the commercialization and implementation of the invention, in this case an innovative multi-functional boat, the question of the profitability of the entire project may appear. Often many innovative ideas/ inventions have not been implemented into mass production due to lack of profitability. Such situations arise from the fact that the properties of the final product are not sufficiently innovative or may not exhibit surprisingly improved performance for competitive products to become a cost-effective implementation in industrial practice.

In a situation where a scientist is able to objectively say that his invention/ technology has a chance to implement because it is profitable, then there is the question of how to raise potential investors ready to put a big capital on its development and implementation in the production process. These are fundamental questions and issues that hits anyone who ever thought about starting the so-called: "own business". Due to the nature of tourism and recreation and water sports, it's hard to talk about opportunities of self-investment or self-financing from the researcher's point of view because with such a specific activity, investment costs and then also production costs significantly exceed the financial capacity of the average researcher. The solution for the measure of third-generation universities are the opportunities offered by the university, as well as academic business incubators that support scientist at setting up and running a business.

A perfect example of the situation described above is a case study on the design and technological research that led to the execution of the original on a global scale multi-purpose design of the boat which achieved the right to utility model protection in the Patent Office of the Republic of Polish lasting from 29th of March, 201316 and then innovative company was founded called Trakt-Boats sp. z o.o. (Ltd.).

At the beginning, the main initiator – Andrzej Ostrowski (PhD) – Senior Lecturer in the Department of Aquatic at Academy of Physical Education in

[16] The right of protection for a utility model: "Boat multi-purpose", No. right of protection 67456.

Krakow, in the course of numerous rescue training and conducting workshops on swimming in open waters – taught skills in swimming the rowing boats in terms of maneuverability and first aid. He observed the occurrence of several problems that were subsequently inspired research, ushering in the prototype innovative, multi-purpose boat.

Rowboats are the basic rescue equipment for inland and sea bathing. They have a displacement chambers to hold it on the surface, even after the flooding. Most often used in Poland to water by lifeguards boats are: „Mazurek", „Jacek", „Cyranka", „Perkoz" and „BL". All these boats have a sloping bottom, it's easy to tilt, threatening overboard. As a result of the lack of inherent water outflow, in case of getting water inside, the boat it has the reduced lateral stability and increases the weight. Rescue boats (except „Mazurek") have built-in buoyancy tanks, ensuring the buoyancy of unit even in the case of total flooding of the cockpit with water. In addition, the decks for resuscitation are located in the front part of the fuselage whereby the successful pull of rescued from the stern he should be transported to this place against the bench by means of transverse and oblique bottom. However, the biggest problem is the injured while on board, making it difficult to narrow and tall transom, if not impossible mounted engine. Besides, pulling the man from the water is possible only in case of he is of decidedly less weight than the pulling one.

Limited lateral and directional stability in these boats may result in increased destabilization of units, flooding the cockpit, the crew and the victim falling into the water, and even capsizing the boat despite the success of pulling the victim on board.

The observed shortcomings became a contribution to begin studying the construction of a new boat that will be used, among others, as emergency equipment, and ultimately it will also be possible to identify another usefulness.

In 2008 a completely new concept of the boat was developed based on modern rescue units and racing yachts. Large displacement of the bottom of the buoyancy of the boat was secured under a load of up to 600-800 kg (5-8 persons on board). This was to allow the potential use of that boat in water rescue and, among others, use for practicing recreation or fishing.

The model in a scale of 1:5 was constructed and its tests were conducted in water with and without load in terms of lateral and directional stability and the size of buoyancy. These tests confirmed earlier suspicions and conducted research and provided a model characterized by parameters of functionality, at the same time having the potential towards practical application.

As a result of further conceptual work the key components of the new technology were identified, as well as expected technical parameters and how they measure during a laboratory demonstration and anticipated operating conditions.

At this stage of research and development a prototype of the boat was build in the expected dimensions – length 400 cm, width 180 cm with relevant profiles of deck, sides and bottom. Tests were carried out on the water in order to verify

the concept and its parameters. Tests were performed on standing water in low winds and low waving.

In 2009 boat tests were conducted during water rescue training of trainers in the Central WOPR Rescuers Training Center in Tama and training activities of swimming at a summer camp students of Academy of Physical Education in Krakow on the lake Rożnów in Załęże. By using the prototype boats for various types of training activities verification of the boat functioning in an environment similar to reality was carried.

Once several design errors have been identified that affected the proper functioning of the boat, in 2010 there were introduced the necessary amendments to the structure and then new, modified hull of boat was built. After building a new boat, the tests included: swimming using oars, swimming with outboard engine, swimming with a windsurfing sail, swimming and windsurfing - with articulated connecting the propeller to the deck. The tests were carried out independently on the lake Rożnów during summer camps in Academy of Physical Education in Krakow and in training of older WOPR lifeguards at the Central Training Center of Rescuers in Tama.

Prototype test conducted in changeable weather conditions with high fidelity simulating actual conditions confirmed the reason of expanding the functions of the boat.

In 2012, after identifying minor design errors improvements were introduced. The prototype of multi-purpose boat has been verified experimentally in full range of working points and the harshest environmental conditions.

In 2013 while participating in the International Conference of "Status, Prospects and Development of Rescue, Physical Culture and Sport in the Twenty-first Century" in Bydgoszcz, in addition to the plenary of the prototype there was a demonstration of the functioning of the multi-purpose boat in practical panel on the river of Brda in the distance from Młyńska Island to Opera Nova. It was confirmed therefore that advanced technology is applicable in operating conditions. It was confirmed that the target level of technology has been achieved by the multi-purpose boat and the boat can be used in the anticipated conditions.

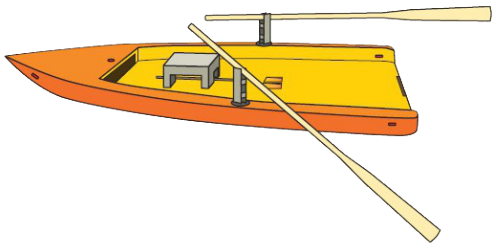
Andrzej Ostrowski (PhD) has shown that multi-purpose boat is already in its final form and may be implemented in the target conditions. As a result of innovative work lasting from 2008 to 2014 an original world-wide multi-purpose boat has been created. Its originality is confirmed by:

- Certificate of utility model protection issued by the Polish Patent Office under the title: "Multi-purpose Boat", no right of protection 67456;
- The project of the boat received favorable opinions from:
  - the Chairman of the Education International Life Saving Federation of Europe,
  - Assoc. Professor Stoyan Andonov, Ph.D Chairman of the National Commission on WLS at BRC,
  - President of the Conference: Rector of the University of Economy in Bydgoszcz.

Boat received the name – "Laura" and was presented at the Malopolska Innovation Exhibition in Krakow in 2014 and 2015. It was nominated for the competition of "Innovator of Malopolska 2014", organized by the Technology Transfer Centre of Cracow University of Technology together with the Marshal Office of Malopolska Region. Boat "Laura" has passed tests in the field of stability, displacement and buoyancy confirmed by the Polish Register of Shipping in Gdynia, gaining certification of conformity and the manufacturer's identification code assigned by the Polish Yachting Association. It meets therefore the requirements of commercial production.

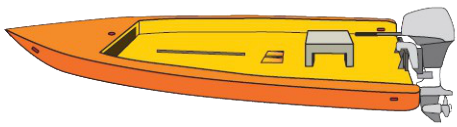
Figures 2–5 below presents how the boat could be remodeled by the client alone without using a professional help, the basic version of the multi-purpose boat "Laura".

Figure 2. Rowing multi-purpose version, the innovative "Laura" boat



Source: http://plywam.eu/index.php?strona=wioslowa, [13.04.2015].

Figure 3. Motor version of multifunctional innovative "Laura" boat



Source: http://plywam.eu/index.php?strona=motorowa, [13.04.2015].

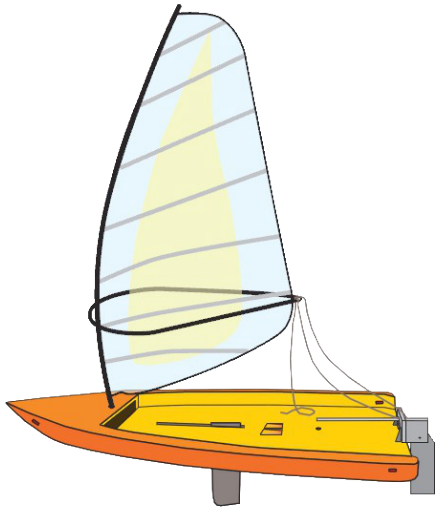
It should be noted that the rowing version of boat Laura allows to swim with two oars with a length of 270 cm, with special rowlocks permanently attached to the oars. Then the boat can be used for 1 to 5 people simultaneously. The boat can then be used in:

- recreation,

- water rescue,
- water tourism,
- fishing.

Similar application finds also a multifunctional "Laura" boat in its motor version. Mounting outboard engine of power up to 10 kW will be possible without special knowledge and experience of the person floating (customer). In this case outboard engine should be previously mounted to the special transom. This version allows free swimming for 1 to 5 persons. Importantly, according to the trends of environmental protection – it is preferred to use electric motors with a battery which will allow ultimately to swim up to several hours in any water body. It should be noted that swimming with an electric motor is also very safe because the opportunity to hide the battery to dry hatch is guaranteed. As indeed is the case with the electric motor.

Figure 4. Sail version of multifunctional, innovative "Laura" boat



Source: http://plywam.eu/index.php?strona=zaglowa, [13.04.2015].

Sailing boat version allows you to surf after the earlier inserting of the sword to the dagger board box, mounting the rudder to the transom, shoving in a hole the front part of the deck mast with a sail (windsurfing propeller) of an area of 10 m2 and attaching the sail between the sail tack around the corner and transom. Then will it be possible to use this version for many people in:

- sailing training,
- recreation,
- nautical tourism.

Figure 5. Windsurfing multi-purpose version of the innovative "Laura" boat

Source: http://plywam.eu/index.php?strona=windsurfing-pl, [13.04.2015].

Windsurfing version – allows training of windsurfing after having inserting the sword into the daggerboard box, mounted rudder to the transom and the propeller joint rail. Then the boat can be effective for 1–2 persons, among others, in:

- sailing training,
- recreation,
- nautical tourism.

One can also foresee different variants of training windsurfing:

- thruster operated by one person, eg. learning to windsurf, and the other supports the rudder (instructor), which helps set the hull in relation to the wind,
- like above by one person without the use of a rudder, then one can remove the helm,
- like above by two people (student, instructor) without a rudder – both people at the same time support the propeller.

The advantages of the innovative multi-purpose boat are primarily much higher, than for other entities of similar size and designation, sense of security, speed swimming and convenience. Large longitudinal and lateral stability of the hull to allow safe transit of the cockpit, easy boarding after capsizing, ease of entry, being caught on board from the water, which is especially important when using the original, so for rescue on water areas should also be emphasized.

While continuing activities aimed at commercializing research, attempts

have been made to identify possible options for developing business and launching production of multi-purpose „Laura" boat. The interest in serial production of innovative multi-purpose „Laura" boat expressed the representatives of Malopolska Regional Development Agency SA (MARR S.A.) in Krakow, and as a result, on 13 August 2014 the agreement was signed in the pre-incubation project co-financed by the European Union under Measure 3.1. „Initiating innovative activities" Innovative Economy Operational Programme. This enabled the establishment of a capital company Trakt-Boats sp. z o.o. (a spin-out company) in which shareholders are Andrzej Ostrowski PhD (majority shareholder) and the Regional Development Agency SA in Krakow (MARR S.A.). Since December 2014, the company became operational, and financial support provided by MARR S.A. allowed hiring and adaptation of production hall and completion of work on the prototype boat. Acquiring a partner to do business was made possible largely thanks to the possession of the SPC Patent Office for utility model but also thanks to precisely prepared business plan taking into account the necessary calculations and financial projections for planned economic activity, identified a team of colleagues, which would permit a smooth and trouble-free activities, and what is very important collective determination and passion for the originator Andrzej Ostrowski PhD to further pursue its work in advancing the boat.

At this point the preparation and modernization of the production hall of the boat is already completed. Production will take place in the village Węgrzce near Krakow. Without a doubt, the pursuit of such a business brings with it many diverse problems but it seems that the chances of market success is almost certain.

Verifying a partner who is the second shareholder – the Malopolska Regional Development Agency in Krakow (MARR S.A.), involved for many years in the promotion and support of business, supporting companies and business entities in development activities, the development of the spin-out company – Trakt-Boats sp. z o.o. it is rather vulnerable.

Andrzej Ostrowski PhD has many contacts to specialists in water sports industry who can help in development activities and promotion of the new company. At the same time it opens up the opportunity to participate in various programs of assistance company which is owned by fellow researcher working actively at the university. These programs and various competitions are available at institutions such as: NCN, NCBiR, etc. – which support development of researchers. And participation in various conferences and symposiums gives the opportunity for the free promotion of the company and product offered.

The final product, according to the analyzes, can be offered in the market at a price significantly lower than competitive products (less than 10.000 PLN) by which it can be expected that the interest of different stakeholders, for example branches of Voluntary Water Rescue Service (WOPR) located throughout Poland, Fire Brigade, Police, etc. will be large. After the construction of the Marketing Department and Trade, on which it will be required to find potential customers interested in buying a multifunctional boat.

With the support of specialists in finance, marketing, management, engineers, mechanics and specialists in structures models of ships, various plans of action for Trakt-Boats sp. z o.o. are developed. There are identified aid schemes and various forms of financial support that are necessary to allow for the expansion and invest in further modernization of the boat. We managed to explore the possibilities of implementation of new (mobile) mechanism which allows to introduce another innovation, i.e. the expansion of the current version of the boat and on the basis of a quick remodeling her on two-or three-pedal boats.

In conclusion, the simplest path of commercialization of research, inventions or technologies in the field of tourism and recreation and water sports is the licensing or sale of intellectual property rights to a particular invention but it does not guarantee the implementation of the invention into industrial practice. The most risky, although most profitable form of commercialization of research is to establish one's own business in the form of spin-offs/ spin-outs. However, taking into account the characteristics of the market and the industry specification commercialization model is often beyond the reach of scientists. Therefore, at this point institutions should come out in front of business environment and also they should support Alma Mater which would allow to establish a new economic entity, the special purpose company, with the task of commercializing inventions developed and research implemented. The natural consequence of the actions taken is to raise capital what in the era of EU funds, various grants and programs promoting innovation, and at the same time, focus on the development of innovative technologies, is relatively easier, also by the prevailing market trends and social issues. Certainly all these activities require faith in project and are incomparably more difficult challenge for any potential scientist, than typical projects or research grants. Therefore, it is worth considering already at the stage of commercialization the selection of appropriate team of people with diverse skills, as well as with specific knowledge and experience in marketing, sales and legal regulations applicable in the particular case. In fact, the idea of science is only the beginning of a very complex process in which without the support of many people, with different skills and business dealings, often not directly related to science, in its pure form, will not function in an efficient and bringing financial satisfaction way.

Findings and conclusions

Entrepreneurs are increasingly aware that only with innovative product they can effectively compete in an increasingly demanding market. Strong economic position of innovative companies shows that the most effective way of building value is the continuous implementation of solutions based on modern technologies. They may be based on external solutions or on the results of R&D carried on in-house or just in cooperation with other entities, eg. universities or technology parks. Through skillful transfer of modern technology and commercialization of research results Polish companies can gain a lot. The

future stands before those organizations which managers think innovatively, as shown by the examples of the most innovative companies by Forbes.

Running a business is one of the paths for professional development. It has numerous advantages, such as independence and autonomy of decision-making or the freedom to choose the time and place thereof. Unfortunately there is also the responsibility, which as a rule, is generally borne individually. Large risk of running such projects may be substantially limited just by selecting the path of the spin-off or spin-out. This ensures a high level of knowledge, often a technological advantage and the ability to use material and technical base of universities and research institutes. Therefore, such measures have a high probability of success.

In a specific case, we are dealing with a very innovative activities, one can even say that innovation worldwide which has developed and implemented from the beginning Polish researcher. Academics have an excellent opportunity both to obtain information on individual markets as well as promote their own products through scientific networks. The good reviews and the authority in the world of research teams allow them to more easily build the brand through the use of a good position in academia of which with success can and should take advantage Andrzej Ostrowski PhD.

The issue of academic entrepreneurship in Poland has a relatively short history and is at an early stage, as well as its policy support. In Poland, the universities are still perceived as entities essentially no interested in ensuring that employees or students can develop the business. The phenomenon of spin-outs and spin-offs, however, is crucial to the strategic renewal of universities based on academic entrepreneurship because new ideas and business concepts based on knowledge can be implemented in the new business entity. The creation of the new company is beneficial from the inventor/ entrepreneur point of view because of the freedom of action, while the parent unit avoids the risks associated with starting work on a new product or technology. Creating spin-outs and spin-offs in an environment of scientific institutions stimulates economic development, economic value and at the same time creates new jobs which contributes to minimize the effects of the crisis. It is also a manifestation of a new perspective on the role and place of higher education in the region's and even country's economy.

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ENHANCEMENT OF RESEARCH IN SUPPORT OF THE ENTERPRISE: THE EXPERIENCE OF SPIN OFFS

Keywords:

spin off, research, university, start up

Summary

The international experience of the spin off, or those companies specifically created in order to economically exploit the research results generated within academic departments and laboratories.

Introduction

The Third Millennium imposes an ever changing and innovative course of development on modern society. Research authorities, universities, foundations, NGOs, think-tanks and start-ups are the drivers of change of a territory, of a nation, of a continent and of the whole world by spreading knowledge and culture in the most progressive societies. However, the dynamic engine of a company sometimes defies the laboratories of a research centre, surpassing years of study and analysis often swallowed by perverse formulae of academic bureaucracy directly on the field. Indeed, over the years, especially in some European countries we have witnessed a consolidated identification of the State as the entrepreneur's worst enemy, increasingly concerned with the fiscal and legislative aspects rather than with vigorous strategic instruments for developing research to support enterprise.

The current economic context, affected by a long and deep global crisis, requires greater investment from the states in technological research and development policies capable of also providing craftsmen and small and medium sized enterprise with innovative instruments to improve their international competitiveness.

The Fairchild Semiconductor and the "eight traitors"

In order to better understand some of the subsequent steps of this publication, it is worthwhile looking at what happened back in 1957 when a group of scientists abandoned a company founded by William Shockley[1]. Eight engineers, later known as the "eight traitors", gave rise to a new company, *Fairchild Semiconductor*, that, not only led to important technological innovations in the sector of semiconductors in the United States, but also triggered "a process of economic fission which continually produced new challengers"[2]. This event is considered by authoritative economists as the first step towards the new culture of *spin offs* that, thanks to substantial public tenders of the armed forces, guaranteed *Fairchild Semiconductor* significant growth. Therefore, the state, with its own public tenders, wagered on a small enterprise and increased its value. A momentous occasion that actually generated true competition between small and medium-sized enterprises which took the place of the ageing and expensive large enterprises until then on the payroll of the military divisions and so sure of an exclusive relation with the state that they had no desire to make any investment in research and development.

The propulsive thrust of research, innovation and technological development was thus provided by a small company made up of scientists capable of stimulating the attention of the political decision maker towards more advanced instruments, techniques and processes, which were capable of improving the military heritage of the state itself. As a consequence, the healthy competition led the entrepreneurial system to provide continual and constant research of technological development in all the production sectors. However, this became a very delicate passage which was not easy to manage because the *talent* of the "eight traitors" cannot always be found in all corporate contexts, such that the enterprises, above all the SMEs, asked for support from structures dedicated exclusively to the activities of research and development.

The role of universities

The universities, which have always been the holders of academic knowledge, made a first step towards technological transfer in 1980, in the United States, thanks to the Bayh-Dole Act which provided incentives to the

[1] William Bradford Shockley, (London, 13th February 1910 – Stanford, 12th August 1989), Nobel Prize winner for Physics in 1956, was the precursor of the first "transistor" and started off modern electronics of semiconductors. In the 1950's and 60's Shockley started an important process aimed at marketing a new transistor design by creating "Silicon Valley" in California, which later became one of the most important centres for developing semiconductor devices.

[2] M. Mazzuccato, *Lo stato innovatore,* Laterza, Bari, 2013, p. 108, [from:] F.L. Block, M.R. Keller, *State of Innovation: The U.S. Government's Role in Technology Development*, Boulder, Paradigm Publishers, 2011.

marketing of *university-based* technologies[3]. This was the first legislative act regulating the use of public research, allowing a synergetic pact between University, enterprise or no profit organisations, guaranteeing them a correct management of the inventions also thanks to state aid. This use also produces a profit for the universities themselves, generating and feeding new investments in academic research and triggering a virtuous circle.

However, progress inevitably brings with it some economic and juridical assessments on the suitability of a university to continue being the owner of the inventions. Indeed, some scholars consider the judicial ownership of the invention by academies to be quite inefficient economically and they suggest two different solutions:

- free bargaining between researcher/ inventor and university or another subject with the purpose of marketing the product; *or*
- leave the new product widely available to the public through an open source strategy[4].

This first important legal act subsequently fostered other important decisions adopted in different continental areas through similar instruments, by granting, in many cases, widespread organisational and managerial independence to the individual universities whose own internal regulations have created the basis for a wider and more collaborative relationship with the entrepreneurial system.

The spin off's characteristics

What, though, are the characteristics that a spin off must have if it wants to be activated? Actually there are undoubtedly essential aspects that must describe and motivate the creation of an academic spin off project: *objectives, project innovation, scientific and technological features, Financial plan, reference market, make-up of the company structure and relevant shareholdings.*

All of this must come within a larger cooperation project between the university and enterprise, aimed at promoting academic know how marketing interventions to the benefit of the business fabric and of society, creating, at the same time, an economic benefit for the universities themselves. The creation of academic spin offs thus opens new development possibilities for the university system, promoting a virtuous process of competition within the research system aimed at immediate marketing through a public/ private legal subject.

Indeed, the discovery of an innovative product/ process, no longer remains in a traditional university laboratory but acquires a different and new conformity within a spin off, run also by young entrepreneurs and/or professionals with the main objective of making a profit. It is clear and evident that the scientific and

[3] F. Faggioni, *L'impresa Spin Off della Ricerca – Nascita*, sviluppo e processi di internazionalizzazione, Cedam, Rome 2013, p. 1.

[4] M. Kenney, D. Patton, *Reconsidering the Bayh-Dole Act and the current university invention ownership model*, "Research Policy", No. 38, 2009.

technological "invention" can also be transferred through different instruments from the spin off (publications, seminars, licence contracts, etc) but with economic effects of many other kinds.

It is also necessary to analyse the motivations that lead a university professor, on the one hand, and an entrepreneur on the other, to activate the creation of an academic spin off. Obviously for the entrepreneur, especially if it is of a micro/ small enterprise, establishing a structure made up of university researchers and backed up by managerial experience and skills would be an advantage in terms of economic and organisational management of any core of researchers to employ within its own original company. As far as they are concerned, the researcher would find several growth opportunities: on the one hand immediate and profitable dialogue with the entrepreneur, on the other the availability of structures, laboratories, greater, agile and easily managed economic resources and financial instruments that would also guarantee other activities of study and research.

