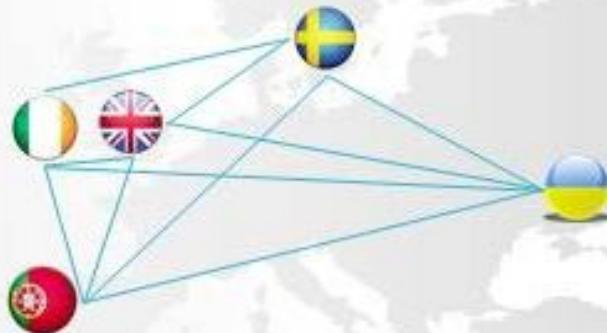




Surveys and studies

Innovation perspective
In Ukrainian IT- Educational
Standards



**National Education Framework for Enhancing IT
Students' Innovation and Entrepreneurship 530576-TEMPUS-
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INTRODUCTION

Creating a culture of innovation in contemporary Ukraine is one of the key objectives of the national economic development and Euro integration. Furthermore, the existence of effective environment for innovation in the globalized economy is actually one of the conditions for existence and development of any company in general. According to a number of research, the majority of business representatives in Ukraine are considering innovation as buying foreign technologies and equipment or purchasing off-the-shelf technologies for a song in a research institute. As a result, entrepreneurs have a very negative attitude towards most academic research and research institutes as sources of innovation projects without any practical purposes. And they are often right because most innovation projects are not integral, have nothing to do with industrial technologies and they are carried out without detailed market research. Manufacturers have to solve a number of problems related to the implementation of this technology: from legal issues to the marketing promotion strategy. They can perform none of these tasks in a good and workmanlike manner. So today in Ukraine there is hardly any comprehensive approach to the formation of innovation environment, despite the great scientific and technological potential of the country. In general innovation in Ukraine can be regarded as a set of scientific, technological, organizational, financial and commercial measures aimed at the commercialization of knowledge, technologies and equipment. Being officially a priority activity, the government support is often declarative. And the government cannot be blamed for this because the concept of innovation culture is just emerging in Ukraine. According to the legal basis of Ukraine, innovation is the activity focused on use and commercialization of scientific findings and promotion of new competitive goods and services at the market. The primary objective of national innovation policy is to create the socio-economic, organizational and legal conditions for effective reproduction, development and use of scientific and technical potential, implementation of cutting-edge, environmentally friendly, safe, energy and resource saving technologies, production and promotion of new competitive products [1].

In Ukraine there are several types of innovations:

- Technical innovations appear in the production of new products or products with improved properties;
- Technological innovations appear when improved methods of production

are applied;

- Organizational and management innovations are related to the processes of optimal organization of production, transport, distribution and supply;
- Information innovations are implemented to organize rationally information flow in science, technology and innovation, to improve reliability and timeliness of information;
- Social innovations are aimed at improving working conditions, solving problems related to health, education and culture.

Among innovation levels in Ukraine the level of research at universities and different educational institutions should be mentioned. This includes developments, inventions and research which are conducted in study groups at schools and in laboratories, clubs of technical creativity. Students and schoolchildren take an active part in creating and inventing new products. Ukrainian schoolchildren and students make inventions in different spheres of science and technology, and then many of these inventions are developed commercially. Unfortunately, Ukraine is experiencing economic crisis nowadays, so the government had to cut off funding to study groups and centers of technical creativity for young people. In western universities professors are often employed in research institutes which cooperate with private firms. Consequently, research institutes, whose goal is technology transfer, maintain a close relationship with both universities and industry. Professors are allowed by the university authorities to create private research centers, which are independent legal entities on the university campus. In Ukraine, despite the high scientific and technical potential of research organizations and universities, the most crucial issue is to create a culture of innovation exactly at this level. We need a clear policy on how to work with students and involve them in all stages of the innovation project, to form the basic knowledge about preparation and implementation of innovation projects etc. A comprehensive program for research organizations' staff is also required because the level of their activity in the field of innovation can be characterized as "extremely poor". The autonomy of universities needs diversifying sources of research funding, replacing government financing. The long-term goal of the autonomy is to fully reimburse the money spent on research. To fulfill this goal, universities should be converted into a vehicle to transfer scientific ideas to industry and society as

implemented innovations.

