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Approaches to Entrepreneurship and Leadership Development at an Engineering University

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Dr. Sanger is a professor in the School of Engineering Technology in the College of Technology of Purdue University. His focus and passion is real world, industry based, senior capstone experiences both domestically and internationally. He has successfully developed this area at Purdue and at Western Carolina University. Prior to his career in academia, Dr. Sanger had a successful 30 year career working in and with industry managing and participating in broad range technology development and commercialization.

Dr. Julia Ziyatdinova,

Julia Ziyatdinova graduated from Kazan State Pedagogical University in 1999. Her major areas of study were foreign languages and she finished her University course with honors and qualification of teacher of English and Turkish. She continued her training and obtained PhD in Education degree in 2002. The topic of her PhD study was titled "System of Character Education in the US Schools: Current State and Trends for the Development". She also received additional minor degrees in Management (1998) and Psychology (1999) in Kazan State Technological University.

Julia joined the team of Kazan State Technological University as an instructor at the Department of Foreign Languages and the School of Foreign Languages "Lingua" in 1999 and was rapidly promoted to the position of Associate Professor at the Department of Foreign Languages in 2003. Her teaching career was perfectly balanced by the experience of a translator and an interpreter. She is a well-known person at Kazan international conferences and other events for her high quality consecutive and simultaneous interpreting, such as interpreting for the Academy of Sciences of the Republic of Tatarstan.

The new milestone in Julia's career was the position of the Chair of Department of Foreign Languages for Professional Communication in 2007, when she took over all the responsibilities related to foreign language training at Kazan State Technological University. The teaching and research priorities of her department were then focused on professional and intercultural communication for students in a technical university, professional translation and creation of foreign language environment at a university.

Because of her talents and activities, Julia became one of key figures in university international life. When Kazan State Technological University obtained the new status of a National Research University and joined the list of Top 30 Russian universities, Julia was offered a position of a Head of University International Office. She took over this position in April 2011 and rapidly gathered a strong team of professionals to face the challenges of the new university status and transformed International Office into University International Affairs with two offices covering all the aspects of internationalization.

In addition to her intensive career, Julia is also the Director of Center for Intercultural Communication – a company within the University structure offering excellent language training services for students and adult employees.

Julia is the author and co-author of over 85 publications including monographs, journal articles and study guides.

Dr. Dilbar Sultanova

Doctor Dilbar Sultanova received her specialist degree in chemistry in 1997, and her PhD in economics in 2000. Both degrees were granted by Kazan National Research Technological University. Further postdoctoral studies resulted in obtaining Doctor of Economics degree, granted by St-Petersburg State University of Engineering and Economics (ENGECON) in 2009. The postdoctoral research was focused on the influence of a market structure on innovative activities of Russian chemical and petrochemical companies. The research was supported by the scholarship of the Government of the Republic of Tatarstan, Russia. Dilbar continued her career in Kazan National Research Technological University at the position of the

Chair of the Department of Economics and Management in Nizhnekamsk Chemical Engineering Institute in 2002-2012. She supervised several projects for Tatarstan chemical and petrochemical companies in the years 2002-2007 and headed the Department of Macroeconomic Research in Advanced Economic Research Center in the Academy of Sciences of the Republic of Tatarstan in the years 2007-2010. Her contribution to the projects was the supervision of their economic sections (including setting of research objectives, project supervision, economic assessment, report writing, presentations, and publishing of research discoveries). She was personally involved in the strategic planning of economic development at a regional level. All these research activities contributed to her outstanding professional recognition confirmed by the awards given by the Academy of Sciences of the Republic of Tatarstan and the Ministry of Economy of the Republic of Tatarstan.

Dr. Sultanova is currently chairing the Department of Innovations in Chemical Engineering at Kazan National Research Technological University. At this position she became the winner of the U.S. Russia Foundation grants focused on youth entrepreneurship development. Her current area of responsibilities includes development of multidisciplinary undergraduate and post graduate entrepreneurship programs at Kazan National Research Technological University, especially for Nizhnekamsk petrochemical cluster. She is also responsible for organisation of various entrepreneurship promotion events such as Best Student Business Plan competitions for the students pursuing their degrees in polymers. Dilbar is the author or co-author of 5 textbooks, and over 50 research papers. She is currently the member of the Dissertation Council in Economics at Kazan National Research Technological University.

Approaches to Entrepreneurship and Leadership Development at an Engineering University

Abstract

American universities run efficient projects on development of innovative entrepreneurship for engineering programs. A Russian technological university has adopted a program on commercializing the innovations for engineering PhD students. The paper analyzes the changes in entrepreneurial motivation of PhD students that undergo this course.

The growth of competition in the world markets and intensification of economic activities create entrepreneurial risks for market agents. Despite considerable investments into the innovative infrastructure, the Gross Domestic Product (GDP) growth rates that arise from innovative products are below desirable expectations. Today, the economically active part of the Russian population prefers to derive a steady income as contract employees without any entrepreneurial risks. Investments into construction of industrial parks and other innovative infrastructure are justified mostly if the market residents with competitive products are available. However, low innovative activity, especially in the regions, sets certain doubts on the expectations that these infrastructural objects will be filled with small innovative businesses.