International literature on the subject of spin offs, however, offers further reflections. A research spin off, indeed, is also interpreted as a reality within public research authorities in which a group of researchers decides to break away to begin a new independent business reality[5]. This process, anyway, means determining four main key factors which must characterise a spin off, meaning: the presence of a university researcher in the shareholding structure; research activity originally carried out in the university or in other public research authorities for many years; starting a profit making business; producing and marketing services and products belonging to the same subject area as the academic founding members[6].

Beside all this, however, another important chapter concerning the use of intellectual property opens. Indeed concerning this, there has always been a lively debate between those supporting the theory, whereby the ownership of a patented product/ process or an exclusive may prevent third parties from producing or using a patented product/ process without the agreement of the owner him- or herself. Indeed this would lead to the belief that intellectual property is a source of competitive advantage that leads us to a wrongful interpretation of the role of universities. Actually, being owners of more patents than a large company, the universities should have benefitted economically on specific markets, but as we know it is an unfeasible mission. In reality the "*true competitive advantage for the technological enterprise is innovation and not the instrument required to protect it*"[7]. Indeed, all enterprises owning a patent are not competitive on the market, if the patent they own refers to a technology that

[5] A. Piccaluga, V. Chiesa, *Le imprese spin-off della ricerca in Italia e all'estero, "Quaderni della Fondazione Piaggio"*, No. 3, 1996, p. 177-195.

[6] C. Balderi, A. Patrono, A. Piccaluga, *La ricerca pubblica e le sue perle: le imprese spin off in Italia*, "Quaderni dell'Istituto di Management", Scuola Superiore Sant'Anna di Pisa, No. 1/2011.

[7] G. Conti, M. Granieri, A. Piccaluga, *La gestione del trasferimento tecnologico: strategie, modelli e strumenti*, Springer, Milan 2011, p. 91-94.

has been superseded, is obsolete or even not completely developed and without prospects of being developed. Therefore, technological innovation remains the only true added value to a company's capacity for competing and in the case in point, of a spin off.

But how, when and why is an academic spin off created? By analysing transaction costs, it has been demonstrated that the higher the transaction costs for licensing a technology on the market, the higher the probability of creating a spin off with the aim of lowering these costs[8]. Indeed scientists and researchers carry out an important action in reducing the agency costs.

From a 2007 investigation carried out by Minshall and Wicksteed it was found that the spin-off is chosen as an instrument of transfer in place of other mechanisms when the following conditions occur: availability of platform technologies, development of technologies with different possible applications, when a technology is not ready for the market and finally when the researcher has the personal objective of seeing a technology invented by him or her placed on the market. From this, it can be seen how many of these reasons are closely connected to the technological sector and just one to personal reasons. In time, however, it has also been demonstrated that through the creation of an academic spin-off the main individual motivations of the scientists are characterised in: research for independence[9], international acknowledgement and seeking prestige[10], recovering research funds[11], lack of ordinary work satisfaction[12], influence of the university choices and strategies that lead the academics to assess and undertake these types of enhancement strategies.

The process of creating a spin off is, therefore, supported by two main factors: a technological one and an individual one. However, a third one has to be added: *the bureaucratic factor*. Indeed, the academic spin off frees the scientist/ researcher from the shackles of many administrative procedures which heavily affect the development process of a research project. Despite being set in a university regulatory framework, the spin off reacts to the public organisational layout by totally assuming the characteristics of a company which commits itself to the market with the best of science tackling the competition.

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[8] D. Antonioli, U. Rizzo, *Le determinanti della creazione di spino off accademici. Il caso dell'Università di Ferrara*, Ferrara writing in memory of prof. Antonio d'Atri, Franco Angeli Ed., Milan 2013, p. 353-376.

[9] S. Shane, *Academic entrepreneurship: University spin-offs and wealth creation*, Edward Elgar, Cheltenham 2004, p. 103.

[10] T. Stuart, W. Ding, *The social structural determinants of academic entrepreneurship: an analysis of University Scientists' participation in commercial Ventures*, "American Journal of Sociology", No. 112, 2006, p. 97-144.

[11] C.S. Hayter, *In search for the profit-maximizing actor: motivations and definitions of success from nascent academic entrepreneurs*, "Journal of Technology Transfer", No. 36, 2010, p. 340-352.

[12] U. Rizzo, *Why do scientists create academic spin-off? The influence of the context*, "Third International Workshop on Entrepreneurship, Culture, Finance and Economic Development", Namur, Belgio, 2012.

From seeking public funds to international partnerships, from relations with banks to employing a collaborator, from the flexibility of work to managing the objectives, the spin offs are like an innovative form of transferring technologies without constraints or strict bonds to observe.

Many spin offs now carry out a decisively leading role in some sectors of the economy including but not limited to chemistry or the environment. In Italy, for instance, true domestic networks have existed for years. They include dozens of Italian universities and research centres. Indeed, in 2001, the Polytechnic of Milan invited the Italian universities to a meeting where they could compare their experiences of application of law no. 383/2001[13] and establish common strategies on the technological transfer processes. At first 27 Italian universities expressed an interest in discussing common strategies and then in 2002, 28 university deans signed a memorandum of understanding in Rome with the following main objectives:

- "harmonizing the principles and criteria on which the actions regarding patenting, establishing "spin-offs" and technological transfer are inspired;
- Harmonizing, in perspective, the judicial instruments to be used, dictating basic rules in the subjects indicated in the previous point;
- Making useful information available for reinforcing the opportunities for research cooperation on the patented themes and on the patentable results also to identify conditions suited to increasing the economic impact of the results of the research, either through licensing, or by assessing the assumptions for the creation of spin-offs and business incubators"[14].

This meeting created "Netval", Network for Exploiting University Research (*Italian: Network per la Valorizzazione della Ricerca Universitaria*) which now includes 54 Italian Universities, the Italian Centre for Aerospace Research (CIRA), the National Research Council (CNR), the Council for Research and Experimentation in Agriculture (CRA), ENEA and the National Nuclear Physics Institute (INFN), supporting the exploitation of the results of the research through training activities and networking with institutions, the business and financial world.

The added value of networks of this kind comes firstly from their capacity of supporting the research spin offs in their activities of programming and creating annual training plans for professional figures inside the universities, dedicated to the transfer of technology, but also for entrepreneurs who interact with the public research world; secondly by determining the fundamental themes to

[13] Law no. 383 dated 18th October 2001, also known as "Tremonti bis", Official Gazette of the Italian Republic no. 248, [24.10.2001].

[14] NETVAL – Network per la Valorizzazione della Ricerca Universitaria, (network for exploiting University Research), http://www.netval.it/netval-network/storia/, [10.06.2015].

developing technology transfer activities; thirdly by organising and promoting operative thematic groups and fourthly in interacting with the domestic and foreign ministries and bodies.

The prospects in Europe for spin offs

In the meantime, within its economic and political function of stimulating competitveness and employment, the European Union has for quite some time been using a process of strengthening the European research and technological transfer system, by using the American experience as an example. In a communication of 2003[15] the European Commission highlighted the need to focus on exploiting research and creating spin off companies. Since the 1990's the establishment of these companies has accelerated, even though their density remains significantly lower than the level recorded in the proximity of the American campuses. Indeed, the enterprises created in Europe by researchers or in association with them are less, unlike the startup enterprises springing up on our continent and that, being free from purely academic constraints, have more managerial autonomy and a more immediate competitiveness on the market. In the same communication it was highlighted how in Europe various domestic legislation has experienced converging development towards formulae close to the American Bayh-Dole law, and the member states which have yet to adopt measures of this kind are hastening to do so. The real effect of these measures is still difficult to measure precisely, but the divergencies existing compared to the provisions in force in some member states, as well as the national character of the regulation, have long had the effect in Europe of complicating and limiting the transfer of technologies and the transnational collaborations.

However, in spite of these objective problems of a regulatory nature, the European Union has undertaken to create the best conditions for enterprises, researchers, universities and the same spin offs to be put in the condition of improving the activities of research and technological transfer. Firstly with a Recommendation of the European Union of 2008[16] which reiterated the need to strengthen the role of the public research authorities as effective disseminators and promotors of the results of the research financed with public funds, with the purpose of turning it. This objective could be achieved precisely with a collaboration between university and industry or by creating spin offs. Subsequently by means of another important act which establishes the

[15] European commission COM (2003) 58 definitive dated 5th February 2003, *The role of universities in the Europe of knowledge*, Horizon 2020, mettendo in competizione le proprie attività di ricerca e le possibilità di trasferimento tecnologico.cedendo dire.

[16] European Commission, Recommendation dated 10th April 2008 regarding the management of intellectual property in the activities of transferring knowledge and the code of good practices destined to universities and to other public research authorities (2008/416/CE) modified with number C (2008) 1329.

European Institute of Innovation and Technology (EIT)[17] whose purpose is to promote entrepreneurship within its activities of higher education, research and innovation. In particular, the EIT should promote entrepreneurial excellence and support the start up of enterprise and spin-off's.

Beside what has been described, the European Union has also provided significant economic support: Horizon2020[18]. This is the European Commission instrument for funding scientific research and innovation which can boast one of the highest allocated budgets in the world: almost 80 billion euro, for 7 years (2014 to 2020). Through this programme, all the natural persons or corporations (enterprise, ngos, spinoffs, startups, universities, etc) can carry out research projects or actions aimed at scientific and technological innovation that have a significant impact on the life of European citizens.

Conclusions

In conclusion, it is worthwhile reporting what could be defined as the "favourable conditions" for developing an academic spin off. Some European universities are distinguished by a large number of spin ffs, others for a limited number, but with more significant economic effects. It is certainly necessary to develop more awareness of the business opportunities that a spin off can generate from a university viewpoint, and also of the benefits that a more developed business culture could create on a regional and domestic level. Secondly, it is important to exploit and promote the inspiration that other worldwide success stories have had in order to stimulate greater security and capacity for undertakings, especially amongst the young graduates. Finally, actively stimulating the development of entrepreneurial talent, especially amongst the young and helping founders of spin-offs to obtain access to true investors, sponsors and benefactors. Many areas of Europe are still going through a strong period of crisis in terms of support to spin offs due to a weaker business culture than other continental areas like for instance the United States.

The *Smart Specialization Strategy* of the European Union, however, lays down the basis for a new course of growth and development. Indeed, a new concept of innovation policy aimed at promoting the efficient and effective use of the public investments in research is taking shape. Its objective is precisely that of promoting regional innovation in order to achieve economic growth and prosperity, allowing the regions to concentrate on their strengths.

It is doubtless necessary, therefore, for the European spin offs to have the courage of increasing their managerial capacity by directly accessing forms of

[17] Regulation (EU) No. 1292/2013 OF THE EUROPEAN PARLIAMENT AND COUNCIL dated 11th December 2013 which modifies regulation (CE) No. 294/2008 establishing's the European institute of innovation and technology.

[18] European Commission, Regulation No. 1291/2013 of the European Parliament and of the Council dated 11th December 2013 establishing Horizon 2020 – the Framework Programme for Research and Innovation (2014–2020) and repealing Decision No 1982/2006/EC.

support that the European Union offers, for example, precisely Horizon 2020, putting its own activity of research and the possibilities of technological transfer in competition.

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PART III

INNOVATION MANAGEMENT

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INNOVATIVE ACTIVITY AND ITS DETERMINANTS IN DOMESTIC AND FOREIGN ENTERPRISES IN POLAND

Keywords:

innovation, innovation activities, enterprises in Poland

Summary

The article is aimed at presenting the innovative activity and its determinants in domestic and foreign enterprises in Poland, based on the findings of research conducted by the author. The paper consists of theoretical part (discussing the essence of the innovation activities and evolution of innovation models) and empirical part (discussing innovation activity among Polish enterprises and multinational corporations operating in Poland based on the author's own survey).

Introduction

The European Union defines innovation as one of the most important factors which is going to determine the competitiveness of economy in the coming years. By the term 'innovation', one understands an ability and motivation of entrepreneurs to undertake a permanent search and take advantage of the results of this research, new ideas, concepts and inventions. Moreover, innovation involves improvement and development of production and operating technologies which also refer to services, the application of new solutions in organization and management, progress in the development of infrastructure, and, first and foremost, information, with its gathering, processing accessibility[1].

According to the latest theories and practice, innovations are the result of numerous, complex interactions among units, organizations and environment in which they operate. The development of innovation theories and processes

[1] W. Janasz, K. Kozioł, *Determinanty działalności innowacyjnej przedsiębiorstw*, PWE, Warszawa 2007.

shows further evolution of these phenomena and together with all processes in today's economy it will result in the emergence of more complex and realistic models of innovation process. The article is aimed at presenting the innovative activity and its determinants in domestic and foreign enterprises in Poland, based on the findings of research conducted by the author.

The paper consists of theoretical part (discussing the essence of the innovation activities and evolution of innovation models) and empirical part (discussing innovation activity among Polish enterprises and multinational corporations operating in Poland based on the author's own survey).

Innovation activities – definition

Innovation activities are all scientific, technological, organizational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Some innovation activities are themselves innovative, others are not novel activities but are necessary for the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation.

During a given period, innovation activities at a company may be divided into three kinds:

- successful in having resulted in the implementation of a new innovation (though not necessarily commercially successful),
- ongoing, work in progress, which has not yet resulted in the implementation of an innovation,
- abandoned before the implementation of an innovation[2].

The different forms of innovation can be classified in several ways. Here are highlights of one of the proposed classification:

- a product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics,
- a process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software,
- a marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing,
- an organizational innovation is the implementation of a new

[2] OECD, 2005, *The Measurement of Scientific and Technological Activities: Guidelines for Collecting and Interpreting Innovation Data: Oslo Manual, Third Edition, prepared by the Working Party of National Experts on Scientific and Technology Indicators*, OECD, Paris 2005.

organizational method in the firm's business practices, workplace organization or external relations[3].

Evolution of innovation models

The innovation landscape has changed since new phenomena emerged, e.g. fast and easy information and technology transfer, technological progress, knowledge diffusion, electronic data exchange, global market, and global consumer. Hence, many enterprises have changed their innovation models.

While defining innovation process, one can provide two definitions. Following Schumpeter, the innovation process is a certain sequence of events: starting from an idea (invention), through implementation (innovation) and dissemination (imitation)[4]. W. Janasz defines innovation process as generating an innovative idea (regardless of what this idea is about or in what area of innovation it has been drawn), then creating, designing and implementing it for the first time. The main stage in the process involves launching a new product or adopting a new solution[5].

The innovation process, as the definition says, consists of phases and stages interacting with one another. We can look at innovation processes from different perspectives: economy, enterprise or separate innovation. No matter which approach we use, an innovation process generally consists of two phases: the creation of an innovation and its dissemination.

Innovation models have evolved from simple linear models. Good examples are: the technology-push model (up to the second half of the 1960's) and the market pull model (in the 1970's). More recent innovation models try to build more complexity and interaction into the framework and explicitly stress the need for openness towards external partners in innovation and R&D. The "third-generation" innovation model combines the technology-push and need-pull models by stressing linkages and feedback loops between R&D and marketing. The subsequent integrated model of the 1980's ("fourth-generation") emphasizes innovation as a broadly parallel process with cross-functional integration and parallel development within the company and with external collaborators.

R. Rothwell claimed at the beginning of the 1990's that there were five generations of innovation models[6]. His last 'fifth-generation' model combines integration networking with information technology, based on networking of marketing, R&D, production and customers. However, this model has the same structure of the innovation process (R&D, production, customer, marketing) as the models of the 'first-generation' (table 1).

[3] The OECD Glossary of Statistical Terms, http://stats.oecd.org/glossary, [12.05.2015].

[4] J. Schumpeter, *Teoria rozwoju gospodarczego*, Warszawa 1960.

[5] W. Janasz, K. Janasz, A. Świadek, J. Wiśniewska, *Strategie innowacyjne przedsiębiorstw*, Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin 2001, p. 194-197.

[6] R. Rothwell, *Successful Industrial Innovation: Critical Factors for the 1990's*, „R and D Management", No. 22, 1992.

Table 1. Six generations of innovation models

Generation	Key features
First and second	The linear models – need-pull and technology-push
Third	Interaction between different elements and feedback loops among them – the coupling model
Fourth	The parallel lines model, integration with the firm, upstream with key suppliers and downstream with demanding and active customers, emphasis on linkages and alliances
Fifth	Systems integration and extensive networking, flexible and customised response, continuous
Sixth	Open innovation, self-learning system

Source: own study on the basis of: R. Rothwell, *Towards the fifth-generation innovation process*, „International Marketing Review", Vol. 11, No. 1, 1994, p. 7-31.

Can we already start talking about the "sixth-generation" innovation model? The answer seems to be positive. The end of the 1990's and the first decade of the 21st century brought new solutions, structures and, finally, new approaches towards development. Thus, the 'sixth-generation' model is an answer to the changes in the global environment and its influence on enterprises. Moreover, enterprises themselves have changed: their structure, ties (so networking enterprise emerged), emphasis on cooperation. In this model attention is paid to knowledge as a separate category and the processes managing the knowledge as well as learning processes. Innovation processes should be planned in a way to enable the following: creating new knowledge, managing the existing knowledge, storing up the knowledge, transferring the knowledge or using it again. Different kinds of boundaries are crossed: between enterprises, between sectors participating in innovation processes, in taking advantage of the experience of many organizations and their employees. Finally, new problems have emerged[7], i.e. the protection of intellectual property and regulations in an innovation chain.

The 21st century strengthened the substantial changes on the market, which made enterprises change their innovation models. The innovation process is becoming more expensive and risky due to global competition, short product cycle, technological progress. As a consequence, enterprises start to share risk doing research with other enterprises and organizations, apply the open innovation model and enter enterprise networks.

[7] Own study on the basis of: D. Nobelius, *Towards the sixth generation of R&D management*, "International Journal of Project Management", Volume 22, Issue 5, 2004, p. 369-375; P.K. Ahmed, *Sixth generation innovation: innovation management systems into the future*, "European Journal of Innovation Management", No 3, 2000, p. 112-114; J. Baruk, *Zarządzanie wiedzą i innowacjami*, Wydawnictwo Adam Marszałek, Toruń 2006, p. 122.

Innovative activity and its determinants in domestic and foreign enterprises in Poland – survey findings

Survey on the innovation activity and its determinants, was carried out in the following two groups: Polish enterprises and international companies (multinational corporations)[8].

Questionnaire survey was conducted among selected entities. It was carried out in the second half of 2011 and addressed to 94 transnational corporations and 102 Polish enterprises via e-mail. As a result, 33 transnational corporations responded, i.e. 35% of chosen firms and 40 Polish enterprises, i.e. 39% of chosen firms. On the basis of the survey and empirical observation, 57 R&D centers established by multinational enterprises in Poland were identified. Enterprises function in ten sectors of economy. Table 2 presents detailed data.

Table 2. Type of activity conducted by enterprises in Poland

Type of activity	Number of Polish enterprises	%	Number of multinational enterprises	%
Automobile	2	5,0	4	12,1
Electronic	6	15,0	5	15,1
IT	9	22,5	13	39,4
Pharmaceutical	4	10	2	6,1
Aeronautical	0	0,0	1	3,0
Chemical	4	10,0	1	3,0
Foodstuffs	5	12,5	2	6,1
Machinery and equipment	5	12,5	3	9,1
Textile	1	2,5	0	0,0
Metal	4	10,0	2	6,1
Altogether	40	100	33	100

Source: own elaboration.

Most of the sectors in which organizations operate, belonged to the high and medium-high technology (table 3).

[8] For all the results of the survey see: K. Kozioł-Nadolna, *Internacjonalizacja działalności badawczo-rozwojowej w kształtowaniu procesów innowacyjnych przedsiębiorstw w Polsce*, CeDeWu, Warszawa 2013.

Table 3. Technological advances of enterprises in Poland

Technological advances	Polish enterprises		Multinational enterprises	
	number	%	number	%
High and medium-high technology and high-tech services	30	75	29	88
Medium-low technology and low technology	10	25	4	12
Altogether	40	100	33	100

Source: own elaboration.

Polish and multinational enterprises were asked about the number and type of innovations they introduced in the years 2005–2011. To the question if a given entity launched a technologically new or developed product during the period 2005–2011, 30% of enterprises answered no, whereas 70% – replied yes. The number of innovations differed considerably, from 1 to 30 innovative products. As far as the entire period under analysis is concerned, 37% of enterprises did not introduce any process innovation, while the remaining 63% introduced at least one new technological process or developed the existing one.

Enterprises operating in Poland did not really innovate their marketing and organizational methods. Throughout the period under analysis, only 39% of them did so. This may stem from the fact that in Poland MNEs located mainly their production departments dealing with technological aspects of innovative process, while marketing rested with their head offices. They introduced from 1 to 3 non-technological innovations.

The results of questionnaire survey conducted among Polish enterprises differ from the findings published about multinational enterprises. The main difference lies in the number of innovations that both groups tend to introduce. Polish enterprises introduced more innovations than multinational corporations involved in R&D activity in Poland. During the period under analysis, all the entities responding to the survey launched a brand new or developed product on the market. Just as in the case of multinational enterprises, the number of innovations differed substantially, i.e. from one to forty-seven innovative products.

Surveys conducted in Scandinavian countries led to similar conclusions, namely that the engagement of overseas branches in innovative activity was smaller than the engagement of local ones[9]. Furthermore, survey conducted in Poland among Polish and multinational enterprises operating in Łódzkie

[9] B. Ebersberger, H. Loof, *Corporate Innovation Activities, Does Ownership Matter?*, The CIS Study Statistical Report, Nordic Innovation Centre's Forum for Innovation Policies, Oslo 2005, p. 43-45.

voivodship suggests[10] that the latter are less innovative than the former (particularly those operating on the global market). Contrary conclusions were drawn by M.A. Weresa (in the years 1995–2000 enterprises with foreign capital introduced innovations more often)[11] and M. Kolarz (in the years 1997–2001). Polish enterprises were more innovative than enterprises with foreign capital, yet during the period 2002–2003 the latter were far more innovative)[12].

Throughout the period under analysis, 5% of enterprises did not introduce any innovation process, while the remaining introduced at least one brand new technological process or developed the existing one.

Polish companies introduced non-technological innovations more often than multinational enterprises, to be more specific in the years under discussion 62% of them did so. According to table 4, the number of marketing or organizational solutions introduced by a given entity fluctuated between 1 and 10 (table 4).

Table 4. Number of innovations introduced by Polish companies and multinational enterprises in the years 2005–2011

Product innovation	Polish companies introducing innovations		Multinational enterprises introducing innovations	
	number	%	number	%
0	0	0	10	30
to 5	4	10	11	34
6–10	18	45	8	24
11–15	12	30	3	9
above 16	6	15	1	3
Total companies	40	100	33	100
Process innovation	**Polish companies introducing innovations**		**Multinational enterprises introducing innovations**	
	number	**%**	**number**	**%**
0	2	5	12	37
to 5	13	32	7	21

[10] See more: M. Jasiniak, *Działalność innowacyjna przedsiębiorstw krajowych i zagranicznych w Polsce – analiza porównawcza*, „Przegląd Organizacji", No. 4, 2012, p. 11-15.