The important role of education in promoting more entrepreneurial attitudes and behaviors is now widely recognized. However, the benefits of entrepreneurship education are not limited to start-ups, innovative ventures and new jobs. Entrepreneurship refers to an individual's ability to turn ideas into action and is therefore a key competence for all, helping young people to be more creative and self-confident in whatever they undertake. The Bologna process can have a positive effect on the way entrepreneurial knowledge is spread. The 46 Bologna signatory countries met in London in May 2007, and recommended such measures as the recognition of non-formal learning, the development of flexible curricula to accommodate student and staff mobility, and enhanced university-employer collaboration in innovation and knowledge transfer [3]. At higher education level, the primary purpose of entrepreneurship education should be to develop entrepreneurial capacities and mindsets. In this context, entrepreneurship education programs can have different objectives, such as: a) developing entrepreneurial drive among students (raising awareness and motivation); b) training students in the skills they need to set up a business and manage its growth; c) developing the entrepreneurial ability to identify and exploit opportunities. Graduates' start-up is one of a range of possible outcomes. Currently the teaching of entrepreneurship is not yet sufficiently integrated in higher education institutions' curricula. So the real challenge is to build inter-disciplinary approaches, making entrepreneurship education accessible to all students, creating teams for the development and exploitation of business ideas, mixing students from economic and business studies with students from other faculties and with different backgrounds [3]. The demand for learning about entrepreneurship is increasing. However, there is a short age of human resources and funding for this type of education; therefore it is not possible to meet this demand fully. Action-oriented teaching is labor – Intensive and costly, and require specific training. There is a need to graduate enough PhD students in entrepreneurship who can become teachers. Moreover, there is very little in terms of incentives to motivate and reward teachers for getting involved in entrepreneurial teaching and interaction with students. It is currently difficult to build a career in entrepreneurship, as research remains the main promotion criterion [3]. Developing and delivering entrepreneurship is significantly affected by the internal organizational structure of an institution.

Faculties and departments tend to work quite separately, with many obstacles for students who want to move and for teachers interested in establishing cross-disciplinary courses. A rigid curriculum structure is often an impediment to interdisciplinary approaches. In terms of specific contents, programs and courses should be adapted to different target groups (by level: undergraduate, graduate, post-graduate, PhD; by field of study: economics/business, scientific/technical studies, humanities, arts & design, etc.). The best way to encourage entrepreneurship among students is by giving examples from the relevant technical area. As regards current teaching methods, there are a wide range of techniques to supplement lectures as the most basic teaching tool. However, there seems to be a gap between the methods actually used and those that are viewed as the most effective and appropriate. Using experience-based teaching methods is crucial to developing entrepreneurial skills and abilities. Traditional educational methods (like lectures) do not correlate well with the development of entrepreneurial thinking [3]. There is a need for more interactive learning approaches, where the teacher becomes more of a moderator than a lecturer. Crossing boundaries between disciplines, and multidisciplinary collaboration, are essential elements in building enterprising abilities. Getting real entrepreneurs involved in the teaching can make up for the current lack of practical experience among professors. Although entrepreneurs and business practitioners are in general involved in the teaching, there are few examples of entrepreneurial practitioners engaged in the full curricula experience. Most frequently, they come to give short presentations to students (e.g. as personal testimonials or guest lecturer) or as judges in competitions. European higher education institutions are not sufficiently involved and effective in working with alumni who have been successful in their entrepreneurial end devours, and who could bring back knowledge and funds [3]. Also, mobility of teachers and researchers between higher education institutions and business is in general very low, and this practice is not actively encouraged. There are in many cases few or no incentives, and in some cases outright disincentives. The strength that gives higher education institutions an innovative capacity, and hence entrepreneurial potential, is their autonomy. While diversity is richness, institutions and educators will gain from exchanges and mutual learning, open sources of information, examples of good practice across Europe. Coordination is needed at a policy level to ensure that all higher education institutions

are given the necessary incentives and opportunities to take on this challenge. It is very important to determine how entrepreneurship can be integrated into primary, secondary, and higher education; adopt legislation supporting relations between private business and universities; establish awards for entrepreneurial universities, teachers and students, and promote positive examples of academic spin-offs. At their level of responsibility, higher education institutions could: set up a strategy and an action plan for teaching and research in entrepreneurship, embedding practice-based activities, and for new venture start-ups and spin-offs; create an entrepreneurship education department, which would serve as an entrepreneurial hub within the institution and spread the teaching of entrepreneurship across all other departments; offer an introduction to entrepreneurship and self-employment to all undergraduate students during their first year. In addition, give all students the opportunity to attend seminars and lectures in this subject; set up incentive systems to motivate and reward faculty staff in supporting students interested in entrepreneurship, and acknowledge the academic value of research and activities in the entrepreneurial field; develop clear institutional rules about intellectual property; award academic credits for practical work on enterprise projects outside the established courses [3]. The important role of education in promoting more entrepreneurial attitudes and behaviors, starting even at primary school. Entrepreneurial programs and modules offer students the tools to think creatively, be an effective problem solver, analyse a business idea objectively, and communicate, network, lead, and evaluate any given project. Students feel more confident about setting up their own business as they can now test their own business ideas in an educational, supportive environment. However, the benefits of entrepreneurship education are not limited to boosting start-ups, innovative ventures and new jobs. Entrepreneurship is a competence for all, helping young people to be more creative and self-confident in whatever they undertake.

