

Session # 2560**Teaching Entrepreneurship to Engineering Students**

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Abstract

In 2003 the Technical University of Moldova successfully piloted an ambitious entrepreneurship program for a group of its students, consisting of formal instruction and an internship with a successful Moldovan entrepreneur. This paper describes the project and the place of the program within the framework of the new International Center for Entrepreneurship in Moldova. The authors present this report with reference to the challenges of teaching entrepreneurship in a former soviet socialist republic, one which today is struggling to find its feet in the fast moving global economy.

Introduction: The Republic of Moldova

Entrepreneurship education has taken on a new role in the past several years, as the international development community has begun to realize its importance in rebuilding and reorienting countries whose economies need to be recast, revised, rebuilt or revitalized. While large scale, globally financed projects are often required to rebuild a country's essential infrastructure, individuals must begin to believe that there is a place for them in the new economy, and that they have the capacity and skills to control a part of their destiny. Capacity building requires both individual and collective initiative if it is to succeed and result in real economic benefits. Teaching people how to be entrepreneurial within the context of their own evolving economies is a working link between large-scale international efforts and the destiny of the individual.

The Republic of Moldova is located in the Black Sea region of Eastern Europe, north of Turkey, east of Romania, sharing a border with Ukraine. Today 4.5 million Moldovans live in an area slightly larger than the US state of Maryland, 80 % of them with income below the poverty line, and most of them in rural areas. The predominant language is Romanian. The second traditionally used language is Russian.

At the end of World War II, the land that is today Moldova became the Soviet Socialist Republic of Moldova, but on August 27, 1991, it gained its independence from the Soviet Union. Since independence, Moldova quickly moved to reform its economy, privatizing its industries, seeking to enter into the global markets, and achieving some success. However, Moldova's economic rebuilding was

slowed considerably by the sinking of Russia's economy, with which it was still closely tied, and the election in 2001 of a Communist parliament continues to weaken Moldova's prospects for attracting foreign investors.

Higher education in Moldova consists of a mature set of colleges and universities. The Technical University of Moldova, founded in 1964 and located in the capital, Chisinau, is the only technical university in the country. The university enrolls 14,000 students in nine faculties, taught by around 800 teaching staff. The TUM offers undergraduate and graduate degrees, and is deeply involved in scientific and technical research. The TUM has administrative responsibility for a network of technical colleges throughout the country, and thus functions somewhat as a multi-campus educational system. The TUM is also a leader in the Black Sea University Network, an organization of over one hundred universities located in eleven countries clustered around the Black Sea and dedicated to "peace strengthening, conflict prevention, early warning institutions, governance improvement, instructional technology and learning, economy restructuring, joining the regional and global economic circuit, mentality change regarding modernization, tolerance and the capacity to work in joint projects, good neighbourliness and regional partnerships."

Much of what we take for granted when we in the US discuss entrepreneurship education is not yet present in Moldova. A supportive infrastructure of contract law, taxation, intellectual property rights, communications systems, licensure, banking and finance, transportation, are still in various stages of development. So Moldova faces enormous internal and external impediments when its attempts to plunge into the often chaotic world of globalization, where even mature industries in economic powerhouses such as the US and the European Union are now struggling to thrive in the new world economic order.

First steps and funding

During the visit of TUM Vice Rector Dr. Tiginyanu to the University of Michigan in December 2000 – June 2001 (supported by the US National Research Council) he realized how deeply the entrepreneurial spirit is imbedded in the US society. "I discovered a new mentality, a new way of thinking, a new world . . .," Dr. Tiginyanu reported. In May 2001, Dr. Tiginyanu met with Dr. Bethany Oberst from James Madison University, with whom he had been in close collaboration since 1998, and Dr. Russel Jones from World Expertise LLC. The three discussed the possibility of offering a course on entrepreneurship at the Technical University of Moldova. The team researched several possibilities and came to the conclusion that the most appropriate step would be to start with a pilot project. In autumn, 2002, Dr. Tiginyanu submitted a project to the Soros Foundation Moldova. That project received funding for the design and implementation of a pilot entrepreneurship course at the Technical University of Moldova to be offered as an extra-curricular program. In the spring of 2003 another proposal was submitted to the Eurasia Foundation which obtained funds for the creation of the International Center for Entrepreneurship in Moldova. The staff of the Center work at space donated by the Technical University of Moldova and consist of eleven specialists, including five lecturers, a course coordinator, managers, a web-site programmer, etc.

Selection of faculty and students

The first challenge was to identify professors with international experience, and experienced specialists in economics to teach in the pilot program.