[11] M.A. Weresa, *Wpływ handlu zagranicznego i inwestycji bezpośrednich na innowacyjność polskiej gospodarki*, Wydawnictwo SGH, Warszawa 2002.

[12] The survey was based on data concerning the number of patents. M. Kolarz, *Wpływ zagranicznych inwestycji bezpośrednich na innowacyjność przedsiębiorstw w Polsce*, Wydawnictwo Uniwersytetu Śląskiego, Katowice 2006, p. 114.

6–15	22	55	9	27
above 16	3	8	5	15
Total companies	40	100	33	100
non-technological innovation (marketing innovation and organizational innovation)	**Polish companies introducing innovations**		**Multinational enterprises introducing innovations**	
	number	**%**	**number**	**%**
0	15	38	20	61
to 5	18	45	13	39
6–10	7	17	0	0
Total companies	40	100	33	100

Source: own elaboration.

Among all enterprises participating in the survey, 9% were not going to adopt any innovative solution (product, process, non-technological innovation) in the years 2012–2014. This may stem from following a defensive strategy in the period of economic recession or taking a conscious decision about not launching innovative products outside the mother country. As for Polish enterprises, 8% of them declared so.

The origin of innovation is a major determinant of an innovation activity. According to the survey conducted among multinational enterprises, in the majority of cases (61%) innovations were developed by enterprises themselves. This is proven by the fact they conducted their R&D activity in their Polish branches belonging to the global research network (as part of which R&D centres operate all over the world). 21% of enterprises produced solutions in cooperation with other entities, while 24% of them declared that their innovations were designed by R&D institutions in Poland. The highest percentage (75%) of Polish enterprises designed innovations themselves, one-third (33%) cooperated with other enterprises, and every tenth enterprise collaborated with R&D institutions. This confirms that Polish enterprises cooperate with the world of science to a limited extent.

Innovation activity was to enable enterprises to accomplish certain objectives. The majority of multinational enterprises strove after greater competitiveness (87%) and making their products innovative (85%). These goals were considered the most essential. As for 92% of Polish enterprises, it was greater competitiveness that was of real significance.

Both groups of entities regarded business growth an important objective (to be more specific, 36% of multinational enterprises and 52% of Polish companies). 37% of Polish enterprises claimed that greater novelty of products was the main aim of innovation activity (compared to 85% of multinational

enterprises). Furthermore, nearly half of MNEs (45%) declared it was important to expand the range of products, and 42% – to replace withdrawn products with new ones. Polish enterprises did not pay that much attention to replacing "old" products with new ones. On the contrary, multinational corporations declared that innovation activity did not have to be aimed at reducing harmful effect exerted on the environment.

Conclusion

The survey indicates that throughout the period under analysis Polish enterprises introduced higher number of innovations than multinational corporations engaged in R&D activity in Poland. It was then that all Polish firms launched a brand new or developed product on the market. The number of innovations introduced by Polish enterprises differed considerably, namely from 1 to 47, and by multinational corporations – from 1 to 30. It seems that the survey on the innovativeness of firms operating in Poland is a major and interesting research problem that requires further monitoring and analysis.

Literature:

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LEGAL ASPECTS OF STARTING UP A BUSINESS ACTIVITY IN POLAND

Keywords:

start up, income tax, tax deduction, texation

Summary

An entrepreneur that decides to run a business activity should register it and make a choice as to the form of income tax. The aim of the article is the analysis of legal conditions associated with the decision to start up a business activity by a small entrepreneur. Knowledge of legal aspects allows to increase tax savings owing to the reduction of tax by choosing the proper form of taxation.

Tax policy in the domain of the taxation of individuals' income is crucial if an entrepreneur cares to get as high as possible an after-tax profit enabling further company development.

Introduction

Today, both in the Polish and global economy, one can observe sweeping changes in entrepreneurship conditions. Research clearly shows that companies belonging to the sector of small- and medium-sized enterprises are best at coping with such a situation. It is them that play the key role in economic development, both at the micro and macro levels. They have an impact on the national employment level and contribute significantly to the formation of the GDP.

Any entrepreneur who has decided to conduct a business activity should register it and make the right choice as to the form of income tax, which, as it turns out, is one of the most important decisions made by entities before starting up a business activity. This is so because this choice has an impact not only on the amount of tax liability, but also on the frequency of settlements with the tax office and laboriousness records.

The aim of this article is to analyze the most important legal conditions associated with the decision to start operating. An important issue for entrepreneurs is to choose the right and most beneficial form of taxation. In order to implement this, the author presents the pros and cons of the various forms of

taxation. The sector of small and medium enterprises (SMEs) constitutes the largest group of companies or entities, which, to a smaller degree, consists of entities of commercial law. It consists primarily of partnerships. Therefore, the Author's observations focus on this group of taxpayers. The subject of the study concerns different forms of taxing the income of individuals, as in fact only these can undergo selection.

Adam Smith puts forward the assertion that the certainty of how much tax an individual has to pay, is of such importance that even the high irregularity in the distribution of taxes is not as great an evil as even a small degree of uncertainty in this regard. Tax policy in the field of income tax from individuals is essential if entrepreneurs are anxious about the after-tax profit earned; they expect it to be as high as possible, thus enabling the further development of the company. The skillful use of the legal framework for taxing individuals with income tax can provide a much smaller fiscal burden. Minimizing the tax burden allows the company to achieve much faster growth by retaining a large part of the profits.

Indicating the possible forms of taxation of the income of these businesses and the description of the conditions used in selecting the form of taxation as well as advantages and disadvantages of various methods of paying tax debts will allow for the realization of the objective pursued by the author.

The business activity of a small entrepreneur in the light of the tax law

Innovativeness and entrepreneurship – these are features one can use to define the running of a modern business. It would seem that founding a company in the twenty-first century is a simple matter. However, every entrepreneur starting up a business activity in Poland must take into account not only the benefits that come from running an enterprise, but also the consequential burdens.

Within the meaning of Art. 2 of the Act of 2 July 2004 on the Freedom of Economic Activity, an "economic activity is gainful manufacturing, construction, trade, services and searching, exploration and exploitation of minerals from deposits, as well as the professional activity carried out in an organized and continuous manner"[1]. Targeting earning indicates that economic activity is profit-oriented, and comes in several forms. First of all, this is the manufacturing activity. This term refers to those activities involving the transformation of material into a new product. In addition, it includes the sale of own products. Construction activity includes design works and their creation, as well as the maintenance and demolition of buildings. In turn, trade manifests itself through the sale of goods and services on the domestic market, as well as on foreign markets. The aim of these services is to satisfy human needs, usually

[1] Journal of Laws 2004, No. 173, item. 1807.

non-factually and for a fee. Owing to the wide range of meanings, the Act does not indicate clearly defined business continuity or how to organize it. For that reason each particular case must be interpreted individually.

Economic activity has been defined in the tax code in a broader sense. This is any profitable activity which also includes freelance professions. This applies to work performed under one's own name and at one's own expense or on one's own behalf and on the behalf of clients, even if the person performing it is excluded from the business by other laws, and the business was not qualified on account of economic activity[2].

Principles of business registration by a small entrepreneur

Literature offers many definitions of a company. It constitutes a fundamental business entity. The easiest way to define it is that it is an activity that brings financial benefits to a group of employees, which performs it in a systematic manner. The company is considered in three categories: organizational, legal, economic[3]. The legal category indicates the possession of a legal personality. It allows the incurring of debts and contracting, as the subject of business transactions. An essential requirement is to have a legal nature, but it is not enough to call a business unit an enterprise. It should fulfill the third condition that is economic independence. This means covering the company's expenses with cash revenues earned from operations.

Small- and medium-sized enterprises can be defined both in quantitative and qualitative terms. The quantification approach is presented in table 1[4].

Table 1. Criteria for classifying companies in the European Commission Regulation

The company category	Employees	Annual turnover	Balance sheet total
Micro	Fewer than 10	Up to 2 mln Euros	Up to 2 mln Euros
Small	Fewer than 50	Up to 10 mln Euros	Up to 10 mln Euros
Medium-sized	Fewer than 250	Up to 50 mln Euros	Up to 43 mln Euros

Source: Author's own study based on: Annex I to COMMISSION REGULATION (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in application of Articles 107 and 108 of the Treaty, Art. 2.

[2] According to the European Commission's Recommendation of 3 April 1996, in 2005 the Recommendation of the European Commission concerning SMEs came into force, which included economic developments after 2006. The Act of 29 August 1997. Tax, Journal of Laws of 1997, No. 137, item. 926, Article 3, point 9.

[3] J. Lichtarski, *Podstawy nauki o przedsiębiorstwie*, Wydawnictwo Akademii Ekonomicznej we Wrocławiu, Wrocław 2007, p. 47-52.

[4] *The new SME definition. User guide and model declaration*, Enterprise and industry publications, European Commission, 2006, p. 14.

According to this definition of small- and medium-sized enterprises, a relationship appears between the following requirements: employment, annual turnover, total assets of the balance sheet. It should be noted that employees are not included in the training of apprentices who work under a contract of apprenticeship or vocational training. The duration of maternity or parental leaves are also recognized. Annual turnover is calculated excluding VAT and other indirect tax burdens. The definition of microenterprises was also introduced and defined in the Act of 11 July 2014 in the amendment to the Law on Accounting. The changes included in this legal act allow for financial reporting by microenterprises in a simplified form[5].

The establishment of a business activity, contrary to popular opinion, is not a complicated procedure, and from year to year the registration of a company is becoming a simpler process. When starting up a business, an entrepreneur should answer some basic questions, namely: What type of business would they like to run? Will the project be carried out individually or with partners? And what capital will it have? The answers to these questions will allow the entrepreneur to make the right decision regarding the form of the establishment and the choice of taxation.

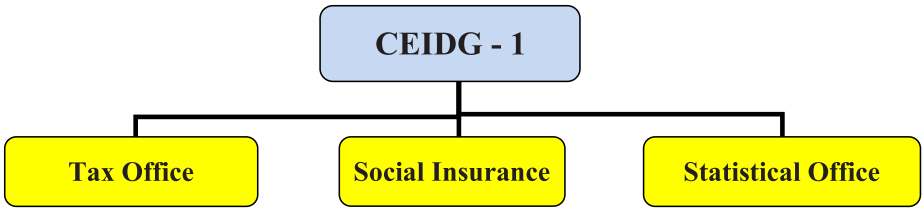
Businesses acting individually and partners of registered civil partnerships should register at the Central Office of Registration and Information on Economic Activity (CEIDG), which started operating on 1 July 2011 as a standardized, nationwide database of entrepreneurs. Registration in CEIDG is exempt from fees. Active entrepreneurs can use this facility to make a changes to, suspend, resume or close the company. It allows accessing information about entrepreneurs. By means of the CEIDG one can access the Central Information of the National Court Register (KRS). In the application one lists all the activities they intend to perform individually and as a partner in partnerships. Entry into the CEIDG data covers the following businesses details: the business name and social security number of the entrepreneur, date of birth, taxpayer's identification number code (if they have one), tax identification number (if they have one), details of any nationality, address, entrepreneurs and addresses where work will be performed, the date of commencement of business activity, a description of the subject of their business on the basis of the PKD (Polish classification of activities). Activities may be entered on a date of CEIDG-1 application form, and its printout of an entry certificate. The CEIDG-1 form also has additional features. When registering the application, an entrepreneur simultaneously submits:

[5] Journal of Laws of 2014, Item 1100. Implemented simplifications are important as companies that satisfy the definition of microenterprises, bearing in mind the criterion of income and employment, as well as running accounts, represent 21.7 thousand of about 112 thousand entities obligated to carry them out. http://ksiegowosc.infor.pl/wiadomosci/143997 Nowelizacja-ustawy-o-rachunkowosci-jak-skorzystaja-na-tym-mikroprzedsiebiorcy.html, [01.06. 2015].

- an application to assign or change the REGON statistical number [6],
- an application of for an identification number to the Tax Office – NIP,
- a statement on the choice of the form of income tax from individuals,
- registering a contributing payer with Social Insurance,
- a statement on the continuation of social insurance in the Agricultural Social Insurance Fund in the case of farmers.

The functionality of the CEIDG-1 application is presented in figure 1.

Figure 1. The functionality of the CEIDG-1 application



Source: author's own research.

Despite the fact that Polish law does not impose upon an entrepreneur the duty to develop a company stamp, it is necessary to operate formally. There are also no general rules regarding the content that should appear on such a stamp. Necessary information includes: the full company name, the name of the owner, registered address, business ID number and VAT. The potential entrepreneur will also have to open a company bank account because they will need it to transfer premiums to the Social Insurance Institution and the Tax Office. This account is required by law for transactions in excess of EUR 15.000, regardless of the number of payments. The registration of the insured, i.e. the person running the company or other insured persons, i.e. coworkers, employees or contractors to social or health insurance is independent on the submission of the CEIDG-1 application form within 7 days of the date of starting up a business. The notification shall be made after lodging either electronically or directly in paper format to the Social Insurance Institution a ZUS ZUA or ZUS ZZA form.

Entrepreneurs undertaking economic activities should consider the issue of VAT. At the time of entry into the CEIDG, the trader shall report to the tax office only formal issues related to income tax. There remains also the matter of tax on goods and services (VAT). Therefore, the entrepreneur, prior to carrying out the first activity regarding tax, is obliged to submit a registration, which is a VAT-R form with the competent tax office for the registered address of the business. The taxpayer legally starting up a business can benefit from the exemption limit of the personal setting of the value of sales, which is PLN 150.000. For the

[6] This is the National Official Register of Economic Entities. It includes legal persons, organizational entities without legal authority and individuals conducting economic activity.

purposes of VAT settlement, entrepreneurs are obligated to record sales, and the sales confirmation is required in order to issue a VAT invoice or delivery receipt.

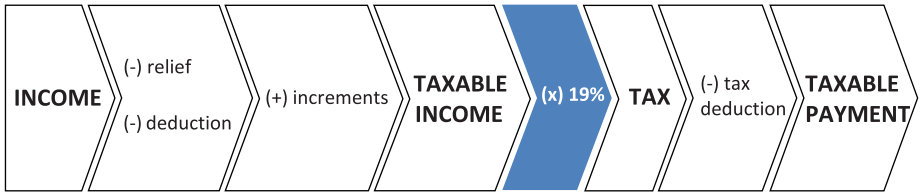
Certain types of businesses require consent for their management and, therefore, traders must report to the competent authorities. This consent may be in the form of concessions, licenses, permits or a regulated activity registry entry. Activities requiring licenses are associated with: mines and oil gas extraction, involving manufacturing or trafficking weapons, ammunition, distribution of radio and television programs, air transport, casinos, etc. There is also a group of activities, access to which requires a notification to the General Inspector of Financial Information.

Income tax forms for small- and medium-sized enterprises

Enterprises in Poland operate in accordance with the tax system, which was shaped over the span of many years. This system is created by both direct and indirect taxes. Indirect taxes include: VAT (hereinafter called the tax on goods and services), excise tax and gambling tax. Direct taxes include: income tax on individuals and legal persons, inheritance tax, agricultural tax, forest tax, real estate tax, transport tax, as well as civil legal stamp duty tax and tonnage tax.

In the sector of small- and medium-sized enterprises for taxpayers involved, the largest controversy was evoked over income tax. One feature of this tax is that it causes the lawful transfer of property between the taxpayer and the state. Its source is income. In the Polish tax system core income taxes include: corporate tax and income tax from individuals. The first of the two taxes was introduced in Poland in the Act of 1992 on income tax from legal persons. Payers of this tax duty are legal persons and companies in an organization, organizational entities without legal personality, and tax capital groups. Since 1 January 2014, limited joint-stock partnerships are also subject to this tax. Taxpayers are also companies without legal personality having their registered offices or headquarters in another country if, in accordance with the law of that State, they are considered legal entities and are subject to taxation there on all income regardless of where the income was gained. The tax duty in Poland is determined in accordance with the 19% tax rate. Taxable income is reduced by certain legal reliefs, such as: loss from previous years, capital expenditure or donations granted to public benefit organizations, and increased by any increments related to the loss of privilege to previously used deductions from income. The tax amount can then be reduced through exemptions or tax deductions. These reductions are, for example, due to the fact that the entity, in previous tax periods, paid from amounts that were exempt from this duty. The method of calculating the tax on the income of legal persons is presented in the following figure 2.

Figure 2. Determining the income tax liability of legal persons



Source: author's own research.

The second type of obligation is individual income tax. Economic activity carried out by individuals in Poland may be taxed in the following forms:

- taxation in general:
  - scale tax (graded tax),
  - flat tax;
- simplified forms of taxation:
  - a lump sum on recorded income,
  - tax card.

The tax liability which is tax progression (tax scale) comes down to the taxation of income earned from non-agricultural economic activities in accordance with the scale, which has been 18% and 32% since 2009. This is a fundamental and obligatory form of taxation of income earned by individuals, therefore there is no obligation to submit a declaration in order to choose it. Flat tax was introduced in 2004, according to the Polish tax strategy[7]. In this case the income is taxed at a uniform rate of 19%. The implementation of this form of taxation is aimed at the approximation method of accounting for the tax liability of individuals running a business activity, in order to settle legal persons. This strategy included the creation of a single proportional taxation of income tax for both individuals and legal entities.

The business activity of an individual may also be taxed in simplified forms. The flat rate income tax was introduced on 23 December 1993 and came into force on 1 January 1994. A lump sum on recorded income is one of the two forms of flat rate income tax. A significant simplification is the assumption that the taxable amount shall be an income that occurred in taxation on general terms. It is not possible to include expenditure in the cost of revenues.

The tax card is considered the simplest form of business taxation. It was introduced via the Ordinance of the Minister of Finance on the tax card on 20 December 1991, but became operational only in the following year. The legal norm regulating its use is the Act of 20 November 1998 on lumpsum income tax on some individual incomes. The introduction of the tax card caused many

[7] *Tax Strategy, the Ministry of Finance*, Warsaw 2004, p. 9, http://www.finanse.mf.gov.pl, [12.06. 2015].

reforms in the Polish tax system. Tax card rates are updated almost every year. The latest announcement of the Minister of Finance of 17 November 2014 on the tax card, which appeared in the Polish Monitor on November 27, concerns the rates in force since January 2015.

Comparison of the scope of taxation on general principles

The Act of 26 July 1991 on income tax from individuals regulates the scope of both the subjective and objective fiscal duties of individuals. According to this regulation, an entity that is taxed is any natural person receiving an individual income. Income tax is calculated on all income, regardless of the source of revenue.

The subject of this tax is, as its name suggests, income. The calculation of this tax does not take into account is the type of revenue source that has permitted the achievement of this income. There is also the possibility that the object of taxation is, in some cases, revenue. The person charged with the income tax may receive income from different sources of revenue. In this case, the total of the income from all sources in a given year shall be subject to taxation. There is a pattern here that if a taxpayer has incurred a loss in one of the sources, this does not diminish the revenue from the others. Items of individual income tax may also include income or revenue from non-agricultural activities and special branches of agricultural production. Scale tax is the obligatory form of taxation for small entrepreneurs running a business activity, regardless of its nature. In this form the phenomenon of progressive tax is applicable, meaning that the more income an entity generates, the higher the tax rate it will be charged. The selection of this method of taxation is associated with the accumulation of income from non-agricultural activities of the entity's income from other sources of revenue. The taxpayer is entitled to deduct social security contributions. If a taxpayer has qualified for the group of persons with disabilities or has dependents, such person may deduct from their income expenses designated for rehabilitation.. One may also deduct donations provided by the entity to public benefit and religious organizations, as well as blood donation goals. The deductibility comprises also the expenses that a taxpayer has suffered as a result of Internet use (up to PLN 760).

The second form of taxation on general principles is the flat tax of 19% of the tax base. Basically, this method of taxation is chosen by taxpayers who achieve a high annual income. This tax is optional. The taxpayer is obligated to deliver to the competent tax office, by 20 January of the tax year, a written declaration expressing the desire to settle their taxes in this form. An exception to this rule are entities starting up their activity during the fiscal year. In their case, the request must be submitted by the day preceding the date of starting up non-agricultural business activity, but no later than on the day that the first revenue is gained[8]. The selection of such forms of taxation involves the loss of

[8] Journal of Laws of 1991 No. 80, item 350, Art. 9a, Section 2.

the benefit of more incentives and tax preferences offered by the taxation scale. One loses the opportunity of filing a joint tax return with a spouse, and the tax dismissal, which was entitled for investments in special economic zones. On the other hand, it is possible to deduct contributions from income that have been paid by the operator in respect of social security and tax losses. The benefit is also the possibility of a tax deduction for health insurance contributions, as well as the payment of 1% of tax to public benefit organizations.

The use of this form of taxation is beneficial to taxpayers who, using the tax scale, have crossed the second tax threshold. They would be required to pay 32% tax on income. In this form, the tax duty is always subject to a single rate of 19%. The disadvantage of flat tax is the loss of the possibility to deduct the amount that was established as tax-free (PLN 3,091). The advantages and disadvantages of choosing this method of tax charges are presented in table 2.

Table 2. Advantages and restrictions of the flat tax

FLAT TAX	
Benefits	**Restrictions**
• A uniform tax rate regardless of the size of income. • Eligibility to benefit from this method of taxation, regardless of type, size or activities.	• Loss of the possibility to use most exemptions. • It is not permitted to settle the tax duty together with your spouse. • No amount of free tax burden. • The obligation to maintain a tax revenue and expense ledger. • The obligation to submit annual tax statements.

Source: author's own research.

A lump sum on recorded income and the tax card

A lump sum on recorded income is not available for all entrepreneurs. Thus they can account for taxpayers who operate alone or in a partnership. The revenue of these entities may not exceed the equivalent of EUR 150.000, which gives PLN 626.880 for the year 2015. This is a fundamental flaw in the method of the calculation of tax liabilities. Operators are obligated to keep records of equipment, revenue records, and an inventory of fixed and intangible assets. It is the duty of the taxpayer to calculate and pay the tax by the 20th day of the following month. As for the month of December this payment shall be made when filing the annual tax return. There is a duty to settle the financial year by 31 January of the following year.

The entity calculates the income tax, and therefore does not include the cost of its acquisition. Such a solution may be beneficial for taxpayers who incur low operational costs. The main advantage of the lump sum is the fact that its rates

are generally low and dependent on the type of business – the lowest rate is only 3%. But the biggest benefit to the taxpayer is the lack of the requirement to maintain a revenue and expense ledger or accounts. A simplified record of revenues is sufficient. The last attribute of the lump sum is the tax relief but there is no relief for families.

The second form of lump sum tax is the tax card. It is not a very competitive tax treatment because of the possibility of it being applied to a limited group of entities. The tax card can be used only in service activities run for the population's sake as well as the performance of some professions. This type of activity, however, is not the only requirement when choosing this form of taxation. Another criterion is the number of employees, accurately determined in the regulation for the type of activity. In addition, it cannot be applied to any type of business. It also does not apply to any deduction or tax, with the exception of health insurance contributions. The amount of tax is determined centrally for the whole year and depends on the type of business, the place in which the entity performs this activity, and the number of employees. The advantage is that the entrepreneur knows exactly what tax rate is to be paid for a given month and it is uniform throughout the tax year. However, this is not beneficial for the taxpayer who, in a given period, did not gain any revenue or incurred a loss as they remain obligated to pay the amount of the tax.