Universities and technical institutions (e.g. polytechnics) should integrate entrepreneurship as an important part of the curriculum, spread across different subjects, and require or encourage students to take entrepreneurship courses. Special attention should be paid to systematically integrating entrepreneurship training into scientific and technical studies and within technical institutions, to facilitate spin-offs and innovative start-ups, and to help researchers acquire

entrepreneurial skills. There needs to be more focus on developing the skills necessary for fully exploiting innovation and knowledge transfer activities in combination with the commercialization of new technologies [2].

CHAPTER 1

LAW ON INNOVATION ACTIVITY IN UKRAINE

The Law defines legal, economic and organizational principles of state regulation of innovation activity in Ukraine [1]. The objects of innovation activity are:

- innovation programs and projects;
- new knowledge and intellectual products;
- production equipment and processes;
- infrastructure of production and entrepreneurship;
- organizational technical decisions of production, administrative, commercial or other nature, which significantly improve the structure and the quality of production and (or) social sphere;
- raw materials, means of their mining and processing;
- commodity output;
- mechanism of consumer market forming and sale of commodity output.

The subjects of innovation activity may be natural persons and (or) legal entities of Ukraine, natural persons and (or) legal entities of foreign states, stateless persons, their associations, which conduct innovation activity in Ukraine and (or) attract property and intellectual values, invest own or borrowed funds in the implementation of innovation projects in Ukraine.

Pursuant to the Law, the state regulation of innovation activity is performed as follows:

- definition and support of priority directions of innovation activity on state, branch, regional and local levels;
- forming and implementation of state, branch, regional and local innovation programs;
- creation of normative legal base and economic mechanisms for support and stimulation of innovation activity;
- protection of rights and interests of the subjects of innovation activity;
- financial support of implementation of innovations projects;
- encouragement of commercial banks and other financial crediting establishments, which credit implementation of innovations projects;
- support of functioning and development of contemporary innovation

infrastructure. The subjects of innovation activity may obtain financial support for implementation of financial projects by:

- full interest-free crediting (under the conditions of inflation indexation) of priority
- innovation projects at the expense of funds of the State Budget of Ukraine, budget
- funds of the Autonomous Republic of Crimea and funds of local budgets;
- partial (up to 50%) interest-free crediting (under the conditions of inflation indexation) of priority innovation projects at the expense of funds of the State Budget of Ukraine, budget funds of the Autonomous Republic of Crimea and funds of local budgets on condition, provided that the other funds necessary for project financing were invested by the project agent and (or) other subjects of innovation activity;
- full or partial reimbursement (at the expense of funds of the State Budget of Ukraine, budget funds of the Autonomous Republic of Crimea and funds of local budgets) of interests paid by the subjects of innovation activity to commercial banks and other financial crediting establishments for crediting of innovation projects;
- granting of state guarantees to commercial banks which credit priority innovation projects;
- property insurance of implementation of innovation projects by the insurers in compliance with the Law of Ukraine "On Insurance".

The sources of financial support of innovation activity shall be:

- funds of the State Budget of Ukraine;
- funds of local budgets and funds of the Autonomous Republic of Crimea;
- own funds of specialized state and communal innovation financial crediting establishments;
- own or borrowed funds of subjects of innovation activity;
- other sources which are not prohibited by the legislation of Ukraine [3].

Universities activities from primarily regulated by the Law of Ukraine "On Higher Education". This Law hasn't questions concerning innovative activities, innovative research, but Chapter 10 of Law is devoted to research and scientific activities in the universities. In this chapter discusses the purpose and objectives of scientific and scientific-technical activities in higher education, organization and management of scientific and technical activities. Also it has links to two documents – to the Law of

Ukraine " On Higher Education " and the Law of Ukraine "On the scientific and technical activities", the second one determines legal, organizational and financial principles of operation and development of scientific and technical sphere, creates conditions for scientific and scientific-technical activities, ensuring needs of society and the state in technological development.