Under these circumstances, educational institutions become more important as they can provide regional production clusters, industrial and technical parks with the specialists who possess innovative skills and an economically-oriented mindset. Foreign experience of regional development reveals that many large educational institutions perform the function of innovative cluster centers and form groups of innovative companies involved into both innovative production and social entrepreneurship[1].

The universities run engineering projects in public services. Since 2001, engineering program students from a university in the United States of America have been developing program products for nonprofit sector[2].

The strategic plans of engineering programs at certain universities are aimed at intensification of innovations, development of entrepreneurship and leadership[3].

In practice, the idea of building the knowledge in innovative entrepreneurship along with the leadership motivation that directs students towards organization of start-ups, becomes more popular among universities[4].

In order to increase the efficiency of innovative entrepreneurial programs, universities prepare engineering entrepreneurship courses for students with different training level and interests towards innovative ideas[5].

In this respect it is interesting to learn from the experience of regional universities in the USA, Great Britain, and Germany. In this study, we considered the experience of a US university with innovative entrepreneurship infrastructure which was used as the site for start-ups launched by students and faculty who are interested in commercializing their innovative ideas[6].

Entrepreneurial training for the population eager to launch their own businesses is a widespread practice in the US universities. The university under consideration implements several academic programs both for students and young faculty. The entrepreneurship development program for engineering students (not majoring in Economics) proved to be one of the most effective among such initiatives[7].

The university's entrepreneurship development center invited MBA students to join contracting activities. Students gain practical experience as economists and market experts in the start-ups located in its innovative park. This center organizes training courses for MBA students and PhD students twice a year. This course is dedicated to commercialization of innovations on their way from a laboratory to the market, and is also focused on the innovative entrepreneurship principles.

In 2013, the representatives of a Russian engineering university visited the university in the USA for a short-time training program. The visit has resulted in the development of a new training course at the Russian university. This course is aimed at commercialization of research and foundations of fundraising. The training solves the problem of intensifying innovative and entrepreneurial activities among PhD students of engineering programs[8]. The course includes lectures and practicums in economic estimation of investments, business planning and taxation of small innovative companies, fundraising mechanisms for project implementation, and administration of innovative projects. Annually 150 PhD students attend the course. To increase its efficiency, a special survey for the participants has been performed prior and after the innovative entrepreneurship course.

The purpose of research was to study the motivation toward implementation of entrepreneurial projects and commercializing research results among PhD students and young scientists of engineering programs.

In order to achieve the survey goal, the sets of questions were developed to reveal the following:

1. The motivation of PhD students to set up their own business (from 0 to 100 points);
2. PhD student vision on the existing and possible barriers to set up their businesses;
3. Necessary knowledge to start entrepreneurial activities.

150 PhD students participated in the survey prior and after attending the course 'Commercialization of Research: Foundations of Fundraising'. It demonstrated the following statistics:

1. 36% of the survey participants with low level of interest in setting up their own business (0 to 60 points) did not change their mind after the course.
2. 41% of the survey participants had initial average interest to entrepreneurship development (61 to 80 points), this figure changed to 22% after the course.
3. The percentage of the survey participants with a high motivation to entrepreneurship (81 to 100 points) changed from 23% before the course to 42% after the course.

Thus, the proposed training course increased the motivation of the students with a certain interest to business, and did not affect the initially indifferent audience.

The results of this research have shown that the participants changed their opinion on the barriers in setting up a personal business: before the course, 12% of the survey participants considered high taxes to be an important barrier, after the course, this figure changed to 8%. Another obstacle is that the intensive competition decreased the number of opinions from 14% initially to 6% of the survey participants after the course. Psychological factors, such as uncertainty and fear were considered important by 12% of the students before the course and only 6% after the course.

The absence of a start-up budget was initially believed to be the most important barrier by 30% of the PhD students; this figure, however, changed to 17% after the course.

At the same time, a number of barriers received a higher percentage of opinions after the course, among them the lack of a good business idea (from 2% to 6%), administrative barriers (from 4% to 14%), zero business experience (from 2% to 5%), and poor knowledge in Economics (from 5% to16%).

As a result, some students indicated new barriers they found important: economic downturn and lack of a qualified team to commercialize and innovate. Therefore, these students gained a more systematic vision on commercialization of research results.

Thus, we think it is important for this innovative entrepreneurship course to consider the initial level of student motivation towards research commercialization. The survey confirmed that the education could be efficient when highly motivated engineering students were enrolled. Moreover, this group of students was the one to demonstrate insufficient expertise in Economics as the main barrier for a start-up. The obtained results make it possible to conclude that the experience of one of the American universities in differentiating the programs of commercializing the innovations in compliance with motivation of PhD students should be taken into account.

The graduates of the above mentioned training program contribute to the development of the innovative infrastructure in the region where the described above engineering university is located. The graduates have an opportunity to implement their ideas at a special economic zone with the reduced taxation for international and local startups and a lower cost of residence which is located in the same region as the university is. Another project which demands such graduates are regional technical parks in chemical engineering, petrochemistry, and IT.

Thus, entrepreneurship and leadership development for engineering PhD students is primarily important for a Russian university today, in post-oil economy, when the university has to teach its students how to succeed in a global environment[9] by developing competitive technological innovations for the world market.

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