Conclusions

The role of the SME sector is often underestimated at the macro level yet one should keep in mind that it is precisely these companies that set the framework for economic and social progress by means of the impact on individual elements of the economy, as well as other entities. They contribute significantly to the changes that take place on both local and regional markets.

The proper tax policy allows entrepreneurs to focus their activities in order to reach desired objectives and gain competitive advantage. The decision to start up a business activity, for every small entrepreneur, should therefore be associated with the analysis concerning the selection of the most appropriate form of taxation. Thus among the determinants conditioning the existence of business entities, it is the tax liability that plays a key role, as the entity affects the amount of this duty. The choice of the best variant for the entity to settle accounts with the tax office is limited by many factors comprised in the tax law. Knowledge of these legal norms and the ability to take steps that are intended to minimize the tax burden, allow the selection of the appropriate tax strategies for targeted activities.

Companies belonging to the sector of small- and medium-sized enterprises may choose how to tax their income on a general basis or have the opportunity to take advantage of the simplified forms of taxation, which are provided in the Act. Although accounting duties were limited in the flat rate tax forms, they are not available for all entrepreneurs, especially those operating on a larger

scale. Commonly available methods of taxation are general principles that also have many advantages and are more beneficial for companies incurring high deductible costs.

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PREPARATION TO OPERATE THE CENTRE FOR EDUCATION IN MATHEMATICS AND CHEMISTRY BUSINESS AS A RESULT OF ACADEMIC INITIATIVES AT UJ AND CUE

Keywords:

academic entrepreneurship, commercialization, entrepreneurial university

Summary

The article presents two academic initiatives organized by the Jagiellonian University and the Cracow University of Economics, which results were many ideas for academic enterprises and an example of one of them is described in detail in the article. Creating ideas for the academic enterprise is the result of entrepreneurial activities of universities. This type of university activity is necessary, taking into consideration the increasing competitiveness in the education market, in the higher education sector, and bearing in mind the importance of universities in building the knowledge-based economy.

Introduction

Participation of universities in creating knowledge economy is very large. The impact of the university includes both equipping students, future graduates and employees with the knowledge and competencies that are expected by the labor market, as well as providing innovative solutions aimed at economic development. One important function of the university is also involvement in shaping the direction of economic development, whether in the local, regional, or national level. The advisory help or developed expertise are important contributions to economic development. Particularly important are such university activities that directly affect economic engagement. We are talking about economic engagement of students, graduate students and researchers who set up companies. The

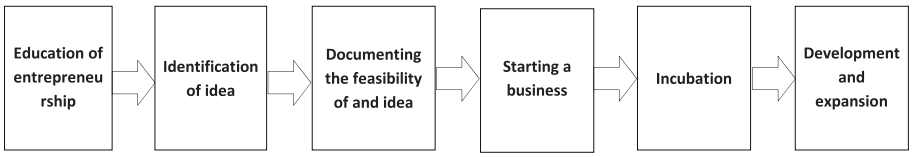
article presents two academic initiatives which helped to prepare the concept of the academic enterprise.

Academic business supportive initiatives

Academic initiatives aimed at supporting and promoting entrepreneurship become more and more common part of the activity of public and non-public universities. Entrepreneurship is a structured process focused on achieving specific economic benefits, which involves the use of the opportunity inherent with a new idea by taking action of a business in risky conditions[1]. Entrepreneurship in the academic dimension is manifested in organizing such initiatives, which in the long term can lead to the achievement by the university measurable financial benefits. Entrepreneurship is on the other side the desired direction for the academic community, and especially for those of its representatives who, through their activity, can lead to the creation of academic enterprise in the formula of spin-offs.

Academic initiatives that support entrepreneurship are mainly aimed at commercializing scientific research results. They can be categorized as pre-incubation and incubation, namely those related to the stage of commercialization or at the stage of just the concept of the company or already in in the stage of operating company. Pre-incubative activities refer mainly to the organization of trainings, workshops, presentations of good practice, including in effect, has led to the decision to establish the academic enterprise. Academic initiatives may be implemented either during the course, as one of the element of an education, or as extra-curricular activities, being performed additionally. At the same time, these initiatives can be diversified and include various types of activities e.g. training and study visits, and can rely on a homogenous actions, e.g. only training. As a result, academic initiatives should crystallize ideas for commercialization, and should create preliminary concepts of operation of such enterprises. It is important to bring to the independence of the functioning of the newly established academic enterprise. Figure 1 shows the model of the support system of the development of start-ups.

Figure 1. Model of the support system of the development of start-ups



Source: A. Sabat, Świętokrzyski model funkcjonowania przedsiębiorczości akademickiej, [in:] *Uniwersytet trzeciej generacji. Stan i perspektywy rozwoju, (ed.)* B. Burawski, Europejskie Centrum Wspierania Przedsiębiorczości Sp. z o.o., Poznań 2013, p. 100.

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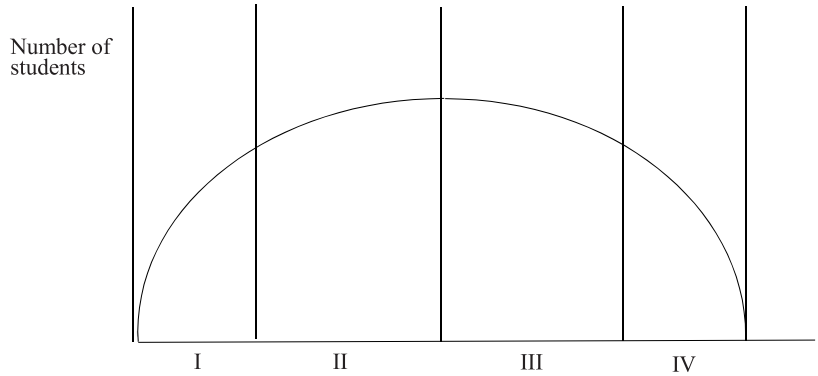
It can be assumed that each company that has been formed as a result of initiatives carried out by the university, is an academic enterprise because it originates from the university. It is also possible to do the definitional differentiation. In case the academic enterprise is considered as the one which activities are organizationally or financially associated with the university could be considered as academic. Their operations are associated with the university and depend on the university.

A special group of the target audience of academic initiatives aimed at supporting academic entrepreneurship are students. Figure 2 shows a cross-sectional structure of students who may be future entrepreneurs.

Figure 2. Number of entrepreneurs in different students' groups according to the year of study



Group I — Determined entrepreneurs,
Group II — Hidden entrepreneurs,
Group III — Having no desire to become an entrepreneurs,
Group IV — Definitely reluctant entrepreneur status.

Source: J.G. Wissema, *Technostarterzy. Dlaczego i jak?,* Edit Sp. z o.o., Warszawa 2005, p. 17.

Reaching the appropriate group during academic initiatives is particularly important. For this reason, such activities as promotional campaigns should be of interest to the university authorities. What's more similar types of activities should be part of the standard functioning of the university which aspires to being entrepreneurial.

Triple helix in academic entrepreneurship

The development of a knowledge-based economy is based on the implementation of innovative solutions which stem from the knowledge generated in research and development units. It also is a catalyst for common initiatives of universities, business sector and public administration.

In the modern economy, the cooperation between authorities, public institutions, business and higher education institutions is a must. The continuous cooperation between those actors and their interdependence can influence the support in technological progress and thus the support for the economic development[2]. EU definition of this collaboration is known as the triple-helix, but discussions on the triple-helix actually stop at identifying the needs of triangular operations. The cooperation within the triple helix indicates actors as well as their indicated their roles, i.e. science produces knowledge, business sector is the ultimate recipient, and the public administration and authorities have become bridges of cooperation, often providing funding. The need for achieving the objectives of cooperation according to the pattern shown does not appear to be subject to discussion. Cooperation in the field of triple-helix, in which the funding comes from the municipality or the ministry or another body of public administration is presently largely a result of EU funding. In such a model of cooperation the model of financial public grant is used.

This model usually is based on the public subsidy for realization of specific studies, which will be used by enterprises in a tripartite agreement between: the enterprise (business), research unit and public authorities. Specifically in Polish conditions, this model usually refers to the subsidy in the form of a EU-program-funded grant such as the structural find program grant. This type of business model is somewhat similar to commissioned projects but differs from them because the research results obtained project outputs must be implemented by enterprises to economic practice. This means that the company (one of the project partner) decides at the initiation of the project to carry out the investment (not necessarily financed by the public resources) or to improve the possessed infrastructure for the purposes to implement the project outputs. This type of support for research financing leading to innovations and at the same time this type of business model may be feasible in situations where business partner would never have undertaken the tasks of research, due to their relatively high cost. At the same time the results of the implementation of the research may contribute to improving the achievement of social objectives[3]. Figure 3 shows the system connections within the triple-helix as well as the links between different actors.

The involvement of the EU funds in triple-helix initiatives helps in fulfilling the objectives of knowledge economy. Implementation of innovative solutions from science to economy is often the financing of initiatives which support the creation of spin-off companies.

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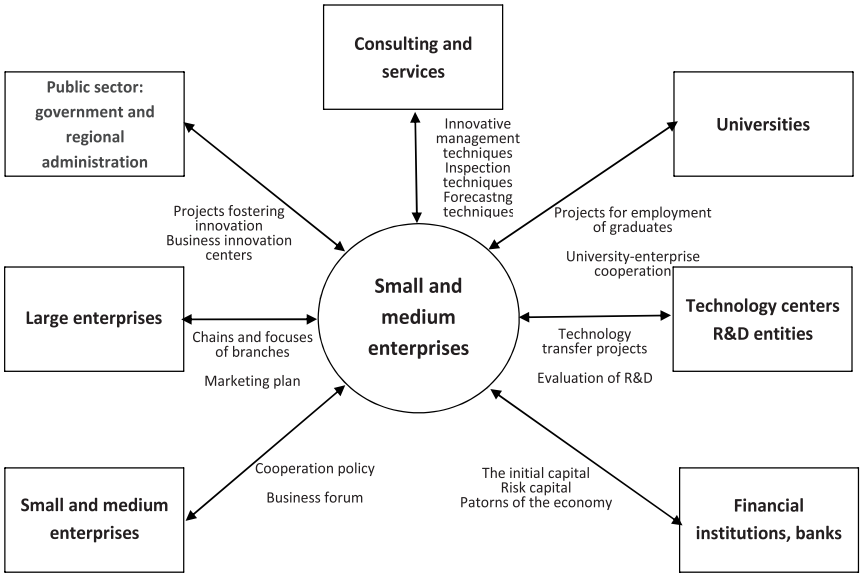
[2] J.M. Bugaj, Z. Godzwon, A. Lis, R. Rybkowski, M. Pilch, *Ekspertyza – Wpływ sektora szkolnictwa wyższego na produkt krajowy brutto. Materiał konferencyjny*, Centrum Badań nad Szkolnictwem Wyższym, Kraków 2012, p. 34.

[3] P. Kulawczuk, *Konstruowanie modeli biznesowych współpracy nauki i biznesu w realizacji działalności badawczo – rozwojowej*, [in:] *Budowa współpracy nauki z biznesem w województwie lubelskim*, (ed.) P. Kulawczuk, Instytut Badań nad Demokracją i Przedsiębiorstwem Prywatnym, Warszawa 2010, p. 47.

Generally, the creation of spin offs may be, on one hand, the effect of opportunities which entrepreneurs see and want to use and at the same time the readiness of the university to accept such actions of its students or staff. This readiness is based on existence of the entrepreneurial development strategy at the university. Also the university authorities should be intended to ensure, as far as possible, the dissemination of practical achievements of the university staff and students. The ability to create a spin off requires an approval of the university to this type of initiative, and in the next stage – providing the support for scientists, especially during development of an idea, as well as getting rid of the psychological fears about generating inequality in the university. The psychological factor is particularly important[4].

Figure 3. Model of the system



Source: E. Stawiarska, *Tworzenie i rola systemu powiązań administracji publicznej, szkolnictwa wyższego, przedsiębiorstw w kształtowaniu podaży i popytu na innowacje*, [in:] *Budowa współpracy nauki z biznesem w województwie lubelskim*, (ed.) P. Kulawczuk, Instytut Badań nad Demokracją i Przedsiębiorstwem Prywatnym, Warszawa 2010, p. 30 [for:] R. Domański, A. Marciniak, *Sieciowe koncepcie gospodarki miast i regionów*, PAN KPZK, Studia Tom CXIII, Warszawa 2003, p. 13.

Academic initiatives, which in this paper are described (one is the Jagiellonian University project and another is the Cracow University of Economics project) were created as results of successful applications for call

[4] P. Kulawczuk, *Konstruowanie modeli biznesowych współpracy nauki i biznesu w realizacji działalności badawczo – rozwojowej*, [in:] *Budowa współpracy nauki z biznesem w województwie lubelskim*, (ed.) P. Kulawczuk, Instytut Badań nad Demokracją i Przedsiębiorstwem Prywatnym, Warszawa 2010, p. 52.

for proposals within European Social Funds. The financial element within the initiatives was the only action taken by the public administration. Preparation and execution of project activities[5] had entirely been done by the project coordinators and partners during the implementation stage. Still academic initiatives are effects of proposals which were prepared on the base of specific requirements included in the call documentation. These requirements include many different criteria (access, horizontal, bonus, etc.), which to the large extent delimit the range of the individual invention in the project preparation. From the beginning of the national development plan implementation, the disbursement procedure of the structural funds are increasingly restricted on how money should be spent. Such procedures to the large extent are helpful because they promote the specific successful types of projects, but on the other hand they affect the innovativeness and the ingenuity of project authors. The unification of the types of results prevents completely new initiatives that might arise and give qualitatively new ways to reduce the disparities between socio-economic development of the country.

Description of the Cracow University of Economics academic entrepreneurship initiative

One of the interesting initiatives to support triple-helix was the project "Innovation Broker as a tool for effective development of the system of a modern economy in Malopolska", co-financed by the European Union under the European Social Fund. The project number was: POKL.08.02.01-12-065/10-00 and was carried out by the Malopolska Region, with the participation of the Cracow University of Economics as a partner. Kraków Technology Park Ltd. was still another partner in the project. The aim of the project was to increase the efficacy of measures to strengthen the cooperation between science and business by building a model of effective and efficient partnerships and brokerage rapidly functioning system in Malopolska. This objective was to be realized by the end of 2013. The project duration was from 1 October 2010 until 31 December 2013.

One of the project workpackage, for which coordination CUE was responsible, was the Grant Programme. This fund was aimed at strengthening the commercialization of research results in strategic technologies for Malopolska, especially for the development of the modern economy of the region. The following key technologies for Malopolska were indicated as those in which individual initiatives could be funded within the grant programme:

- the safety and comfort of life (including technologies: building self-sufficient energy,
- clean energy technologies, materials engineering and nanotechnology for special applications),

[5] In terms of Cracow University of Economics initiative, the University was responsible for one of the project modules – grant program.

- medicine and health (including such technologies as: tissue engineering, medicine and technology locally destroying tumors, monitoring and control of diseases, improvement of treatment based on data analysis),
- information and visualization (including such technologies as: contactless computer interface, intelligent systems, universal access to information).

The guarantee to achieve the project purpose was to support work on the commercialization of innovative, evidence-based technology concepts developed by students and researchers from Malopolska region. The subject of funding under the grant program could be, among others, completion of development or business model or business plan, analysis and valuation of the target market, financial analysis in terms of costs of implementation and production, the profitability of the project, obtaining necessary approvals for starting the business, certification costs, technological audit and performing the prototype tests in certified laboratories, financing intellectual property rights, development strategy and marketing strategy or a technical feasibility study of the project. The maximum amount of each grant was 50.000 zł. The program was aimed at adults – students, graduate students, researchers and academics, with the concept of an innovative project based on the results of research in strategic technologies for Malopolska.

The project was directed towards inhabitants of Lesser Poland Province (Malopolska). To participate in the project one should provide the following:

- presentation of the concept of the idea and potential directions for its commercialization and application of innovation with description of a solution,
- the development concept,
- the use of the grant,
- expected results of the grant.

Within the project there were two editions of the Grant Programme. Altogether 12 grants were paid. The final products within the framework of the grant program were:

- certificates, accredited opinions by the research centers,
- development business models,
- legal opinions referring to the intellectual property rights, know-hows / research outcomes/ intellectual values,
- defined market or target markets,
- valuation and target market analysis,
- development strategy and marketing strategy,
- developed plan to implement production/ services,
- financial analysis in terms of costs of implementation and production and profitability of the project,

- the possibility of commercialization of knowledge[6].

Description of the Jagiellonian University academic entrepreneurship initiative

Another interesting initiative to support academic activity in the field of pre-incubation of ideas on economic activity was the project of the Jagiellonian University entitled "System of connected vessels has an academic career development opportunity", implemented under the Human Capital Operational Programme, Priority VIII "Regional human resources", Topic 8.2. "Transfer of Knowledge", Sub-topic 8.2.1. "Support for cooperation between science and business." The project was co-financed by the European Social Fund, and covered the period from 01.01.2011 to 31.12.2012. Project title refers to the system as it draws ideas from science, passion and experience, and from business – knowledge about how they can be transformed into profits and the development of innovative business[7]. The aim of the project was to increase opportunities for knowledge transfer from universities to the economy by providing the academics knowledge required in the process of setting up and conducting of spin-off/ out. Specific objectives included:

- raising awareness about the setting up and functioning of the spin-off/ out (training, consulting, providing publications on business),
- increasing awareness of career development of students and researchers, with particular emphasis on scientific business,
- promoting academic entrepreneurship through seminars, tournaments, cash flow and media activities.

The project aimed at strengthening the business potential of scientists, students and graduates. The activity to ensure the implementation of the objective was free training program.

Each project edition consisted of 60 hours of training, 5 training seminars. The training included five thematic modules:

- MODULE I – DEVELOPMENT (business idea, identification of needs, the product of the company, team, leadership, commercialization etc.),
- MODULE II – COMMERCIALIZATION (contracts, licenses, financing innovation, intellectual property protection),
- MODULE III – PRACTICE (setting up and running a business, company spin off / out, finance, accounting, etc.),
- MODULE IV – MARKETING (preparation of managerial, marketing strategies, sales, negotiations, etc.),

[6] Rules of the Grant Program from 4 July 2013r. (second edition updated) cited from the website http://www.brokerinnowacji.malopolska.pl/images/program-grantowy/Regulamin_Drugiej_Edycji_Programu_Grantowego_-_Aktualizacja_4_lipca_2013.pdf, [16.03.2015].

[7] http://snp.cittru.uj.edu.pl/?q=node/44, [15.03.2015].

- MODULE V – BUSINESS (elements of a business plan, market analysis).

Project participant could be anyone from Malopolska, who has declared interest in creating spin-off/ out (without having finished idea for a company, and after the training and counseling part of the project without the obligation of setting up the company) in one of the 12 areas identified as RSI (Regional Innovation Strategy) key and also represented one of the identified target groups:

- a student,
- PhD student,
- graduated from the university (in the 12 months from the date of graduation),
- researcher research units,
- researcher and university science teaching.

The company defined as spin-off is considered a new enterprise which was founded by at least one scientist or researcher (person with at least PhD degree) or a student or graduate of the university who wants to commercialize innovative ideas (knowledge) or technology, and is usually dependent (organizationally, formal – legally, financially, etc.) from the parent organization (e.g. universities). On the other hand, the company defined as spin-out is considered a new company, which was founded by at least one scientist or researcher (person with at least PhD degree) or a student or graduate of the university who wants to commercialize innovative ideas (knowledge) or technology, and is usually independent in organizational terms from its parent organization (e.g. universities) and has independent sources of funding. The candidates who wanted to be project beneficiaries were graded according to the the following information:

- the commitment and achievements in scientific activities – research (conducted research, publications, participation in conferences, commercialization of research results, fellowships),
- organizational capacity and engagement in an outside activities (activity or/ and cooperation with student organizations, volunteer work, organization of training events – conferences, events, trips, etc.),
- education (completed courses, training, studies),
- current business activities (internships, practice, cooperation with business, etc.).

General description of the product of Centre for Education in Mathematics and Chemistry business

The core activities of the Centre for Education in Mathematics and Chemistry will consist in educational classes in chemistry at the level of middle school and secondary school as well as chemistry basics for students at faculties other than chemistry. The classes will be additional in character and they will allow for developing the interest in the subject or for covering the part of the

school curriculum that causes difficulties. In the case of students, the classes will provide preparation for university classes, including the labs. The activities of the Centre will be innovative due to the practical classes (experiments and labs) that will allow for participation in chemical experiments and conducting such experiments under the supervision of a qualified teacher. The Centre will also extend its educational offer to include children from primary schools and kindergartens. However, it will require assistance of third persons (parents or carers) to ensure adequate care and safety for the children. The classes will be conducted in line with all security measures and will be adjusted to the age and skills of the students. It will be possible for the parents to take part in the classes along with the children and provide care to their children as well as actively participate in the classes. As the Centre develops, the offer will be extended to include services for institutional customers (schools, kindergartens) by providing regular chemical presentations and workshops. In such cases, the Centre Employees will bring the necessary equipment and reagents to the venue and conduct classes for children and adolescents. The Centre for Education in Mathematics and Chemistry will also offer attractions for children who spend the summer holidays in the city through summer play centers. Furthermore, the Centre will organize science camps for children and adolescents interested in chemistry. A camp will last one week and the classes will be combined with visiting interesting places in Poland. The subjects to be covered during the camp will be related to key topics in contemporary chemistry and protection of the environment. The additional innovation will be the on-line chemistry portal and forum where interested people will be able to ask questions and provide comments, while the Centre will ensure content-related and technical services. There will be numerous chemistry contests announced on the portal in order to attract people with the educational offer of the Centre and with chemistry as such. The Centre for Education in Mathematics and Chemistry will also offer maths lessons at the level of primary school, middle school and secondary school. If customers are interested in physics and biology classes, it will be possible to employ teachers and extend the offer of the Centre.

Competition analysis in Centre for Education in Mathematics and Chemistry business

Private lessons for pupils and students constitute a popular form of making additional money by advanced students, active teachers and retired teachers. This type of competition will have to be considered at the first stage of Centre's activity, but its innovative services will eventually create its competitive advantage. At present, companies operating on the market offer classes only in traditional form without experiments. The key competitors for the Centre will be universities. Many of them offer chemistry presentations for schools and kindergartens as part of the activities of student research groups or didactic departments. The Centre for Education in Mathematics and Chemistry will

provide an unprecedented offer: practical classes, experiments and labs that will be the main advantage which will attract customers. The prices will be similar to the standard offer, which will encourage parents and holders of financial means to choose the offer of the Centre from among others in the market.

Obstacles in the entry to the market Centre for Education in Mathematics and Chemistry business

Activities in the sector of education are related to numerous restrictions. One of the possible obstacles is the lack of approval by the Education Authority (Kuratorium Oświaty) for the activity. Another obstacle results from the strict regulations applicable to some chemical substances, their storage and waste management. Furthermore, the teachers must present adequate didactic preparation for teaching children and adolescents as well as specialist knowledge of chemistry and mathematics. Financial obstacles are related to the costs of rental and adaptation of the rooms in line with the standards required for chemical experiments, the purchase of reagents and the laboratory equipment. These are necessary elements that prove the innovative character of the planned activity.