There are a set of laws dealing with innovations in Ukraine [1]:

- the Law of Ukraine "On the innovation"
- the Law of Ukraine «On the scientific and technical activities»
- the Law of Ukraine «On priority directions of innovative activity in Ukraine»
- the Law of Ukraine «On special regime of technological parks»
- the Law of Ukraine «On the scientific and technical information»
- the Law of Ukraine «On the scientific and technical expertise»
- the President of Ukraine Decree of 30.12.2005, № 1873/2005 "On the Establishment of the State Agency of Ukraine for Investments and Innovations"
- the Decree by Ministry of Education and Science of Ukraine "On Approval of the Procedure of innovative educational activities" (from 07.11.00, № 522)
- the Decree by Ministry of Education and Science of Ukraine «On Approval of monitoring the implementation of innovative projects in the priority areas of technological parks» (from 17.04.03, № 245).
- the Decree of the President of Ukraine from 07.11.2006 № 606/2006 "On the decision of the National Security and Defense Council of Ukraine on April 6, 2006" On the state of scientific and technological areas and measures to support innovative development of Ukraine "
- the Verkhovna Rada of Ukraine "On Compliance for the development of scientific and technological capacity and innovation activity in Ukraine" (№ 1786-VI).
- the Civil Code of Ukraine (Chapter IV "Intellectual Property")
- the Law of Ukraine «On Property»
- the Law of Ukraine «On state regulation in the field of technology transfer»

Such legal documents can be divided into two groups: base and specific. Base

acts are laws, which regulate economic activity in general, and these laws itself do not create the special favorable conditions for establishing of innovation business. Specific laws are laws and legal acts, which take into account the specific of scientific and technical and innovation activity, such normative acts which more or less expressly determine the subjects of innovation sphere. We will consider Laws of Ukraine "About general principles of creation and functioning of the special economic zones (further SEZ) in Ukraine", "About the special mode of investment and innovation activity of technological parks in Ukraine" and Statute about the order of creation and functioning of technoparks and innovation structures of other types. As Ukraine is a young state, there is not enough experience on establishing technoparks; moreover nowadays there are some confusions in legislation background of technoparks activity.

So, in the Law of Ukraine "About SEZ" technopark and technopolis are considered as such special economic zone. It automatically determines the order of their creation, essence of which is that technostructure is created by the Parliament of Ukraine after presentation of the Government, President of Ukraine or local governments. Such process of establishing, obviously, cannot assist to development of technostructure, as, at first, creation takes the heap of time; secondly, enterprises and other organizations can not support this technopark, and thirdly, technoparks in this terms are dependent on Government.

Moreover it is not the same technopark and SEZ, as there is a wide difference between them: different goals, different organizational aspects. So, the representatives of universities or scientific units are necessarily presence in the organization structure of technostructure, moreover they act leading part in the management of technopark activity; unlike SEZ, where such role belongs to public authorities and local government. The process of decision making about implementation of innovation & investment project changes according to it. Also approval of project of activity and constituent documents is carried out by Committee for support of the technoparks and other innovation structures development and has aimed to receipt of innovation status. It means actually that a definite economy subject can be a technopark structure, but formally not be legislatively acknowledged, and consequently, do not get definite preferences [3].

CHAPTER 2

Chapter 2 Conclusions

1. At universities that train bachelors for IT industry, the disciplines dealing with innovation and entrepreneurship were not found in the curricula. If the curricula contain economic subjects, then the issues of innovation and entrepreneurship take up to 0.5 -2 hours of the total class time, which is obviously not enough.

2. While training specialists for IT industry, only 2 of the 97 universities (2%) have disciplines that according to working programs fully cover the issues of innovation and entrepreneurship in the curricula for specialties 7.05010301 - Software Systems and 7.05010101 - Information Management Systems and Technologies. At other universities this issue is a part of economic courses.

3. While training masters for IT industry, only 5 of the 97 universities (5%) have disciplines that according to working programs fully cover the issues of innovation and entrepreneurship in the curricula for specialties 8.05010301 - Software Systems and 8.05010101 - Information Management Systems and Technologies. At other universities this issue is a part of economic courses.

It should be noted that 3 universities are in Kiev (the central region), 1 university is in Berdyansk (the southern region), 1 university is in Donetsk (the eastern region). At universities in the western region the disciplines dealing with innovation and entrepreneurship were not found in the curricula.

4. Only 14 universities, which makes 14.4%, deliver master training in specialty 8.18010012 "Innovation management". This is a modest figure as far as innovation training is concerned.