- The Project Director, Prof. Dr.Sc. Ion Tiginyanu, has worked for two years at the Technical University in Darmstadt (Germany) collaborating with several microelectronic companies from Europe, and for six months at the University of Michigan (USA) where he learned about the foundation of small enterprises by US scientific researchers. He has been responsible for an international project in the field of nanotechnologies financed by the NATO Scientific Division (1997-2000), as well as many others.. Now he is the president of the Commission of Experts on International Collaboration at the Supreme Council for Research and Technological Development of the Republic of Moldova.
- Prof. Dr. Victor Sontea, Dean of the Faculty of Computers, Informatics and Microelectronics at the Technical University of Moldova, is responsible for the entrepreneurial inventory, tracking former scientists and engineers who might want to learn entrepreneurial skills as a way of transitioning out of the old directed economy. He has been vice manager of the TEMPUS/Tacis JEP-10230 on the implementation of Master's studies at the Technical University of Moldova, designed the pilot modules on "enterprise management" and "the business plan," and he has served as the manager of a joint research project in Romania.
- Professor Rafael Ciloci, doctor in economic sciences and lecturer at the Technical University of Moldova, is responsible for the management of the entrepreneurship course. He has participated in the TACIS Program ("Promotion of Higher Economic Education in the Republic of Moldova") and has done research at the Economic University of Athens (Greece). He has been responsible, in the framework of the TEMPUS/Tacis JEP-10230, for the creation of the marketing and management methods modules. He designed the marketing module for the MBA at the Technical University, financed by the TACIS program.
- Dr. Elena Chislari, an economist who founded the Moldova-US Center for Private Initiative, Dr. Marina Coban, an economist from the Academy of Economic Studies, and Dr. Svetlana Gorobievschi, a faculty member from the Technical University of Moldova, all joined the team.
- The project team worked in close collaboration with Dr. Bethany Oberst, Dean of the College of Humanities and Social Sciences at the United Arab Emirates University (UAE) and Dr. Russel C. Jones, P.E., President of the Standing Committee on Capacity Building of the World Federation of Engineering Organizations.

Students enrolled in advanced courses in the Faculty of Computers, Informatics and Microelectronics were asked to express interest in participating in the pilot program, which would be taken as an "overload," in addition to their regular courses. A test was administered to properly select the initial class of thirty-one students from among the seventy-two who wanted to take part. It was felt important to investigate student abilities such as intellectual level and organizational and leadership abilities. University grades were not a significant consideration: preference was given to English-speaking students, those who looked convincing when describing their plans for future private business.

The selection of internship sites

From the first, internships were designed to be an integral part of the pilot program. The internship constituted the final stage of the educational process, following the formal instructional program organized for the spring of 2003. The objectives of the internship were to permit students to synthesize

the benefits of the entrepreneurial program, to evaluate their new knowledge and skills, and to create the foundation for the development of their own business.

For placement sites both large and small enterprises were chosen. The managers of many SMEs were contacted and those who agreed to personally supervise the work of students during the internship were selected. At the end of their internships, the students prepared a report. Some students even succeeded in drafting a business plan for themselves during the internship.

The Center arranged the placement of students with these successful Moldovan entrepreneurs. The students worked for a minimum of twenty hours per week in the position of manager (under a supervisor's control) for a period of two months. Prior to the intern's arrival, the supervisor was trained how to engage the students in work assignments that were not only productive for the company, but also important for student learning.

The Curriculum

All students followed the same curriculum in the spring semester:

- How to set up a private enterprise.
- The legal basis for small and medium businesses
- Account balance. Cash flow and accounting of income and expenses.
- Financial indicators. Budget and cost calculation.
- Notions about the account evidence.
- Human resource management.
- Basics of marketing
- Management under conditions of transition.
- Business plans

The International Workshop on Entrepreneurship Education

In order to recognize the accomplishments of the students who successfully completed the pilot program, to attract favorable public opinion to the new International Center, and to set the tone for future activities, in the fall of both 2004 and 2004 an international workshop on entrepreneurship was organized at the Technical University of Moldova. The workshop was attended by advanced students from across the several institutions of higher education in Moldova, and Moldovan faculty members from across the country. In addition, attendees included productive research and development people interested in bringing their ideas to market quickly. Finally, the entrepreneurs who had served as mentors to the students attended as well.

Program feedback and modification

When asked for feedback, most students said that the entrepreneurship course and their subsequent internship were very useful. Some of them recommended that the course be enlarged. Also, it seems that the internships at small companies were more successful since the students observed flexibility, orientation to innovations, etc. All students found attendance at the closing International Workshop on Entrepreneurship Education very useful. They learned about how entrepreneurship is promoted in other

countries, in particular in the US and Germany, obtained information about opportunities to do business in Moldova and abroad.