Findings and conclusions

The participation of public administration in the activities supporting the creation of spin-off enterprises may be defined as direct or indirect. Direct support can be considered to providing funds to finance setting up of an academic company and its initial operation. The indirect support means financing activities leading to the creation of the concept of setting up and functioning of the academic enterprise.

Providing funding determines taking decisions to setting up the company in a large extent. Also in terms of indirect support, i.e. the financing of trainings, it also determines growth of entrepreneurial activity of students, graduate students and research workers. Therefore, the organization of a similar type of operation, as presented in this paper, is needed. The big challenge is the next stage i.e. the concept stage. As participants' interest of creating the concept of the academic enterprise is not a problem, the decision taken by potential entrepreneurs to run the company faces many barriers. Lots of very interesting concepts of enterprises are presented as results of initiatives, carried out by the university, addressing representatives of the academic community: students, graduate students and research workers. The companies, in case of their establishing, are defined as spin-offs since their inception genesis refers to the ideas drawn from the university. Very often the concepts of economic activities are drawn directly from the work performed by scientists. The concepts often apply to the new idea of using university assets, both tangible as well as intangible.

Taking as an example the concept of the Centre for Education in Mathematics and Chemistry, this regularity can be very easy to confirm. In addition to the

above and, what is also important, supportive activities leading to the emergence of the concept of economic activity are government and public administration activities. Academic nature of initiatives influences more effective participation of academic staff. It results from ensuring a certain amount of guarantees and certainty regarding its participation in a similar type of projects.

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EARLY BIRD CATCHES THE WORM. EFFICIENT MANAGEMENT OF THE INNOVATION PROCESS AS THE KEY TO THE DEVELOPMENT OF SMALL AND MEDIUM-SIZED ENTERPRISES (SMES)

Keywords:

organisation, enterprise, innovations, management

Summary

Innovativeness in a company is determined as the ability and motivation to pursue and commercially exploit all results of scientific research, new concepts, ideas and inventions. However, the pursuit of conscious management of the innovative processes requires determining their goals. This is crucial to ensure its successful completion, i.e. improving the quality of life.

Introduction

Business innovation is generally defined as the ability and motivation to seek and exploit commercially the results of scientific research, new concepts, ideas and inventions. A company focused on innovation, is one that conducts research and development (R&D) or purchases R&D projects on a wide scale, allocating considerable resources to this activity, as well as implements new science and technology solutions, has a large share of new products in its production volume and constantly introduces innovations to the market[1]. However, the process of introducing an innovation in a company requires sustainable management, even more so in small and medium-sized enterprises (SMEs).

[1] A.H. Jasiński, *Technical Innovation and Size of Business in the UK*, "Economics and Organization of Enterprises", No. 7, 1992, p. 24.

The specifics of micro-, small- and medium-sized enterprises

The situation of SMEs in the context of the increasing level of global competitiveness is not clear, as this sector is diverse in many ways[1]. SMEs do not fully utilise the instruments of competitiveness such as[2] marketing and promotion, or product differentiation (innovation) due to limited resources. In addition, the lack of adequate competitiveness potential, including technological base and R&D results often drives the companies to base their competitiveness on the short-term advantages[3] that are easy to achieve also by their market rivals and exposed to the risk of imitation. Not without significance is the lack of market knowledge and the passive approach to innovation in the companies absorbed to a large extent by the current activity.

The level of entrepreneurs' awareness in SMEs regarding the appreciation for the role of technology is relatively low. This generally results from the most commonly encountered, spontaneous kind of entrepreneurship, especially among people running micro- and small enterprises. Among them predominate those with secondary education or poorer[4], who are just gaining skills and knowledge necessary to run a business[5]. Such people are often satisfied with achieving an even modest financial surplus, and their strategies to a greater extent are focused on survival rather than on development. The less numerous, but the ever growing group are entrepreneurs approaching their actions in a professional manner. Among them prevail young people, often with higher education, who draw from the best practices of behaviour and utilise the opportunities for institutional support. However, one of the most important criteria for obtaining such support (local and national government programmes,

[1] The issue of the factors determining the competitiveness of the SME sector was the subject of a research commissioned by the Polish Agency for Enterprise Development in mid-2008. The study "Analysis of the factors of competitiveness of the SME sector" listed the three elements that make up the resources of enterprises. The first is the company's competitive potential in terms of technology, management, innovation as well as the skills and knowledge of the board and the employees. The second are the instruments of competition used by the businesses to build competitive position, and the third are mechanisms and sources of competitive advantage (including the ex post evaluation and *ex-ante* competitiveness of the SME sector in terms of potential for future development). This study was commissioned by the Polish Agency for Enterprise Development (PARP) by Pentor Research International and the Institute for Market Economics Research. The study was conducted on a representative cluster sample of SMEs in Poland amounting to N = 1.000.

[2] A. Kaleta, *Competitive Strategy as Prerequisite for Competitiveness of Polish Enterprises. Competitiveness of Enterprises Against the Challenges of the 21st Century*, University of Economics Publishing House, Wrocław 1999, p. 187.

[3] M.J. Stankiewicz, *Competitiveness in Companies. Building Competitiveness of Enterprises in the Context of Globalisation*, Dom Organizatora, Toruń 2002, p. 89-90.

[4] A.M. Rak, *Managers of Small Businesses*, "Science Annals SERiA", vol. 5, issue no. 2, 2003, p. 162.

[5] K. Szara, *Employee Development as a Factor in Competitiveness of Companies in the Light of the Comprehensive Quality Management*, "Social Inequalities and Economic Growth", issue no. 2, 2003, p. 275.

EU programmes) is the requirement for innovativeness, with which the use of new technologies[6] is connected in many cases.

The role of technology in building an innovative advantage

Similar to many other characteristics of SMEs, the degree of modernity of the technology used is very diverse. The decisive factors are: the size of the enterprise, its geographic location, period of operation, the sector or industry, and the overall level of knowledge, experience and professional training of the entrepreneur[7]. The worst situation is that of the smallest businesses and it is because of the equity barrier, at least in the first period of operation. Another barrier is the widespread lack of recognition of the links between modern technology and the results of activity or improving competitiveness.

Studies show[8] that Polish entrepreneurs, who often express dissatisfaction with their widely understood economic environment, have a surprisingly positive self-esteem. This leads to a lack of interest in the need to change, to invest in the development of enterprises, and thus contributes to postponing the decision to develop the company using modern technology to the indefinite future.

Managing the innovative product lifecycle

The pursuit of conscious management of innovation processes requires accurate determination of their objectives so that the whole venture is a success, that is, an improvement of human life. Before the product is placed on the market, however, it must go through the preceding cycles[9]. These are: phases of observation and creation.

The observation cycle is dedicated to collecting preliminary data on the new product idea and making a decision on whether to introduce alternative solutions in the product. On the other hand, the production cycle includes a search for the product's variants, their evaluation and selecting a particular solution. What follows is a research on the selected product and conducting development works, the result of which is a prototype (sometimes even a trial

[6] National Strategic Reference Framework 2007–2013 (hereinafter NSRF), Warsaw, October 2007, www.funduszeeuropejskie.gov.pl, [14.11.2013].

[7] *Oslo Manual. The Measurement of Scientific and Technological Activities. Proposed Guidelines for Collecting and Interpreting Technological Innovation Data*, OECD/Eurostat 1997.

[8] In statistical, averaging terms, the figures are like this: the average SME company is actually small – the average turnover is approx. 300.000 USD and the operating profit is approx. 30.000 USD (the operating margin is approximately 10%). The average company employs less than four people. Its annual investment expense is approx. 10.000 USD (90% of which is fixed assets expense) and the expense on R&D is approx. 600 USD).

[9] P. Kotler, *Marketing. Analysis, Planning, Implementation, Monitoring*, Warszawa, Felberg SJA 1999.

series and preparing for production and sales). Phases of the product market life cycle are shown in table 1.

Table 1. Phases of the product life cycle

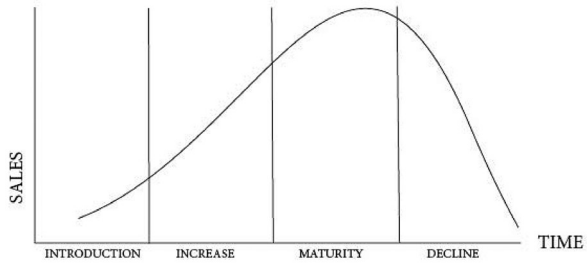
No.	Name of the product life cycle phase	Characteristics of the product life cycle phase
1.	Product launch	A period of slow growth in the sales of the product as it is introduced to the market. There are no profits in this phase due to high costs of the phase.
2.	The increase in the product's market share	The period of rapid market acceptance of the product and significant improvement of profitability.
3.	Maturity i.e. strengthening the product's position on the market	The period of slowdown in product sales, resulting from acceptance of the majority of potential buyers. Profits stabilize or decrease due to increased marketing expenses to defend the product against the actions of the competitors.
4.	The decline i.e. the exit of the product from the market	The period of significant decline in sales and profits until the product exits the market.

Source: Self-study[10].

Abandoning the serial production of the specific product can be caused by the appearance of new products that meet the needs of consumers better, or the fact that the possibilities of production have been exhausted. Determining the product's current lifetime point is a prerequisite for solving the dilemma whether to modernize the product or to replace it? (figure 1). The question is the more important in the case of products utilising high level of knowledge, the so-called advanced technology, because the life cycle of this type of product is different from the standard cycle.

[10] The primary sources report also the concept of five phases, which originate by introducing an intermediate phase between the growth and maturity phases, called the saturation phase. Ch.R. Wasson, *Dynamic Competitive Strategy and Product Life Cycle*, Austin Press 1978.

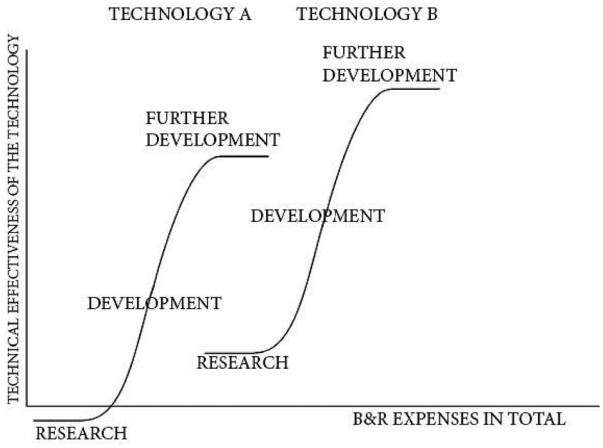
Figure 1. The sales volume and the product life cycle



Source: Ch.R.Wasson, *Dynamic Competitive Strategy and Product Life Cycle*, Austin Press 1978; J.A. Weber, *Planning Corporate Growth with Inverted Product Life Cycles,* „Long Range Planning", Vol. 9, No. 5, October 1976, p. 12-29.

The moment at which a decision needs to be made to change the product or modernize it is defined by the market acceptance of the technology on which the product is based[11]. As a result, the core of each product, i.e. the technological cycle, indicating the level of effectiveness of a given technology and the development expenses must be analysed. The characteristic, S-shaped technology cycle curves are shown in figure 2.

Figure 2. Technology life cycle



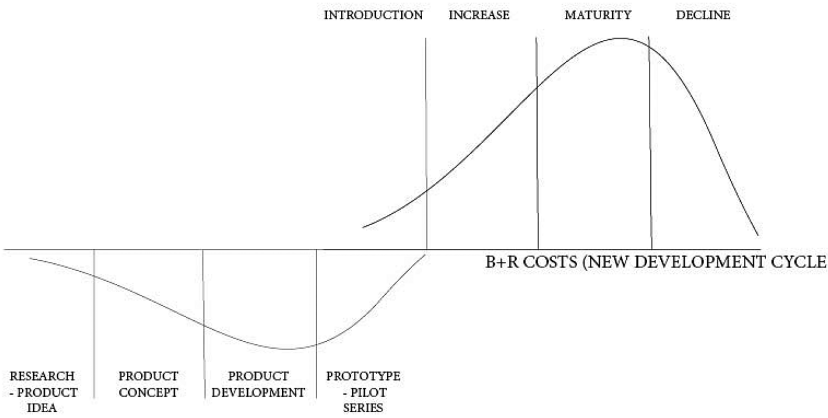
Source: H. Blohm, D. Günter, *Forschungs- und Entwicklungsmanagement*, Schäffer-Poeschel Verlag, 1999, p. 21.

[11] A. Francik, A. Pocztowski, *Innovative Processes. Auxiliary Teaching Materials*, University of Economics Publishing House, Kraków 1999, p. 12.

There is a logical connection and a succession of time between the subsequently applied technologies of manufacturing the product. Research on new technology that will replace the existing one should be initiated when the latter is still used, i.e. reaches maturity, and the possibilities for its further improvement have been exhausted. The new technology must be characterized by higher technical, economic, ecological, and social parameters and therefore should ensure higher cumulative effects. This, in turn, should subsequently result in a quantitative and qualitative leap, both in products and processes, as well as the reduction of unit cost. This process is accompanied by a period of intense learning for both authors of the new technology and its users.

By combining on a single diagram the three mentioned earlier cycles, i.e. the production cycle, the market demand cycle and the innovation cycle in which new technologies are born (including products and processes), you can trace the interdependencies between these cycles (figure 3).

Figure 3. Co-dependent product life cycle



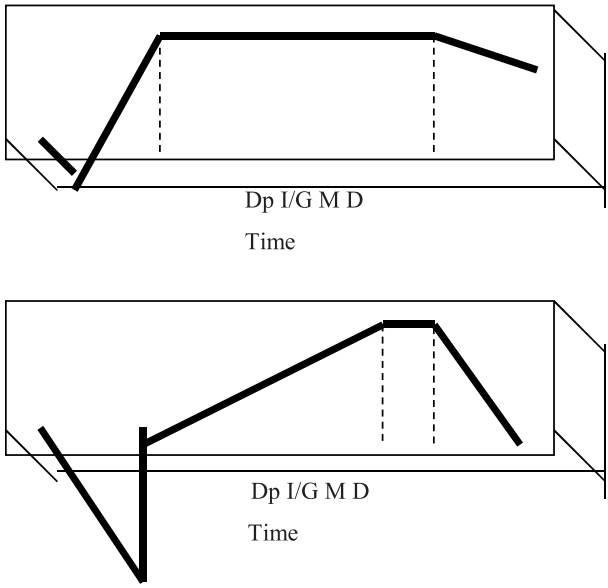
Source: developed based on: L Białoń, T. Obrębski, *Elements of Industrial Policy*, Warsaw Centre for Social Sciences, University of Warsaw, Warszawa 1993, p. 98.

With the advent of product or process innovation in the form of a new technology, the process of market deployment begins in the form of diffusion and transfer of technology[12]. Only at this stage the effects can be observed, both in production processes and on the market, in the process of consumption. However, entrepreneurs do not respond uniformly to the possibility of producing a new product or the purchase and use of a new technology. Some are waiting for the appearance of the first economic successes before they decide to introduce change. As a result, the intensity of dissemination occurs in certain stages. Note, however,

[12] W. Nasierowski, *Managing Technology Development*, Poltext, Warszawa 2000.

that the product life cycle of innovative and high-tech products is slightly different from the life cycle of a product of different nature[13]. These differences become apparent if one compares the shape of a perfect product life cycle curve with the innovative product life cycle curve, as shown in figure 4.

Figure 4. The shapes of the ideal and the innovative high-tech product life cycle



Where:
Dp – product development period,
I/G – introduction and growth period,
M – maturity period,
D – decline.

Source: developed based on: A. Golden, E. Muller, *Measuring Shape Patterns of Product Life Cycles. Implications for Marketing Strategy*, Hebrew University of Jerusalem, Jerusalem 1982, p. 120.

The period of introduction and growth (I/G) is short, and therefore the sales rather quickly reach its maximum, which determines the obtaining the maximum income early. The period of maturity (M) takes quite a long time, which means that the company has an extended period of reaping the profits. The decline (D) is very slow and therefore the reduction of profits is gradual, allowing the freedom to adapt to the current situation.

In turn, the life cycle of high-tech products, i.e. those based on radical innovation, is rather unfavourable for the company, as shown in figure 4. The

[13] *Prospects for Development of Small and Medium-sized High-tech Enterprises in Poland by 2020*, (ed.) E. Wojnicka, PARP, Warszawa 2012.

development phase lasts a long time and its cost is growing rapidly. Also, the period for implementation is long, which means long waiting for profit and growth. The maturity phase is short, which does not provide the opportunity to extend the period of achieving stable profits, and the phase of decline is very fast. Therefore, companies choosing to manufacture high-tech products need to invest time and money in their development. Moreover, introduction of this type of products on the market is time-consuming and the demand does not last too long because of the rapid technological change.

Conclusion

The factor that hinders the application of modern technologies in SMEs is often their location in small towns, far from economic centres. This is due to the lack of the need for change, resulting from the relatively small contact with the domestic market. These companies remain in business and cooperative relationships with companies in a similar situation or close proximity.

The moment of taking the decision to introduce technological changes shall decide on the scale of advantages achieved by users. Therefore, the innovators and early adopters are achieving the most revenue. These entrepreneurs are also relatively more educated, young and enjoying a higher social status. Other groups of entrepreneurs achieve benefits from technological changes depending on the process of diffusion. It depends largely on market conditions (competition), but mainly on the characteristics of the innovation (complexity, the level of profitability, adaptability, experience and knowledge of the adapters) and the national innovation policy.

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PART IV

ORGANIZATION DEVELOPMENT

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RESOURCES AS THE BASIS OF ENTREPRENEURSHIP – A NEW CONCEPT OF BUSINESS MANAGEMENT

Keywords:

work design, reistic approach, resource-based view (RBV), resource slack, waste, profit, dynamic management, effectiveness of enterprise

Summary

The paper presents the principles of a new concept of business management. It is based on the reistic concept of work, which assumes equivalence of resources converted into work results, and also on the main areas of the RBV (Resource-Based View) trend in economics and organization science. It specifies the key components of the concept and presents the methodological principles, including organizational slack. The research dimensions and the structure of the model solutions are also described. The Author taps into the research output of Polish researchers such as: Adamiecki (organization and management), Lange (economics) and Kotarbiński (praxeology).

Introduction

The development of the contemporary civilization is in particular characterized by the increasing role of the technical progress and globalization processes effects. Technical progress means new kinds of machines and devices as well as their applications (technologies), which increasingly rely on IT systems[1]. Globalization has been made possible by: opening the borders and free flow of all kinds of resources, both financial and physical, including the freedom of movement and employment. This in turn makes it possible to introduce continuous changes that adapt businesses to the changing criteria and mechanisms of action and evaluation. Tumultuous business environment faced by firms is becoming a challenge to managers.

[1] J. Olszewski, *System pracy w warunkach rozwiniętego społeczeństwa informacyjnego*, Wydawnictwo Uniwersytetu Ekonomicznego w Poznaniu, Poznań 2013, p. 17-41.

There are two major trends in the changes taking place. The first consists of taking up actions that make it possible to obtain a dynamic effect. This is possible due to the existence of programs that control core business activity, wide application of software in fully or partially automatic performance of business functions (quoting, contracting), record-keeping, reporting functions (including report making – data generating programs), and even customer (applicant, stakeholder etc.) self-service. It must be noted that the actions are process-related and the level of the ex-ante formula of "just-in-time" programmed management is exceeded. Now we have conditions and capabilities to create mechanisms of dynamic, "live" management inside time and place of an organization, i.e. we have an information base enabling management on a current basis and using it in action.

The second of the major trends in theoretical considerations is attempting to "unpack the firm's black-box." The black-box is a hypothetical engineering device which is used to make a given product, however, at the designing and planning stage nobody is interested in how the product is made, i.e. how the box operates. It is presumed that the desired effect is obtained when appropriate elements have been fed into the box[2]. Unpacking the black-box consists mainly of identification and operationalization of tasks, making the executive blocks, creating work flows and its effects flows, with close coordination of the resources used and with optimization of the remaining resources. This enables both task programming and establishing the resources strategy and tactics, i.e. optimization of sourcing, possessing (disposing), use and redundancy of the particular kinds of resources and their applications. The aggregate goal of both trends is finding new ways to increase efficiency via rationalization of a firm's costs and results. The solutions must take into account the processes of the core business activity and the functions of the other activities. They regard two main factors: resources and their kinds, and resources tactics.

Theoretical bases of the new concept of management

Reistic concept of the work

The theoretical basis for the approach to a firm was found in the work trends. The literature on this issue distinguishes between two classical approaches to the work issue. The first one is the subjective (anthropocentric) approach. This is a classical approach that since the times of A. Smith has been viewing work as a human domain, where work is created and done by humans and for humans. The second approach, described as a mixed (subjective-objective) one, constitutes a concept which partially revokes the axiom of human supremacy. It assumes the existence of "common ground" for the social and technical system, even though it underlines the superior role of a human

[2] R.H. Robbins, *Globalne problemy a kultura kapitalizmu*, 3 wyd., Pro Publico, Poznań 2009, p. 54.

in relations with technology. Its aim is an aggregate, complex optimization of social and technical relations, which sets conditions for obtaining desired levels of organizational efficiency and quality of work performed by employees. This approach encompasses the sociotechnical and kaizen trends (including their derivatives such as lean production, lean manufacturing, lean organization).

The proposed third approach exceeds the framework of the work paradigm known hitherto. This is a subjective (reistic) approach, based on the principle of equivalence of consumed (i.e. converted into planned results) elements (systemic relations of conversion of the particular elements). In accordance with the proposed approach, WORK is (1) conversion (2) of applied knowledge, skills and competence (human capital) and machines, facilities, equipment, materials, raw materials, information, buildings, structures, space, which are used in the process (3) carried out in physical space and within specified time (4) into desired products (5) in the structure of the said components corresponding to technological requirements of those products[3].

Table 1 describes features of the proposed approach.

This concept also accounts for the equivalence of elements subjected to the conversion. It is assumed that all the components applied are necessary to obtain the planned outcome in the implemented and available technology. Conversion is predicated on the assumption that as the technological process advances, the product accumulatively takes shape. The share of individual components in a specified work mainly depends on its type, as well as the specifics of the order and the deployed technical resources, which determine the choice of a production technology. Work involves increasing use (consumption) of the resources incrementally, as any given tasks are carried out. What is relevant in the concept is not the particular resources viewed individually, but their manufacturing configuration. Managers and contractors make use of the complementarity and substitution features so as to obtain the results in an economic and efficient manner.

Table 1. Characteristics of the organizational work mechanism

Attribute	Content
Equivalence	The necessity of the presence of specified resources which are used in the product realization process
Resource Structuralism	The amount, method of use (conversion) of resources and its quantitative, evaluative and qualitative structures
Accumulativeness	The accumulative nature of product development with respect to materials and costs
Complementarity	The mutual complementation of components within a resource (a module) or between resources (modules)

[3] J. Rymaniak, *O nowy paradygmat pracy – ponad i poza człowiekiem*, „Humanizacja Pracy", No. 1, 2011, p. 23-44.