CHAPTER 3

Chapter 3 Conclusions based on survey study

1. In most high schools key persons does not provide adequate attention to the development of student's innovation and entrepreneurship.
2. In most universities innovative work or not involved, or it belongs to the divisions which in its core activities have nothing to do with it.
3. In most universities innovative and entrepreneurial work associated exclusively as research work under the guidance of teachers, not paying attention to the independent student's work development.
4. Ukrainian students actively and successfully participated in various innovative competitions. Among the most common: Ukrainian festival of innovative projects (www.startup.kpi.ua), Zavtra.ua, Microsoft ImagineCup, «Iron entrepreneur.»
5. Universities still paying not enough attention to the implementation of modern innovations in to the learning process (development of unified educational information space, "brainstorming", "game design", interdisciplinary ties).
6. IT students do not get enough knowledge and skills during their studies.
7. Universities effectively cooperate with both state and international well-known companies in conducting joint activities and training. Unfortunately very small number of universities has connections with innovative structures and investment funds.
8. In high school has a well organized system of intellectual property protection. At present, most universities do not have the actual mechanisms of payment of royalties for the objects of intellectual property. Very small amount of such documents that get students. Estimation of the ratio is one such document for 50 students.
9. Not all universities have completed innovative products that were created with the student's participation. In many cases innovative products creates for own university's needs. Almost none of such innovative products which is known outside of Ukraine.

10. In universities there is no mechanism helping students with startups creating. This is evidenced by the lack of information about student startups in majority of universities.

11. Creating of own companies in most cases carried out by students at their own expense without additional funding from the university or investor.

12. Total number of startups in Ukraine is very low, despite the high educational and scientific potential of its citizens.

CHAPTER 4

CHAPTER 4 Conclusions

The survey of 546 IT students of all years of study of Ukrainian partner universities, the collection and the analysis of the appropriate statistical information have been carried out within the performance of WP2 tasks concerning the research of current situation and tendencies of developing innovations in the context of Ukrainian universities. The analysis of the results of this survey allows with a high level of reliability to pose the main problems with a current state of IT expert training in Ukraine in the field of entrepreneurship and innovation and to concentrate efforts of the project on the elimination of these problems and further development of innovative potential of Ukrainian IT branch.

The survey results allow to draw the conclusions about the high entrepreneurial and innovative potential of Ukrainian IT students and the tendency of the growing experience of practical activities and innovative and entrepreneurial potential of Ukrainian IT students throughout their training at university. The analysis of the results of students' responses has shown the overwhelming importance of one of the project objectives related to the development and implementation of the relevant disciplines on innovation and entrepreneurship into the national standard of IT expert training, and this fact testifies the appropriateness of these disciplines in the educational and vocational training programs for "master" level.

Thus, the realization of the Tempus project aims by improving the level of students' practical training, developing and introducing new subjects on entrepreneurship and innovation will find the reflection in the nation-wide standards of IT master training; the development, implementation and regular support of virtual innovative space as a single network source of information, collaborative environment, mutual assistance and finding investors will highly improve the reliability of the realization of innovation potential of IT students and increase the quantity of successful start-ups, organized by university graduates, will deepen the ties between industry, universities and students and reduce response time for calls of post-industrial society.

All these facts demonstrate the critical importance of the results of this project

for the development of innovative and entrepreneurial potential of Ukrainian IT students, the development of education in Ukraine and its integration into the European educational space, and the enhance of competitiveness, innovation and knowledge-intensity of Ukrainian economy and IT industry in particular.

GENERAL RECOMMENDATIONS:

1. Each university should clearly identify the person which will be responsible for cooperation with companies in a field of innovations and entrepreneurship among IT - students.
2. Each university should establish an appropriate unit, the main features of which will be work with companies in a field of innovations and entrepreneurship among IT - students. By name and essentially the most suitable are: Center for Innovation, Commercialization and Entrepreneurship, Business Incubator Center. At the state level should be developed Standard Regulations on innovation, commercialization and entrepreneurship for Universities.
3. The best experience of leading universities should be shared among all Ukrainian Universities.
4. At the governmental level for all IT – programs should be developed an typical syllabus for courses such as: "Economics and Business", "Intellectual Property", "Technical and scientific creativity", "Basic scientific research", "Basics of Business", "Management innovative projects. "
5. Should be taken into account the innovative potential of students for Master and PhD programs.
6. Advice mechanism for the protection of intellectual property, which would have provided the payments of royalties to the students should be developed.