The pilot program was a good experience for professors, as well. Some of them, in particular, took note of the reactions of students during the 1st semester and modified the content of lectures for the 2nd semester. Some professors concluded that the course should be added into the regular university curriculum. And finally, the faculty attended the International Workshop on Entrepreneurship Education and found it useful, in particular the contribution of foreign specialists.

The entrepreneurs themselves gained useful experience from serving as mentors, although some of them mentioned that July-August is not the best time for internships. The managers of small enterprises expressed their interest in hiring some students after their graduation from the university.

Other improvements and developments which came from this pilot program include the following:

- New sources of financial support will be sought.
- Three new modules will be added to the program: Managing a small enterprise; Quality management; and Intellectual property.
- The program will be expanded to include participation of students and teaching staff from the following faculties: Faculty of Computers, Informatics and Microelectronics, Faculty of Civil Engineering, Faculty of Urban Planning and Architecture, Faculty of Textile Industry, and Faculty of Radio-Electronics and Telecommunications.
- To ensure a better selection of students certain questionnaires and tests have been designed to allow the faculty to determine the intellectual level, temperament and individual characteristics of applicants, as well as their organizational and leadership abilities. Priority will be given to socially active applicants, oriented to self-achievement and success.
- The course will end with a graduation exam.

The International Center for Entrepreneurship of Moldova

The ultimate goal of the projects supported financially by the Soros Foundation Moldova and the Eurasia Foundation is the creation an International Center for Entrepreneurship in the Republic of Moldova and the development of an entrepreneurial spirit in Moldovan society. With Eurasia Foundation support, plans call for the following: an elective course entitled “Organization and administration of the private business” added into the curriculum at the Technical University of Moldova and its affiliated technical colleges throughout the country; the organization of managerial internships; and the creation of opportunities for cooperation with partners from the European Union, the United States, and other countries.

Programs and activities to be run under the umbrella of the International Center for Entrepreneurship include the following:

- to offer training courses for graduate students of the Technical University, in order to facilitate their involvement in SME development;
- to organize two-month internships for graduates;
- to identify active researchers and entrepreneurs in Moldova and to create a data base accessible via the Internet;

The International Center for Entrepreneurship has several dimensions:

- to serve established and potential entrepreneurs by providing them with access to the most up-to-date information to help keep their products competitive in the world markets;
- to serve to develop Moldovan faculty expertise in entrepreneurship, so that future generations of students will be appropriately educated;
- to serve Moldovan students by offering instruction and experience in business practices that complement their engineering studies;
- to serve Moldovan researchers by connecting them with potential markets in Moldova and around the world, and helping them obtain funds for business development and expansion;
- to serve the City of Chisinau and regional centers by partnering with them in technology transfer;

There is an additional important issue related to the regional impact of the new International Center for Entrepreneurship. The National Secretariat of the Moldovan branch of the Black Sea University Network is located at the Technical University of Moldova, and starting in October 2004, the BSUN will be under the leadership of Dr. Ion Bostan, Rector of the TUM. At the October meeting of the rectors of the almost 200 member institutions of the BSUN, it was agreed that the entrepreneurship model should be offered to other countries of the Black Sea region such as Ukraine, Russia, Georgia, Armenia, Azerbaijan, etc. Using some structured workshops and the BSUN information infrastructure, the administration of the International Center for Entrepreneurship will make available to representatives of those countries the outcomes of its activities and disseminate information and expertise.

Summary and conclusions

With vital support from the Soros Foundation Moldova and the Eurasia Foundation, the International Center for Entrepreneurship at the Technical University of Moldova has succeeded in establishing a viable education program for university students, is making progress toward institutionalizing entrepreneurship education as a regular part of the TUM curriculum, has created productive ties with local industries and successful Moldovan entrepreneurs, and is taking steps to reinvigorate scientists, engineers and researchers whose livelihood was destroyed in the political and economic aftermath of the breakdown of the Soviet Union. In its comprehensive design and strategic collaborations, the Center can serve as a model for other universities which seek to identify their role in their country's economic growth and recovery.

The notion of teaching entrepreneurship in economies emerging from the former Soviet Union is new. For more information, readers are referred to the websites of the Technical University of Moldova (<http://www.utm.md>) and the Black Sea Universities Network (<http://www.bsunonline.org>). The National Collegiate Inventors and Innovators Alliance (<http://www.nciia.org>) is one of the leaders in promoting such programs in the United States and afforded the authors an opportunity to address its members on this topic at its 2004 meeting.

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ION TIGINYANU is Professor and Vice Rector at the Technical University of Moldova, in Chisinau. His responsibilities include international studies, entrepreneurship programs, and scientific research leadership.