Systemic Conception	Sets of relations between components within and between modules
Substitution	Replacing components with other components from the same resource (module) or from other resources (modules)
Modularity	Sets of resources creating subsystems which realize subsequent technological phases of product development
Measurability	Taking into account all tangible and legal assets (i.e. eligible for registration and accounting)
Duality	Basic activities which create costs but also generate income, and others, which only create costs

Source: Adapted from: J. Rymaniak, *Work in organization: key factors of the reistic approach,* [in:] *Advances in Social and Organizational Factors,* (ed.) P. Vink, CRC Press, Taylor & Francis Group, Roca Baton 2012, p. 564.

The organizational basis is mapping the operations. It is done by marking off phases, i.e. sets of organized actions of a similar nature, making up a specific, closed stage of a manufacturing process[4]. Particularly important is the systemic approach reflecting the relations within and between the executive segments. The segments take a form of modules being organizational links (work stations, work cells, teams, etc.) or outsourced operations and partial/ semi-finished outcomes, which, apart from cooperation, outsourcing and transaction costs dilemma, require coordination activities.

The described concept encompasses measurable resources and processes. Only such processes can be unambiguously determined, the costs of individual resources and segments (modules) can be specified, and that can be used for the purposes of management on a current basis. At this stage of theoretical advancement it is not possible to effectively include non-tangible resources in the measurement processes. Intangible assets or goodwill fall within the scope of a company valuation, determining its current value and estimating its future value. As such, they provide an answer to the question: how much may an investor obtain from the company and what kinds of actions would that take? The actions may be completely different than developing the company or its core activity. There are many examples of company mergers and acquisitions aimed at quick exploiting of a certain attribute or kind of resource. It is enough to mention acquisitions carried out to eliminate competitors (partially using the purchased resources) or to take advantage of the company's location (land). The presented concept is connected with resources and the way they are used in the company.

[4] Z. Jasiński, *Istota, elementy i zasady organizacji działalności operacyjnej*, [in:] *Podstawy zarządzania operacyjnego*, (ed.) Z. Jasiński, Oficyna a Wolters Kluwer Business, Warszawa 2011, p. 13-27.

Resource-Based View (RBV)

The scientific point of reference in the science of organization and management as well as economics is the approach to enterprises and entrepreneurship in the context of resources. This requires determining the criteria of understanding the resources and identifying their role and relationships in operations.

The theories developed so far have distinguished three criteria and ways of understanding and using the resources. The first of them consists of understanding the company as a set of productive resources. Economists emphasize that: „The important distinction between resources and services is not their relative durability; rather it lies in the fact that resources consist of a bundle of potential services and can, for the most part, be defined independently of their use, while services cannot be so defined, the very word 'service' implying a function, an activity….. Ideally, the size of a firm for our purposes should be measured with respect to the present value of the total of its resources (including its personnel) used for its own productive purposes"[5]. The dominating perspective is viewing production as a service, and perceiving the significance and development of a firm as a set of resources. The organizational approach, in turn, includes the concepts of an external impact of resources, especially to obtain a sustainable competitive advantage (SCA). According to Barney's concept, achieving a competitive advantage is explained by having four key features: Valuable, Rare, In-imitable and Non-substitutable (VRIN). The VRIN characteristics mentioned are individually necessary, but not sufficient conditions for SCA. Within the framework of the resource-based view, the chain is as strong as its weakest link and therefore requires the resource to display each of the four characteristics to be a possible source of a sustainable competitive advantage.

Another kind of approach is presented by Peteraf who presents four conditions for SCA development, namely: Heterogeneity, Ex post limits to competition, Imperfect mobility, Ex ante limits to competition[6]. When heterogeneity is a prerequisite for generating balanced rents/ income, the others sustain the equilibrium. Both concepts have caused differentiation of theoretical considerations, as sustained competitive advantage in the sense of sustaining a unique strategy in equilibrium (Barney) does not necessarily imply the earning of rents in that equilibrium (Peteraf), and vice versa[7].

The third trend is the concept of dynamic capabilities, focused on rationality of allocation and use of resources. The competitive advantage of firms is seen as

[5] E.T. Penrose, *The theory of the growth of the firm*, [in:] *Resources, firms, and strategies: a reader in the resource based perspective*, (ed.) N.J. Foss, Oxford University Press, Oxford 2003, p. 27-39.

[6] M.A. Peteraf, *The Cornerstones of Competitive Advantage: A Resource-Based View*, "Strategic Management Journal", Volume 14, Issue 3, 1993, p. 179-191.

[7] N.J. Foss, *The Resource-based View: Aligning Strategy and Competitive Equilibrium*, [in:] *Strategy, Economic Organization, and the Knowledge Economy. The Coordination of Firms and Resources*, (ed.) N.J. Foss, Oxford University Press, Oxford 2006, p. 61-80.

resting on distinctive processes (ways of coordinating and combining), shaped by the firm's (specific) asset positions (such as the firm's portfolio of difficult-to-trade knowledge assets and complementary assets), and the evolution path(s) it has adopted or inherited. In short, identifying new opportunities and organizing effectively and efficiently to embrace them are generally more fundamental to private wealth creation than is strategizing, if by strategizing one means engaging in business conduct that keeps competitors off balance, raises rival's costs, and excludes new entrants[8].

The new proposal, which is more compatible with the idea of conversion, is taking into account common features of the resources, rather than the differences. Human capital is a set of KSAO, i.e. intellectual capital combined with features of character and volition. Physical capital of employees must be sustained on the level that enables normal functioning of human capital. As it is inevitably "consumed", mental and physical capabilities of employees are continually renewed.

The second kind of resources is the machines and facilities (including equipment, technological lines, buildings and structures). These resources are used in work, so they are also subject to physical consumption. However, their consumption volume is hard to measure and it is often measured by means of a convention (technical service life, depreciation write-offs). Another kind of resources includes raw materials, materials and semi-finished products. These resources are subject to full consumption, as they are converted into products. This group also encompasses technological supplies necessary for the conversion, e.g. electric power, water, technical gases. In the contemporary world, the more and more important production factor is information. It is used similarly as the other resources. Some specified information material is obtained, it is then processed or new information is created on the basis of data obtained earlier, or from scratch. Therefore, there are different ways of creating information. Also, information serves different functions – from record-keeping to commercial and business purposes. The specific feature of this resource is the relatively low price and striving to make it a factor of competitive advantage. Physical space is the last of the resources mentioned in this paper. It is a component which can be used like machines and can be improved in quality like human capital. In general, the concept includes different sorts of space as cost drivers, taking into account the need for a minimization of resource allocation and the functions of space (maneuverability, lack of resource concentration, space density etc.). Assuming that resources form the basis of the business activity, it is necessary to adopt certain criteria.

[8] D.J. Teece, G. Pisano, A. Shuen, *Dynamic capabilities and strategic management*, "Strategic Management Journal", Vol. 18, Issue 7, 1997, p. 509-533; C.E. Helfat, M.A. Peteraf, *The dynamic resource-based view: capability lifecycles*, "Strategic Management Journal", Vol. 24, Issue 10, 2003, p. 997-1010.

Principles of resources modelling

Modular segmentation as a construct analysis

The modular segmentation of an organization's activity is applied to the resources that are indispensable to perform the core activities and to secure the company functioning. These form the firm's basis which should be adjusted to the changing contractual conditions (capability to sustain the competitive advantage).

There has been no research of this kind within the RBV approach. Creation of resources being a base of a newly formed company has not yet been the subject of theoretical studies. Analysis of the relevant literature shows the main focuses of the research done so far: the processes of resources creation in big companies that are in advanced stages of a company life cycle, integration of resources, management of resources or resources development. Those research studies have classified the resource structure in terms of different processes, sub processes or operation[9].

Due to the flow variability, the modules (nodes, phases) should be viewed statically. Thus, modular segmentation of a company consists of applying modules to the operation process (operational implementation of contractual tasks). There is a collision of the company's resource potential and the processes of using the resources. The company's effectiveness depends on the "full convergence" between the possessed resources utilization with the contracts' technological time, i.e. having no resources that are not being used in the technological time in a given calendar period (timing).

Reusable stationary modules and periodic modules are applied, which most often are used for the purpose of implementing ad hoc tasks. The module structure is also adjusted to the task requirements. Thus, intra-resource costs, inter-resource and inter-modular relations develop within them, which result in a mosaic, in terms of costs and quality, of utilization effectiveness and profitability, and – below the bottom line – the company's "cost pockets"[10].

Interweaving the modular method in the contractual processes makes it possible to perceive various anomalies in terms of resources and effectiveness, which are hard to notice when resources are viewed individually in a classic way, even when it is ERP software supported[11].

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[9] M.A. Rizal, *The Resource-based View and Construction of Resource Base*, 2nd International Conference on Business and Economic Research (2nd ICBER 2011), Proceeding, p. 2227-2232.

[10] J. Rymaniak, *Elastyczność jako wymiar reistycznej koncepcji pracy*, [in:] *Sukces w zarządzaniu kadrami. Elastyczność w zarządzaniu kapitałem ludzkim*, t. 2, *Problemy zarządczo- psychologiczne*, (ed.) S.A. Witkowski, M. Stor, Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław 2012, p. 36-44.

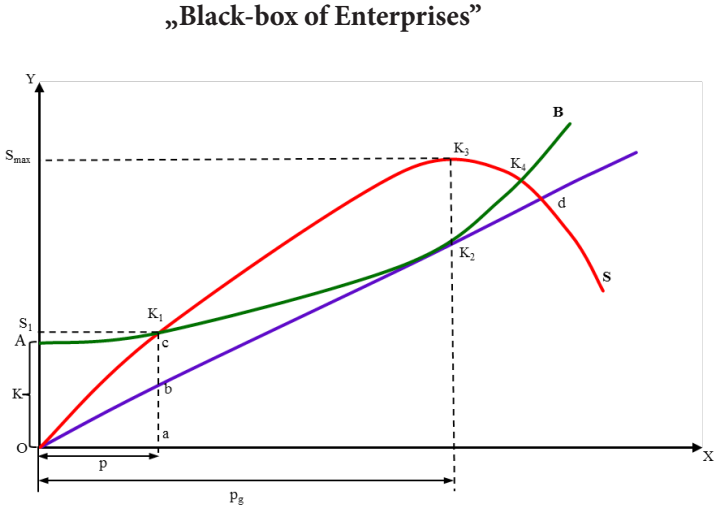
[11] J. Rymaniak, *Segmentacja modułowa procesów w organizacji – model teoretyczny i wymiary ekonomiczne*, [in:] *Nowe koncepcje w zarządzaniu organizacją wobec wyzwań otoczenia*, (ed.) M. Boguszewicz- Kreft, M. Rozkwitalska, Prace Naukowe Wyższej Szkoły Bankowej w Gdańsku, Tom 22/2013, CeDeWu, Warszawa 2013, p. 59-70.

Modelling of company effectiveness management

The main assumption of the concept is organizational slack. It may take different forms and be more or less significant for a planned goal. The literature identifies three facets of slack.

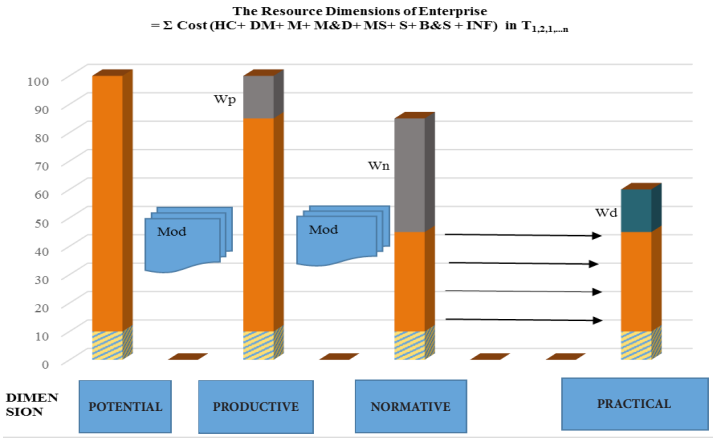
Firstly, slack is conceptually defined as resources not being used to the fullest extent possible. Secondly, slack resource characteristics include location (e.g., absorbed versus unabsorbed) and accessibility (e.g. immediately versus deferred). Thirdly, the two central purposes of slack resources are to act as a buffering mechanism to counter threats and also as a facilitator to exploit opportunities. Organizational slack differs from other buffering mechanisms, such as preventive maintenance and project scheduling, because slack is tangible, while other buffering mechanisms are intangible[12]. It should be noted that although organizational research posits various relationships between a firm's slack resources and performance, the findings so far have been ambiguous[13]. Therefore, new research solutions should be proposed for managing effectiveness through resources.

Figure 1. The Conceptual Framework Research Enterprise Efficiency (adapted method coordinate system from Adamiecki 1909)

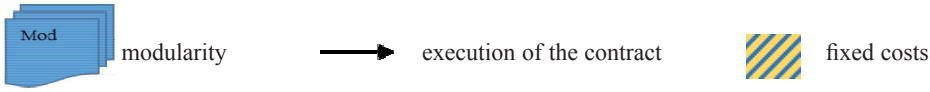


[12] W.T. Lin, K.Y. Cheng, Y. Liu, *Organizational slack and firm's internationalization: A longitudinal study of high-technology firms*, "Journal of World Business", Vol. 44, Issue 4, 2009, p. 397-406.

[13] H. Zhong, *The Relationship between Slack Resources and Performance: An Empirical Study from China*, "International Journal Modern Education and Computer Science", Volume 3, Issue 1, 2011, p. 1-8.



Where:



Source: J. Rymaniak, *Capability, Profit or Waste? Organizational-Economic Dilemmas Criteria for Measuring the Effectiveness of Enterprise,* [in:] Advances in the Ergonomics in Manufacturing: Managing the Enterprise of the Future, (eds.) S. Trzcieliński, W. Karwowski, AHFE Conference, 2014, p. 207-209.

Firstly, slack is conceptually defined as resources not being used to the fullest extent possible. Secondly, slack resource characteristics include location (e.g., absorbed versus unabsorbed) and accessibility (e.g. immediately versus deferred). Thirdly, the two central purposes of slack resources are to act as a buffering mechanism to counter threats and also as a facilitator to exploit opportunities. Organizational slack differs from other buffering mechanisms, such as preventive maintenance and project scheduling, because slack is tangible, while other buffering mechanisms are intangible[14]. It should be noted that although organizational research posits various relationships between a firm's slack resources and performance, the findings so far have been ambiguous[15]. Therefore, new research solutions should be proposed for managing effectiveness through resources.

The upper part of figure 1 shows an adaptation of the concept of Adamiecki (1909, 1925). The founder of the Polish school of management and organization presents the correlation between the production volume, the cost, sales value and time. He formulates the correlations on the basis of the principles of the

[14] W.T. Lin, K.Y. Cheng, Y. Liu, *Organizational slack and firm's internationalization: A longitudinal study of high-technology firms*, "Journal of World Business", Vol. 44, Issue 4, 2009, p. 397-406.

[15] H. Zhong, *The Relationship between Slack Resources and Performance: An Empirical Study from China*, "International Journal Modern Education and Computer Science", Volume 3, Issue 1, 2011, p. 1-8.

classical theory of the firm, i.e. he assumes there are no other factors affecting the analyzed categories, such as e.g. raw materials prices, their quality, labor conditions, condition of machines and equipment, etc.).

Table 2. Dimensions of the enterprise effectiveness management measurement

The costs of creating and possessing	The structure of costs, classified by type, of the resources, and also the relation between the costs of contract-related resources and out-of-contract resources
the costs of using (up) the resources	the intra-resource costs, inter-resource and intermodular costs
(1) PRODUCTIVE POTENTIAL	the resultant costs – amount of resources that may be utilized
(2) NORMATIVE PRODUCTIVE	the resultant costs – optimal, norm-compliant level of resources indispensable for implementing the existing contracts
(3) NORMATIVE PRACTICAL	the resultant costs – the actual level of the enterprise efficiency in using the resources

Source: J. Rymaniak, *Capability, Profit or Waste? Organizational-Economic Dilemmas Criteria for Measuring the Effectiveness of Enterprise,* [in:] *Advances in the Ergonomics in Manufacturing: Managing the Enterprise of the Future,* (eds.) S. Trzcieliński, W. Karwowski, AHFE Conference, 2014, p. 207-209.

Adamiecki pointed out the existence of two points which he called the first and the second critical production. The first critical production is marked as K_1, i.e. the first intersection of AB and OS axes. The production per unit of time exceeds minimum p_0. Then the firm is profitable. The second intersection of the realizable value curve and the cost curve is at points K_2 and K_3. It is shown by production volume p_1, and it shows the greatest distance between the cost curve and the sale curve. Exceeding the point indicates a fall in unit prices and market saturation.

An analysis of the SLACK- WASTE relation requires that four dimensions of company resources be measured simultaneously at any given time (bottom part of figure 1). The ***POTENTIAL*** dimension stands for the cost of all active resources held by the firm. Active resources constitute the cost of all resources held by the firm and/or being at the firm's disposal. This dimension makes it possible to specify amount and value of products that the firm is able to produce within the time given.

The ***PRODUCTIVE*** dimension covers all the kinds of resources which may be used in a given time, in possible configurations of modules, for the purposes of contracts implementation. The dimension thus constitutes the actual, current production capability of the firm.

The third dimension – ***NORMATIVE*** – shows the value of costs specified by means of resource consumption norms, applicable to the contracts being

implemented. In other words, the economic level of optimal use of resources is specified, which is acceptable in the firm's existing organizational and economic conditions. It is an economic model of contracts implementation, necessary for achieving the presumed economic parameters of execution.

The fourth dimension is the ***PRACTICAL*** one. It shows the actual values of resources used (up) in the contract implementation.

The dimensions shown above constitute aggregates specifying the various areas of managing economic effectiveness of an enterprise. They enable especially determination of the level of organizational slack, its causes and ways to mitigate this phenomenon. Applying the variants of economization in Kotarbiński's praxeological concept and the principles of Lange's rational management make it easier to integrate the organizational and economic aspects.

Conclusions

"Live" management of resources is one of the major responses to emerging business trends developed in the organization design field and include the following: downsizing, changing nature of organizations, multidimensionality, networking, lateral integration, customer orientation, process orientation, knowledge distribution[16]. Resources are of vital importance to the idea and existence of firms[17]. They are the material basis of their sense of being and development strategy[18].

The researchers point out that resource positions are perceived, relative, transient and multidimensional; i.e. they reflect the entrepreneur's perception of available resources relative to demand. Moreover, perceived resource positions are not static but change over time, and entrepreneurs can experience different types of resource constraints and slack simultaneously. The influence of perceived resource positions on decision making depends in turn on individual, temporal and resource position dynamics[19]. This leads to a need to research the forms and the idea of positioning in relation with the environment (sourcing, deployment, utilization, disposal), in the context of managing the relations: market opportunities – the condition of resources. Firms' development should

[16] T. Hernaus, *Business Trends and Tendencies in Organization Design and Work Design Practice: Identifying Cause and Effect Relationships*, "Business Systems Research", Volume 1, No. 1, 2011, p. 1-48.

[17] G.B. Voss, D. Sirdeshmukh, Z.G. Voss, *The effects of slack resources and environmental threat on product exploration and exploitation*, "Academy of Management Journal", Volume 51, Issue 1, 2008, p. 147-164.

[18] E. Beleska-Spasowa, K.W. Gleister, Ch. Stride, *Resource determinants of strategy and performance: the case of british exporters*, "Journal of World Business", Volume 47, Issue 4, 2012, p. 635-647.

[19] S.A.M. Dolmans, E. van Burg, I.M.M.J. Reymen, A.G.L. Romme, *Dynamics of Resource Slack and Constraints: Resource Positions in Action*, "Organization Studies", Volume 35, No. 4, 2014, p. 511-549.

be focused on market expansion[20], and consequently on internationalization of medium-sized and large companies[21].

The issues connected with internal resources are of vital importance. The research methodology proposal was based on the reistic concept of the work. This enables an integrated approach to different resources. Using the module concept, the proposed solution enables monitoring on a current basis and assessment of resources held and consequences of holding surplus resources, effectiveness of resources utilization, and possibilities of utilizing any surpluses in future (for example: how slack resources interact with environmental threat appraisal to influence product exploration and exploitation).

The presented proposal makes use of the contemporary capabilities to create dynamic management solutions in the form of resources management performed on a current basis (in real time of the operations). This trend is a foundation for future changes in entrepreneurship and management, where rational utilization of more and more limited resources will be the major issue.

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[20] K. Mellahi, A. Wilkinson, *A Study of the Association between Level of Slack Reduction Following Downsizing and Innovation Output*, "Journal of Management Studies", Volume 47, Issue 3, 2010, p. 483-508.

[21] Ch. Prange, S. Verder, *Dynamic capabilities, Internationalization processes and performance*, "Journal of World Business", Volume 46, Issue 1, 2011, p. 126-133.

[in:] *Podstawy zarządzania operacyjnego*, (ed.) Z. Jasiński, Oficyna a Wolters Kluwer Business, Warszawa 2011.

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THE MEDIATING ROLE OF CULTURE AND PERSONALITY TRAITS BETWEEN LEADERSHIP STYLES, CREATIVITY AND INTRAPRENEURSHIP: A CONCEPTUAL FRAMEWORK

Keywords:

creativity, intra-entrepreneurship, leadership style

Summary

The article presents the relationship between leadership style and the creativity and intra-entrepreneurship of employees. Based on the analysis of conceptual literature on the subject, factors that are the moderators and mediators of dependency have been indicated. A theoretical model is proposed that incorporates variables that have rarely been analysed in the context of creativity and intra-entrepreneurship of employees: the need for cognitive closure, the avoidance of uncertainty, conflict management and organizational identification. The analysis presented in the text may have important implications for the practice of managing an organization.

Introduction

The need to rival hyper-competition, mass customization or the implementation of competition strategy, that is competing with companies in some markets and cooperating in the development of products in other markets, requires a leadership style perfectly suited to the situation and culture in which an organization operates. In addition, the vast majority of businesses operate in a dynamic environment characterized by rapid changes in technology, a shortened product life-cycle or global competition. Therefore, a key resource seems to be the creativity of workers employed in a company and their intra-entrepreneurial attitudes, understood as the ability and willingness to engage in proactive, risk-bearing activities, allowing them to

create innovative strategies of functioning and developing their organization[1].

Creativity and intra-entrepreneurship within an organization

Creativity and intra-entrepreneurship are numbered among the most important factors affecting the competitiveness and efficiency of businesses[2]. A key goal of many organizations is to stimulate the creativity of their employees, defined as the creation of new and valuable ideas concerning products, services or production processes[3].

It seems that creativity, often considered at three distinct levels comprising the individual[4], the team[5] and the organizational structure[6], should be presented in a system-related approach – which treats a creative organization as a system of relationships involving employees at all levels, which shapes and at the same time is being shaped by the environment of the organization. The proposed model is close to the opinion presented by M. Csikszentmihaly[7], according to which creativity emerges from the interaction between staff members, their department/ team and the wider social environment – the leaders, managers, customers and shareholders (the field). T. Amabile[8] in the Componential Theory of Creativity distinguishes three components in the individual – the domain: relevant skills, creativity-relevant processes, intrinsic task motivation and one component outside the individual – the social environment in which the individual is working. According to this theory, creativity requires the coexistence of all the components. A wider or a narrower catalogue of factors affecting the creativity and entrepreneurship of employees has been mentioned in the literature. Typically, they include: individual performance capabilities,

[1] G.T. Lumpkin, G.G. Dess, *Clarifying the entrepreneurial orientation construct and linking it to performance*, "Academy of Management Review", 21(1), 1996, p. 135-172.

[2] J. Hoever, D. Knippenberg, H. Ginkel, G. Barkema, *Fostering Team Creativity: Perspective Taking as Key to Unlocking Diversity's Potential Inga*, "Journal of Applied Psychology", 97(5), 2012, p. 982-996.

[3] T.M. Amabile, H. Conti, L. Coon, J. Lazenby, M. Herron, *Assessing the work environment for creativity*, "Academy of Management Journal", 39, 1996, p. 1154-1184.

[4] G.R. Oldham, A. Cummings, *Employee creativity: personal and contextual factors at work*, "Academy Of Management Journal", 39(3), 1996, p. 607-634.

[5] P.B. Paulus, *Groups, teams, and creativity: The creative potential of idea-generating groups*, "Applied Psychology", 49, 2000, p. 237-262.

[6] R.W. Woodman, J.E. Sawyer, R.W. Griffin, *Toward a theory of organisational creativity*, "Academy of Management Review", 18(2), 1993, p. 293-321.

[7] M. Csikszentmihalyi, *Implications of a systems perspective for the study of creativity,* In *Handbook of creativity,* (ed.) R.J. Sternberg, England: Cambridge Univ. Press, Cambridge 1999, p. 313-328.

[8] T.M. Amabile, *Componential Theory of Creativity*, "Harvard Business School Working Paper", 12, 2012, p. 96.

culture, climate[9], structure[10] of the organization and dissemination practices related to them[11].

However, a leadership style, represented by a leader who has a direct influence on the shaping of creative and intra-entrepreneurial attitudes among the members of his or her team, seems to play a special role. Mumford[12], on the basis of a review of the research carried out in organizations, indicates leadership style as one of the most important factors determining the real creativity of the studied organizations. Such factors as the leader's features, culture of the organization, national culture and the employees' features can be considered mediators of the relationship between the leadership style and the creativity and intra-entrepreneurship of employees.

Leadership style

Leadership can be defined as a process in which an individual affects the members of a group during the completion of group and organizational objectives[13]. According to one of the most widely studied and described concepts of leadership[14], there are three types of leadership: transformational, transactional and laissez-faire (noninterventionist) leadership.

The transactional leadership style is based on creating a clear structure and division of roles. Interactions with team members are transactions in which certain benefits are offered in exchange for the effects of work. The transactional style consists of two components: management-by exception and contingent rewards. A contingent reward consists of granting an award if the level of task completion, determined in advance by the leader, has been achieved. Management-by exception, involving the search of errors and their correction, causes subordinates to focus on maintaining a given state: they do not want changes, they focus on avoiding mistakes and thus are not inclined to take risks, which is necessary in creative and entrepreneurial activities.

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[9] S.G. Isaksen, K.J. Laver, G. Ekvall, A. Britz, *Perceptions of the best and worst climates for creativity: preliminary validation evidence for the situational outlook questionnaire*, "Creativity Research Journal", 13, 2001, p.171-184.

[10] L.B. Cardinal, D.E. Hatfield, *Internal knowledge generation: the research laboratory and innovative productivity in the pharmaceutical industry*, "Journal of Engineering Technology Management", 17, 2000, p. 247-271.

[11] E. Abrahamson, *Managerial fads and fashions: the diffusion and rejection of innovations*, "Academy of Management Review", 16, 1991, p. 586-612.

[12] M.D. Mumford, G.M. Scott, B. Gaddis, J.M. Strange, *Leading creative people: Orchestrating expertise and relationships*, "The Leadership Quarterly", 13, 2002, p. 705-750.

[13] V. Shackleton, P. Wale, *Leadership and management*, [in:] *Introduction to work and organizational psychology: A European perspective,* (ed.) N. Chmiel, Malden: Blackwell Publishing 2003, p. 277-301.

[14] B.M. Bass, R. Bass, *The bass handbook of leadership: theory, research, and managerial applications (4th ed.)*, New York: Free Press, New York 2008.

The second type of leadership highlighted by Bass[15] is laissez-faire, or a non-interfering management style, which involves the avoidance of taking any position. This includes distancing from problems and having little concern for the workers, performed tasks or production.

The transformational leadership style involves inducing the involvement of employees based on their internal motivation, stimulating activity and emotional relationships between the leader and the group members, responding to the needs and aspirations of employees and the conversion of their individual values into group values in order to achieve collective goals[16]. As Bass[17] indicates, transformational leadership involves four factors: inspirational motivation, idealized influence, individualized consideration and intellectual stimulation.

According to the individualized consideration, the leader is personally oriented towards his or her employees, and the leader's behaviour resembles a mentor or guardian who creates the right workplace climate and atmosphere, thereby enabling the development of the group's potential.

Another important issue is the use of intellectual stimulation, which is stimulating intellectual effort and creativity. This is done by questioning the assumptions that have been made, striving to reformulate problems and accepting other perspectives. Subordinates are involved in the process of formulating problems and looking for solutions, which, in addition to inspirational motivation, affects group commitment. Inspirational motivation highlights the sense of work and the identification of challenges. The leader's task is framing an attractive vision "in terms of work goals and articulating this vision through project selection and project evaluation"[18] that can stimulate people's creative efforts.

Idealized influence, which is based on expertise and high-level skills held in a particular field, consists of preferring by the leader the needs of the team members to their own needs, sharing with them the risks that have been taken up, enhancing their faith and perseverance in achieving their goals and behaviour that is consistent with the objectives and values of the organization.

[15] Ibidem.

[16] D.J. Jung, *Transformational and Transactional Leadership and Their Effects on Creativity in Groups*, "Creativity Research Journal", 13, 2001, p. 185-195.

[17] B.M. Bass, R. Bass, *The bass handbook of leadership: theory, research, and managerial applications (4th ed.)*, New York: Free Press, New York 2008.

[18] M.D. Mumford, G.M. Scott, B. Gaddis, J.M. Strange, *Leading creative people: Orchestrating expertise and relationships*, "The Leadership Quarterly", 13, 2002, p. 715.

Relationship between leadership style and creativity

It has been shown that the transformational leadership style significantly affects group members' creativity[19] and organizations' innovativeness[20]. Research shows that there is a positive relationship between group creativity and the fact that the leader is perceived more as a transformational one than transactional[21]. The transformational model of leadership can be treated almost as a synonym for creative leadership[22]. T. Amabile[23], similarly to Sternberg et al.[24], stresses the role of leaders and leadership style in stimulating creativity, pointing to the important role of leaders in shaping the internal motivation of their employees by taking such actions as providing challenges, greater freedom, adequate resources, support and encouragement and paying attention to team design. Internal motivation aroused among respondents leads to greater creativity measured by the indicators of divergent thinking[25].

Groups working under the leadership of transformational leaders achieve significantly higher rates of fluency (the number of ideas produced by the group) and flexibility (the number of different types of ideas produced). The available studies usually confirm the positive effect of transformational leadership, not only on creativity itself[26], but also on the climate conducive to creativity, which is directly related to the team's success in creative endeavours[27].

However, it should be noted that transformational leadership is not consistently related to creativity across conditions – the leader's planning activities should change "as projects move from the idea generation phase to the development and implementation phase"[28]. At every stage of creative project management, it is essential that the leader possesses organizational

[19] S.J. Shin, J. Zhou, *Transformational leadership, conservation, and creativity: evidence from Korea*, "Academy of Management Journal", 46(6), 2003, p. 703-714.

[20] D.I. Jung, C. Chow, A. Wu, *The role of transformational leadership in enhancing organizational innovation: Hypotheses and some preliminary findings*, "Leadership Quarterly", 14, 2003, p. 525-544.

[21] J.J. Sosik, S.S. Kahai, B.J. Avolio, *Leadership style, anonymity, and creativity in group decision support systems: The mediating role of optimal flow*, "Journal of Creative Behavior", 33, 1999, p. 1-30.

[22] R.J. Strerberg, J.C. Kaufman, J.E. Pretz, *A propulsion model of creative leadership*, "The Leadership Quarterly", 14, 2003, p. 455-473.

[23] T.M. Amabile, *Componential Theory of Creativity*, "Harvard Business School Working Paper", 12, 2012, p. 96.

[24] R.J. Strerberg, J.C. Kaufman, J.E. Pretz, *A propulsion model of creative leadership*, "The Leadership Quarterly", 14, 2003, p. 455-473.

[25] D.J. Jung, *Transformational and Transactional Leadership and Their Effects on Creativity in Groups*, "Creativity Research Journal",13, 2001, p. 185-195.

[26] Ibidem.

[27] T.M. Amabile, R. Conti, H. Coon, J. Lazenby, M. Herron, *Assessing work environment for creativity*, "Academy of Management Journal", 39, 1996, p. 1118-1154.

[28] M.D. Mumford, G.M. Scott, B. Gaddis, J.M. Strange, *Leading creative people: Orchestrating expertise and relationships*, "The Leadership Quarterly", 13, 2002, p. 717.

and technical expertise[29] and abilities in the field of environmental scanning and forecasting activities in order to build synergies among different projects[30]. Therefore, planning for cooperation within projects and between the projects of workers with unique expertise becomes the task of the leader[31]. The effectiveness of leaders' sense-making activities are conditioned by their social skills, which according to Senge[32] include, first and foremost, coaching and communication skills. The leader's level of social intelligence and their persuasive skills play an important role in the team's ability to formulate and implement creative solutions, as due to the high levels of criticism and autonomy of creative people, they are not easy to persuade.

Relationship between leadership style and intra-entrepreneurship

Leaders' support for intra-entrepreneurship, through, inter alia, favouring employees' creative ideas and providing funds for their implementation, is one of the most important organizational factors stimulating entrepreneurial attitudes[33]. It has been shown that transformational leadership is associated with the stimulation of intra-entrepreneurship both directly and indirectly – the mediator is an organizational identification, defined as a psychological bond between the employees and their organization[34]. However, no such link was found in the case of laissez-faire leadership, and transactional leadership proved to weaken intra-entrepreneurship[35]. A transformational leader, by providing ideological explanations that link followers' identities with the collective identity of their organization[36], builds an organizational identification, which translates into employees' willingness to engage in the implementation of organizational

[29] A. Sharma, *Central dilemmas of managing innovation in large firms*, "California Management Review", 41, 1999, p. 146-164.

[30] C. Andriopoulos, A. Lowe, *Enhancing organizational creativity: the process of perpetual challenging*, "Management Decision", 38, 2000, p. 474-734.

[31] R. Cagliano, V. Chiesa, R. Manzini, *Differences and similarities in managing technological collaborations in research, development, and manufacturing: a case study*, "Journal of Engineering Technology Management", 17, 2000, p. 193-224.

[32] P.M. Senge, *The leaders hew work: building learning organizations*, "Sloan Management Review", 32, 1990, p. 7-23.

[33] D.S. Elenkov, I.M. Manev, *Top management leadership and influence on innovation: the role of sociocultural context*, "Journal of Management", 31(3), 2005, p. 381-402.

[34] J.A. Moriano, F. Molero, G. Topa, J.P. Lévy Mangin, *The influence of transformational leadership and organizational identification on intrapreneurship*, "International Entrepreneurship and Management Journal", 10, 2014, p. 103-119.

[35] Ibidem.

[36] D.I. Jung, C. Chow, A. Wu, *The role of transformational leadership in enhancing organizational innovation: Hypotheses and some preliminary findings*, "Leadership Quarterly", 14, 2003, p. 525.

goals[37]. The leader's strengthening of intra-entrepreneurial attitudes requires a favourable organizational culture that supports risk-taking and innovativeness.

Culture of the organization

Through numerous studies it has been shown that creativity and intra-entrepreneurship can be truly enhanced only when an entire organization supports them[38]. As a result of research that has been carried out for more than half a century, a consistent set of interactional dimensions has been identified that would favour the enhancement of creativity and intra-entrepreneurship. The set includes: freedom, risk taking, openness, trust, support, orientation and intellectual stimulation, work challenge and intrinsic involvement[39]. The characteristics of an organization's climate and culture that impact the creativity and intra-entrepreneurship of employees negatively include: setting short time frames, strong financial control, strong process control[40], absorbing employees with administrative tasks, subjecting new ideas to severe criticism, condoning the status quo and a conservative, low-risk attitude among the top management[41].

The method of conflict management as a feature of an organization

The method of conflict management is an important element of an organization affecting employee's creativity. There are two types of conflict: task conflict and relationship conflict. The first strictly concerns cognitive discord about a task. The second type, relationship conflict, is emotional discord and is associated with an interpersonal incompatibility between group members[42]. Task conflict is positively associated with group creativity, while relationship conflict negatively correlates with creativity, as it leads to overly focusing on the members of the group instead of focusing on the task and leads to disturbances

[37] R. Kark, B. Shamir, G. Chen, *The two faces of transformational leadership: empowerment and dependency*, "Journal of Applied Psychology", 88(2), 2003, p. 246-255.

[38] L.B. Cardinal, D.E. Hatfield, *Internal knowledge generation: the research laboratory and innovative productivity in the pharmaceutical industry*, "Journal of Engineering Technology Management", 17, 2000, p. 247-271.

[39] L. Ryhammer, A.L. Anderson, *Relations between university teachers' assessed degree of creativity and views regarding their organization*, "Journal of Creative Behavior", 35, 2001, p. 199-204.

[40] J.B. Quinn, *Managing innovation: controlled chaos*, "Harvard Business Review", 171, 1985, p. 73-84.

[41] T.M. Amabile, *Componential Theory of Creativity*, "Harvard Business School Working Paper", 12, 2012, p. 96.

[42] A.C. Amason, H.J. Sapienza, *The Effects of Top Management Team Size and Interaction Norms on Cognitive and Affective Conflict*, "Journal Of Management", 23(4), 1997, p. 495.

of the flow of information[43]. Task conflict strengthens the team's creativity by contributing to extended sharing of information, a reassessment of the *status quo* and a more detailed analysis of the task. The relationship between task conflict and group creativity is curved – the creativity of the team is the greatest at a moderate level of task conflict since when the task conflict is too high, it may reduce the ability to perceive, process and evaluate information, and thus the ability to think creatively, but when task conflict is too low, it may not break the routine and the effects of group thinking[44]. So it seems important to provide the optimum level of conflict by adopting one of the three recognized conflict management strategies: cooperation, avoidance and fight[45]. The fight strategy aims to significantly reduce conflict and gain dominance over it. The avoidance approach in turn is based on passivity and a reluctance to resolve conflict, which leads to high levels of conflict. A strategy that allows an optimal level of conflict to be achieved is solving conflict through cooperation. This involves the exchange of experiences and arguments, inspiration for discussion and encouragement to have open communication. The strategy based on collaboration is connected with transformational leadership, consisting of encouraging cooperation in resolving conflicts, inspiring individuals to adopt a shared vision and commitment to the group objectives and providing individual support and intellectual stimulation[46].

Profiles of organizations' culture

The characteristics of an organization's culture creates work environment that affects not only the willingness to make creative efforts[47], but also the rate of idea generation and the success of implementation efforts[48]. Profiles of organizational culture developed by Cameron and Quinn[49] based on the

[43] P.J. Hinds, M. Mortensen, *Understanding Conflict in Geographically Distributed Teams: The Moderating Effects of Shared Identity*, "Shared Context, and Spontaneous Communication. Organization Science", 16, 2005, p. 290-307.

[44] K. Carsten, W. De Dreu, *When Too Little or Too Much Hurts: Evidence for a Curvilinear Relationship Between Task Conflict and Innovation in Teams*, "Journal of Management", 32, 2006, p. 83-107.

[45] M.J. Gelfand, K. Keller, L.M. Leslie, C. De Dreu, *Conflict Cultures in Organizations: How Leaders Shape Conflict Culture and Their Organizational-Level Consequences*, "Journal Of Applied Psychology", 97(6), 2012, p. 1131-1147.

[46] X. Zhang, Q. Cao, D. Tjosvold, *Linking Transformational Leadership and Team Performance: A Conflict Management Approach*, "Journal of Management Studies", 48(7), 2011, p. 1586-1611.

[47] S.G. Isaksen, K.J. Laver, G. Ekvall, A. Britz, *Perceptions of the best and worst climates for creativity: preliminary validation evidence for the situational outlook questionnaire*, "Creativity Research Journal", 13, 2001, p. 171-184.

[48] G. Ekvall, L. Ryhammer, *The creative climate: its determinants and effects at a Swedish University*, "Creativity Research Journal", 12, 1999, p. 303-310.

[49] K.L. Cameron, R.E. Quinn, *Kultura organizacyjna – diagnoza i zmiana. Model wartości konkurujących*, Oficyna Ekonomiczna, Warszawa 2003.

Competing Values Framework, characterized by a diverse configuration of the features described above, seem to favour taking up creative and intra-entrepreneurial activities to varying degrees.

The adhocracy culture, distinguished by a flexible structure that includes many structural linkages both inside and outside the organization, favours risk-taking and experimentation to develop innovative solutions and promotes diversity and teamwork, may be considered synonymous of a creative culture of the organization. Organizations with the adhocracy culture build their competitive advantage based on the production of unique and difficult to replace goods, relying on the Blue Ocean Strategy[50]. An organization that functions in this way, in order to be able to react quickly to changes in the competitive environment, usually does not have a centralized centre of power, as the organizational structure is matched to the task. Therefore, in this case, matching the culture of the organization, the leadership style and the qualities represented by the leader seem to play a special role in stimulating creativity. The adhocracy culture requires a transformational leadership style, a leader with a high level of expertise and social skills, a visionary prone to risk-taking who effectively takes up sense-making activities[51].

The opposite of adhocracy is a culture of hierarchy, in which the centralization of management and a strict formalization of project implementation dominate. These are the qualities that are negatively associated with the innovativeness and creativity of employees[52]. The aim of an organization with a hierarchical culture is usually an effective production of identical products, and therefore compliance with imposed rules, predictability and stability are highly appreciated values. Creativity plays much smaller role. A hierarchical culture requires a transactional leadership style suited to its characteristics, a leader acting as coordinator and administrator who is able to persuade subordinates to work effectively.

In the case of each type of organizational culture, a leadership style adapted to its requirements can stimulate creativity and intra-entrepreneurship of employees within a scope defined by the culture. According to Sternberg et al.[53] an organization that "resists change is more likely to have kinds of creative leadership that accept existing paradigms (replication, redefinition and forward incrementation)" while in organizations with a more organic structure, a leader who rejects the existing paradigms (redirection, reconstruction, reinitiation) or carries out their synthesis (synthesis) will be preferred[54].

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[50] W. Ch. Kim, R. Mauborgne, *Blue Ocean Strategy*, Harvard Business School Press, Harvard 2005.

[51] L. Dunham, R.E. Freeman, *There is business like show business: leadership lessons from the theater*, "Organizational Dynamics", 29, 2000, p. 108-122.

[52] F. Damanpour, *Organizational innovation: a meta-analysis of effects of determinants and moderators*, "Academy of Management Journal", 34(3), 1991, p. 555-590.

[53] R.J. Strerberg, J.C. Kaufman, J.E. Pretz, *A propulsion model of creative leadership*, "The Leadership Quarterly", 14, 2003, p. 455-473.

[54] W. Morris, *Enhancing Organisational Creativity A Literature Review*, Future Edge, New Plymout 2006, p. 13.

Shaping the culture of the organization by the leader

It should be noted that organizational culture influences the actions of leaders and leaders can also influence the culture[55], as culture is numbered among social structures over which leaders have significant influence[56]. Schein[57] distinguishes two mechanisms by which a transmission of beliefs, values and assumptions of the leader to the group that creates the organization may occur – Primary Embedding Mechanisms and Secondary Articulation and Reinforcement Mechanisms. In organizations that are in their early stages of development, secondary mechanisms play only a supporting role, but with the development of the organization, they become primary mechanisms. What is more these mechanisms contribute to the success of the organization, the stronger criteria they are for choosing a new leader. As a result, the probability that the leader will change the culture of the organization decreases with its development, since it becomes more important to follow strategies that were effective in the past than to implement new visions of the leader.

National culture

To increase the predictive power of the model of the relationship between leadership style and creativity and intra-entrepreneurship, it is necessary to take into account the characteristics of individual workers as well as the characteristics of the culture to which they belong. According to Bass and Avolio[58] tendencies seen in the development of leadership demonstrate the versatility of the transformational style of leadership. In some research this assertion was confirmed[59]. On the other hand, according to Hofstede[60] and Smith and Peterson[61], theories of leadership styles developed in one culture do not have to be equally effective in another, especially if the other culture is different in many dimensions. According to some researchers, leadership is both universal and has features specific to a given culture[62].

[55] M.D. Mumford, *Social innovation: ten cases from Benjamin Franklin*, "Creativity Research Journal", 14, 2002, p. 253-266.

[56] P.E. Tesluk, J.L. Farr, S.R. Klein, *Influences of organizational culture and climate on individual Creativity*, "Journal of Creative Behavior", 31, 1997, p. 27-41.

[57] E. Schein, *Organisational culture and leadership*, Jossey-Bass, San Francisco 1992.

[58] B.M. Bass, B.J. Avolio, *Transformational leadership and organizational structure*, "International Journal of Public Administration Quarterly", 17, 1993, p. 112-121.

[59] H. Zagorsek, J. Marko, J.S. Stanley, *Comparing leadership practices between the United States, Nigeria, and Slovenia: Does culture matter?*, "Cross Cultural Management", 11, 2004, p. 16-34.

[60] G. Hofstede, *Cultural constraints in management theories,* "Academy of Management Executive", 7(1), 1993, p. 81-94.

[61] P.B. Smith, M.F. Peterson, *Leadership, organization and culture: An event management model*, London: Sage, London 1988.

[62] B.M. Bass, *Does the transactional-transformational leadership paradigm transcend organizational and national boundaries?*, "American Psychologist", 52(2), 1997, p. 130-139.

In this paper, the focus was on one of the five dimensions of culture described by Hofstede[63] – the avoidance of uncertainty – which can be defined as the degree of threat felt in the face of new, unknown or uncertain situations[64]. An extensive study by Shane[65], in which 4.405 people from 43 organizations in 68 countries participated, showed a negative relationship between the transformational leadership style and the avoidance of uncertainty. In cultures with high uncertainty avoidance creative ideas may be perceived as threatening because people in such cultures seek absolute truths and values[66]. Accordingly, a transformational leader who inspires employees to create ambiguous plans and allows rules to be broken will be less desirable by workers originating from these cultures than a transactional leader[67].

Conflict and the avoidance of uncertainty

Research carried out by He, Chen Zhu and Peng[68] indicates that the degree of uncertainty avoidance is associated with the conflict management strategies of cooperation and avoiding. A low degree of uncertainty avoidance contributes to cooperation with conflict and to a high degree contributes to its avoidance. The relationship between conflict and uncertainty avoidance at the level of employees is interesting. In the case of workers with a high degree of uncertainty avoidance, who strive to quickly remove ambiguities, there should be less task conflict, based on the disparity between the understanding of a problem and methods to solve it than in the case of workers with a low degree of uncertainty avoidance[69].

Individual characteristics of employees

Shin and Zhou[70] point out to the role of individual factors as a moderator affecting the direction and strength of the relationship between leadership

[63] G. Hofstede, *Kultury i organizacje. Zaprogramowanie umysłu*, Polskie Wydawnictwo Ekonomiczne, Warszawa 2007.
[64] Ibidem.
[65] S.A. Shane, *Uncertainty avoidance and the preference for innovation championing roles*, "Journal of International Business Studies", 26, 1995, p. 47-68.
[66] G. Hofstede, *Motivation, leadership and organization: Do American theories apply abroad?*, "Organizational Dynamics", Summer, 1980, p. 42-63.
[67] An exception noticed by Hofstede (2007) is intra-entrepreneurs who are rewarded for customized ideas because it is related to their position.
[68] Z. He, J.H. Zhu, S. Peng, X. Chen, *Patterns of cultural orientations and conflict resolution in three cultural groups*, Proc., Annual Conf. of the Association for Education in Journalism and Mass Communication, the Association for Education in Journalism and Mass Communication, Miami Beach, Florida 2002.
[69] K.A. Jehn, *A multimethod examination of the benefits and detriments of intragroup conflict*, "Administrative Science Quarterly", 40, 1995, p. 256-282.
[70] S.J. Shin, J. Zhou, *Transformational leadership, conservation, and creativity: evidence from Korea*, "The Academy of Management Journal", 46(6), 2003, p. 703-714.

style and its effects on the functioning of the organization. A high level of conservatism makes the relationship of transformational leadership style and creativity stronger, while a low level of conservatism reduces the relationship[71]. Among the most important mediators of the relationship between leadership style and creativity one should mention intrinsic motivation, which is one of the within-individual components mentioned in the theory by Amabile[72]. This researcher also points to the role of other components: domain-relevant skills (knowledge, expertise, technical skills, intelligence, and talent in a particular domain) and creativity-relevant processes (cognitive and personality processes conducive to novel thinking). Moriano[73] showed, however, that the development of intra-entrepreneurial attitudes is associated with the level of education achieved by the employee (the only significant demographic factor) and the degree of organizational identification.

Need for closure

An important mediator between leadership style and the creativity and intra-entrepreneurship of employees appears to be a need for closure, defined as the tendency to achieve an opinion or task solution rapidly in an ambiguous situation[74]. The need for closure can be examined dispositionally and situationally. It has been shown that the need for cognitive closure intensifies in situations where information processing is becoming difficult or unpleasant[75]. However, in situations where it would involve incurring significant losses, refraining from cognitive closing may take place[76]. The need for cognitive closure can also be considered a disposition determined by, among other factors, cultural norms, the process of socialization or the process of learning in which the transparency and putting someone's own opinions in order were rewarded[77]. It seems, therefore, that the need for closure should be characteristic for cultures with a high need to avoid uncertainty.

[71] Ibidem.

[72] T.M. Amabile, *Componential Theory of Creativity*, "Harvard Business School Working Paper", 12, 2012, p. 96.

[73] J.A. Moriano, F. Molero, G. Topa, J.P. Lévy, *Mangin The influence of transformational leadership and organizational identification on intrapreneurship*, "International Entrepreneurship and Management Journal", 10, 2014, p. 103-119.

[74] A.W. Kruglanski, D. Webster, *Motivated closing of the mind: Seizing and freezing*, "Psychological Review", 103, 1996, p. 263-283.

[75] Ibidem.

[76] Examples of such situations may be the awareness of evaluation or being directly responsible for a task.

[77] D. Webster, A.W. Kruglanski, *Cognitive and social consequences of the need for cognitive closure*, [in:] *European review of social psychology*, (eds.) W. Stroebe, M. Hewstone, Chichester, UK: Wiley 1998, p. 133-173.

It has been shown that the intolerance of ambiguity, a construct forming the need for cognitive closure, is negatively associated with creativity[78], innovativeness[79]. It was also found that the need for cognitive closure favours the pursuit of compromise and the rejection of dissenters' opinions than the formation of new solutions involving ambiguity or dissimilarity[80]. Products developed by people with a high need for closure are rated as less creative[81]. Furthermore, in a study by Chirumbolo et al.[82], it was experimentally shown that groups of people with a high need for cognitive closure produced fewer ideas, developed the input data to a lesser extent and generated less creative ideas. It seems, therefore, that a team dominated by people with a high need for cognitive closure may not be able to take advantage of the opportunities offered by a transformational leader.

The need for cognitive closure and avoiding uncertainty

Few studies that have been conducted to date have shown that the avoidance of uncertainty is a stronger moderator of behaviours associated with reducing ambiguity than the need for cognitive closure[83]. On the other hand, however, it was found that the need for cognitive closure may be more intensified in people from a culture with low avoidance of uncertainty. It seems, therefore, that further research on the relationship between the need for cognitive closure and the dimension of uncertainty avoidance is needed.

The theoretical model – a conclusion

Creativity should be presented in a system-related approach in which a creative organization is treated as a system of relationships involving employees at all levels, which shapes and at the same time is being shaped by the environment of the organization. The elements of this system of connections are factors presented in this study referring to the characteristics of the

[78] D. Tegano, *Relationship of tolerance of ambiguity and playfulness to creativity*, "Psychological Reports", 66, 1990, p. 1047-1056.

[79] A.M. Nicotera, M. Smilowitz, J.C. Pearson, *Ambiguity tolerance, conflict management style, and argumentativeness as predictors of innovativeness*, "Communication Research Reports", 7, 1990, p. 125-131.

[80] A.W. Kruglanski, D. Webster, *Group members' reactions to opinion deviates and conformists at varying degrees of proximity to decision deadline and of environmental noise*, "Journal of Personality and Social Psychology", 61, 1991, p. 212-225.

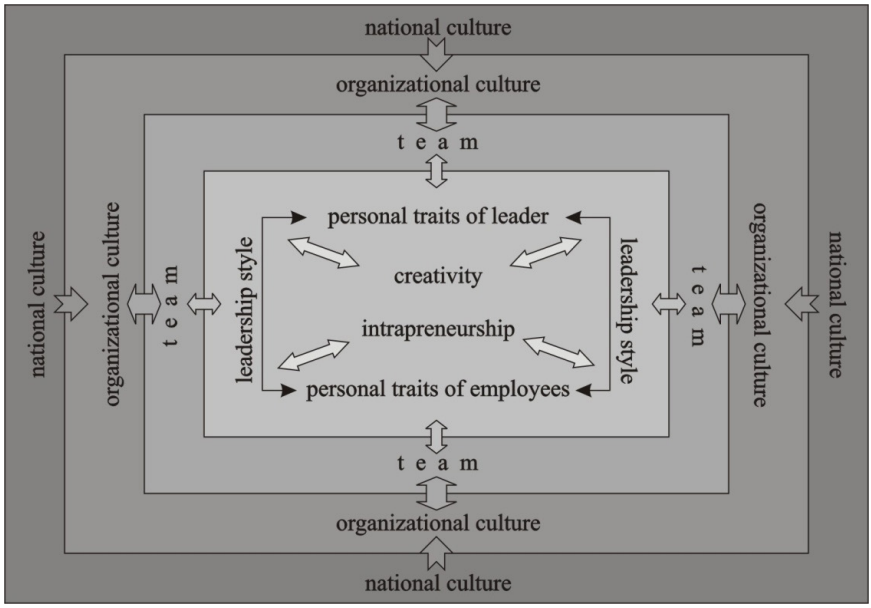
[81] P. Rocchi, *Il bisogno di chiusura cognitiva e la creatività (The need for cognitive closure and creativity)*, "Giornale Italiano di Psicologia", 25, 1998, p. 153-190.

[82] A. Chirumbolo, L. Mannetti, A. Pierro, A. Areni, A.W. Kruglanski, *Motivated Closed-Mindedness and Creativity in Small Groups*, "Small Group Research", 36, 2005, p. 59-82.

[83] K.M. Jung, J.J. Kellaris, *Cross-national Differences in Proneness to Scarcity Effects: The Moderating Roles of Familiarity, Uncertainty Avoidance, and Need for Cognitive Closure*, "Psychology & Marketing", 21(9), 2004, p. 739-753.

leader, the culture of the organization, the national culture and the individual characteristics of employees that modify the relationship between the leadership style and the creativity and intra-entrepreneurship in organizations. Figure 1 shows the most important dependencies described in the article.

Figure 1. The theoretical model



Source: own elaboration.

The innovativeness of an organization whose foundation is the creativity of its employees is the biggest competitive advantage in the rapidly changing and highly competitive global market. The triggering of creativity and intra-entrepreneurship must be a coherent process embedded in the entire organizational environment.

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THE CONCEPT OF SUSTAINABLE DEVELOPMENT AS DEVELOPMENT STRATEGY OF THE ORGANIZATION OF THE FUTURE

Keywords:

development strategy, corporate social responsibility, ethics in business

Summary

The article presents the main features of the concept of sustainability, understood as the dominant area of strategic actions that will help to create responsible business, which includes both effective leadership, innovation, but above all business ethics. The latest concepts of sustainability and enterprise sustainability clearly underline the importance of corporate social responsibility, which is a consequence of increased public awareness, regulation and increased requirements of external stakeholders. Corporate Social Responsibility is an excellent tool for building a competitive advantage, leading to increasing market position of any organization.

Introduction

Contemporary organisations operate and develop in a dynamically changing environment, which shows complexity and uncertainty of operation on all levels of their activity.

Achieving a market success is the most important task for all enterprises, regardless of the kind and structure of their organisation. Management theory but also practice do not offer unambiguous answers to probing questions on the organisation development. One can then risk stating that the strive for excellence will be relative but highly measurable. From this point of view, all activities involving searching for effective leadership, better innovation management and building organisational culture as well as sustainable development culture will make a great contribution to the paradigm of management sciences. Traditional philosophy of enterprise management through classic business models has clearly become obsolete. The change is an inherent process of an enterprise

development, however an intuitive strive for balance can be observed, covering also business and social activity.

The concept of sustainability is the answer to the issue, as it allows for shaping and implementing of flexible forms of changes that will help overcome ever more difficult "market situations". The paper is intended to present the most important assumptions of the concept of sustainability, meant as the dominant areas of strategic operation that will help develop responsible business, including effective leadership, innovation and – first of all business ethics. Corporate social responsibility gains special significance. The latest concepts of sustainability clearly emphasise the importance of corporate social responsibility resulting from an increasing social awareness, legal regulations and growing demands of external stakeholders. It is also a common conviction that the concept of CSR (Corporate Social Responsibility) is a way to gain competitive advantage and to greatly increase the level of culture within an enterprise.

Sustainability as a strategy of enterprise development

Sustainability is a concept of a company of the future, skilfully adapting to the ongoing and turbulent changes in the environment and able to operate under chaos and crisis[1]. The concept is based on the concept of sustainable development, but it has a different nature and dimension.

Sustainable development is meant as a long-lasting process resulting in permanent improvement in the quality of life of current and future generations, reached by balancing three kinds of capital: economic, human and natural[2]. Many documents on sustainable development i.e. economic growth, social progress and changes in the natural environment are presented as correlated phenomena. A subjective approach to the concept, being (…) a process of social and economic as well as spatial changes, which involves integration of political, economic and social activities maintaining permanent balance to provide equal chances for access of both contemporary and future generations to the environment, is referred to as sustainable development[3].

Considering the interest of a small group of stakeholders, from this point of view the concept of an enterprise of the future, also called a sustainable enterprise becomes more complex and applies to a much smaller group of stakeholders. It is important to explain the differences, as it helps to establish a strategy of an enterprise in a more precise way, to develop missions and business models and to implement them. It is also true when modern products are introduced into

[1] W. Grudzewski, I. Hejduk, *Koncepcja sustainability wyzwaniem współczesnego zarządzania*, [in:] *Koncepcja sustainability wyzwaniem współczesnego zarządzania*, (ed.) I. Hejduk, Oficyna Wydawnicza Szkoły Głównej Handlowej, Warszawa 2014, p. 13.

[2] J. Adamczyk, T. Nitkiewicz, *Programowanie zrównoważonego rozwoju przedsiębiorstw*, PWE, Warszawa 2007, p. 7.

[3] G. Zabłocki, *Rozwój zrównoważony – idee, efekty, kontrowersje*, Uniwersytet Mikołaja Kopernika w Toruniu, Toruń 2002, p. 39.

the market, which nowadays is not an easy process. The rate of implementation of new products into the market is frenetic but the failure rate is high[4].

Sustainable development is then a process of compensation of economic goals of an enterprise. The assumptions of sustainable development at an enterprise level were identified by the World Business Council for Sustainable Development and cover the following factors:

- Eco-effectiveness – producing goods and services that are price effective, satisfy the needs of clients and contribute to the improvement in the quality of their life. Eco-effectiveness is reflected in all aspects of an enterprise operation;
- Innovation and technologies – the main factors to reach sustainable development. The processes of innovation development and implementation not only helps to reduce costs and take advantage of new market opportunities, but also to reach eco-effectiveness and building systems of corporate social responsibility, reducing negative impact on the environment, identifying risk areas and their effective management;
- Social responsibility:
  - ecosystems – ecosystem degradation occurs as a result of pollution, use of natural resources in a way that reduces biodiversity or causes complete exhaustion of resources;
  - sustainability and market – production and consumption should be considered together, since they are supposed to improve the quality of life;
  - risk – it mainly applies to: health and safety of employees, responsibility for products and services, care for brand and reputation and completing reporting and financial tasks. The risk in the abovementioned scope is mainly caused by turbulent markets, political instability, sensitive human capital, development and implementation of new technologies, market acceptance and terrorist threat[5].

It should be emphasised that a number of simultaneous or even overlapping elements will influence correct operation of a sustainable enterprise. It is a result of globalisation processes, namely enterprise management involving integration of material and non-material capital, replacing inefficient systems with new ones, often based on more modern market mechanisms. Correlations between modern sustainable enterprises and their surroundings will create business processes and strengthen the changes and innovations.

[4] P. Kotler, *Marketing lateralny*, Polskie Wydawnictwo Ekonomiczne, Warszawa 2004, p. 34.

[5] W. Grudzewski, I. Hejduk, *Koncepcja sustainability wyzwaniem współczesnego zarządzania*, [in:] *Koncepcja sustainability wyzwaniem współczesnego zarządzania*, (ed.) I. Hejduk, Oficyna Wydawnicza Szkoły Głównej Handlowej, Warszawa 2014, p. 20.

Business processes make a key element of an enterprise interaction with the environment[6]. In order for the processes to occur, modern enterprises develop new concepts, such as sustainable enterprise or agile enterprise. Agility means the ability to respond to changes, however it must not be understood as flexibility. The basic difference in the meaning is that flexibility applies to changes in implementing tasks within an enterprise in a standard way. Parameters of flexibility are identified with a product or service, namely a change in the use of machines and equipment, scope of responsibilities and innovation flexibility. The essential difference between flexibility and agility involves the response rate if unexpected market changes occur, using the theory of opportunity.

The problems that enterprises have to handle in relation to unexpected changes in the changing environment have been a dominant topic in industry and academic circuits for many years. A number of solutions have been proposed, including networks, re-engineering, modular enterprise, virtual enterprises, corporations, just-in-time (JIT), etc. There are three concepts of an enterprise referring to the way of operating in an uncertain and unpredictable environment: adaptive and flexible but first of all agile. There are different approaches to defining each of those terms and there are many arguments and uncertainties related to the definitions and components of each of the concept. Some authors suggest clear differentiation between the concepts, while others claim they should be used interchangeably. However, basically all concepts, including sustainable enterprise have been considered as capable of modifying and responding to changes. A change is an inherent process of an enterprise development. J. Thompson claimed that handling uncertainty was the key task of an enterprise, while P.F. Drucker mentioned a search for a change, responding to changes and perceiving changes as an opportunity[7] among the most important tasks of an entrepreneur.

Permanent changes offer both new opportunities whose proper use can determine success of a company but also a great hazard for companies that will react to the changes with a delay[8]. In relation to the above, enterprises are searching for systemic solutions involving sustainable modelling of organisational structures to achieve the greatest effectiveness. Effective and moderate management will stimulate the process of increasing value migration to the enterprise, which will result in a significantly improved balance.

According to research carried out by W. Przychodzeń:

- Companies that effectively implement the concept of sustainable development into their business strategy and decision-making process reach much higher valuation of the capital market than the average;

[6] J.M. Hall, M.E. Johnson, *When Should Process Be Art, Not Science*, "Harvard Business Review" 2009, Journal of Management, published online 10 December 2010, p. 50-65.

[7] H. Sharifi, Z. Zhang, *Agilemanufacturing in practice: Application of methodology*, "International Journal of Operations & Production Management", No. 21, 5/6, 2001, p. 772.

[8] A. Wysokińska-Senkus, *Doskonalenie systemowego zarządzania w kontekście sustainability*, Difin, Warszawa 2013, p. 9.

- The intensity of fluctuations in the stock price of sustainable enterprises is much lower than the market average;
- Sustainable enterprises reach a lower revenue growth rate that the market average;
- Sustainable enterprises do not reveal anti-cyclical nature within a standard stock market cycle;
- Companies that effectively implement the concept of sustainable development into their business strategy and decision-making process demonstrate much higher resistance of their stock prices to stock market breakdowns than the average[9].

A systemic approach, being particularly important when developing a sustainable business model, has to be correlated with its effectiveness. Systemic management effectiveness can be meant as a result of comprehensive management implementation, involving noticing mutual relations between different aspects of an enterprise operation and external environment (namely all stakeholders of the enterprise), considering the changes in time. It is necessary to analyse the causes and effects of the changes and to focus on the ones with key significance for the enterprise in the economic, social and environmental dimension, directed towards sustainable development and innovation[10]. Not only does innovation favour implementation of a strategy focusing on value increase but it also allows for reaching efficient and sustainable development and stabilise the condition of the entity, particularly under economic crisis. The majority of enterprises focus their efforts on marketing while neglecting innovation and forget that a company that wants to grow and operate successfully has to improve its products and technologies, namely constantly search for innovative solutions and implement them into practice[11].

Corporate social responsibility and ethics as elements of a sustainable enterprise

Any human activity resulting in development, is perceived as a social phenomenon par excellence from a time perspective. Therefore social and cultural needs as an intrinsic element of life, as well as their realisation, have gained a new, coherent dimension, in particular for societies focused on creating new values. It is done owing to permanent search for ever better organisational and systemic solutions.

As far as organisational behaviour is concerned, the creation of the concept

[9] W. Przychodzeń, *Zrównoważone przedsiębiorstwo, teoria, praktyka, wycena, kształcenie*, Poltex, Warszawa 2013, p. 11.

[10] A. Wysokińska-Senkus, *Doskonalenie systemowego zarządzania w kontekście sustainability*, Difin, Warszawa 2013, p. 10.

[11] R. Nowacki, M. Adamska, *Podejście innowacyjne w zarządzaniu przedsiębiorstwem*, Difin, Warszawa 2010, p. 47.

of sustainability will be determined by an increase in the significance of such values as trust, ethics or corporate social responsibility. The question that arises is then who is business responsible towards – the concept of stakeholders seems most relevant here. The term "stakeholders" in the theory of economy was introduced by I. Ansoff and R. Steward in the 1960s. They stimulated the development of enterprises and greatly participated in the formation of positive changes.

Corporate social responsibility is a modern concept under great discussion in academic circuits. The name of the concept (CSR) makes an assumption that at the very stage of strategy development, enterprise will take into consideration the interest of the society and protection of natural environment in a conscious and voluntary way. It results from the awareness that the quality of goods or services is no longer enough.

The majority of definitions approaching the issue of corporate social responsibility this way, cover the following statements:

- social responsibility makes an element of an enterprise strategy, facilitating its sustainable development through an optimum use of resources,
- competition requires that enterprises found their competitive advantage on non-economic factors, which are finally reflected in the economic success of the enterprise,
- taking care of the groups related to the enterprise in areas not directly related to its business operation helps create customer loyalty towards the enterprise brand or acceptance of potential customers[12].

As a result of such changes in the enterprise, a synergy is developed between various elements of current operation, e.g. within the organisational culture and in the mindset of the people who will create the organisation, taking corporate social responsibility into account. These elements can provide basis for indicating actions that have to be taken within the systems forming the organisational culture, and in particular within the scope and methods of educating the employees[13].

The interdisciplinary nature of modern science, including business ethics is of very complex nature, where the eligibility criterion may involve research methods or the level of assessment of different social and economic phenomena. If business ethics is supposed to deal with analysis of ethical rules in the economic world, it should be possible to identify the rules and we would be able to differentiate between ethic and praxeological, legal and social ones.

Business ethics makes an inherent part of business operation of an

[12] J. Nakonieczna, *Społeczna odpowiedzialność przedsiębiorstw międzynarodowych*, Difin, Warszawa 2008, p. 20.

[13] B. Mikuła, *Organizacje oparte na wiedzy*, Wydawnictwo Akademii Ekonomicznej w Krakowie, Kraków 2006, p. 224-225.

enterprise. It defines internal working standards within the enterprise as well as relations with customers and stakeholders. The most important factors of ethical operation of an enterprise include honesty at each stage of a business contact and responsibility of every business activity. Good leadership, including the enterprise strategy and its efficient management guarantee implementation of those measures.

Modern leadership in a sustainable enterprise combines the vision of the enterprise with current management, or in other words popularisation of ideas combined with their skilful implementation, considering different kinds of obstacles. G. Rowe and M. Nejad describe this kind of leadership as a synergic combination of a visionary and managerial leadership, covering ethical behaviour. It is becoming extremely difficult to present the issue of business ethics. The interdisciplinary nature of contemporary management, including business ethics, has become eclectic and the criteria of competitiveness can determine the assessment level of different social and economic phenomena.

Applications

Contemporary enterprises facing ever growing expectations of their stakeholders have to respond to any information from outside that can contribute to the enterprise development. Developing solutions, creating the process of innovation and establishing good human relations is not possible without mutual respect, observing moral principles and mutual tolerance in its widest sense. The phenomena are of a systemic nature and form a coherent mechanism and tool for further development.

The concept of sustainability that allows for modelling and implementing of flexible forms of changes that will overcome ever growing challenges that enterprises will have to face is a set of solutions covering the essence of an enterprise operation. It emphasises the need for regular improvement in the management processes and leadership as well as following the rules of corporate social responsibility in close relation to the enterprise business ethics. A socially responsible business makes a perfect tool to gain competitive advantage and build stable market position for any enterprise.

Bauman's philosophy of enterprise management through classic business models is clearly becoming obsolete. A noticeable search for modern business models oriented towards agility and searching for market opportunities can be observed.

A change makes an inherent process of an enterprise development, although there is an intuitive strive for reaching balance, covering business and social activity. The purpose of the paper was to indicate benefits that a process of corporate social responsibility integration can bring, being reflected in the enterprise strategy and assumptions. The complex processes cannot be implemented without considering the concept of a sustainable enterprise.

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