

Cross-disciplinary methodology for development of entrepreneurial skills: the case of Riga Technical University

Anita Straujuma

Institute of Business Engineering and Management,
Riga Technical University
Riga, Latvia

Elīna Gaile-Sarkane

Institute of Business Engineering and Management,
Riga Technical University
Riga, Latvia

Abstract — The impact of introducing and testing of cross-disciplinary methodology for development of entrepreneurial skills within study process becomes more and more important. This paper describes cross-disciplinary methodology and main results of the testing phase.

Keywords — entrepreneurship education, cross-disciplinary methodology, skill development

I. INTRODUCTION

Many scientists have identified the importance of cross-disciplinary approach in education. Some of scientists stress that we even do live in a cross-disciplinary age [1]. A lot of researches are devoted to cross-disciplinary collaboration, culture, learning, experiments, programs etc., but just a few of them towards cross-disciplinary methodology of the entrepreneurial education.

When higher education institutions deal with entrepreneurship education often in reality it becomes cross-disciplinary. There are a lot of different definitions of entrepreneurship, but most of them are about development of a business from the ground up, developing of an idea and turning it into business, about getting profit from this idea.

Entrepreneurship education usually is oriented towards ensuring entrepreneurial success by providing students with motivation, knowledge and skills needed for particular field of business, but today's innovative and technologically oriented society requires new approaches to cross-disciplinary education.

II. ON CROSS-DISCIPLINARY METHODOLOGY IN EDUCATION AND HOLISTIC APPROACH

Cross-disciplinary approach in education is described by many authors like Koke, Lace, Oganisjana, [2] who in their researches stress that entrepreneurship is a dynamic system of the components determined in mixed method research. In this article elaborated holistic functional-structural model of entrepreneurship illustrates that entrepreneurship can be developed holistically as a system when students identify, generate and realize opportunities into new personal, social or economic values not only in the context of specialized

entrepreneurial disciplines, but within a wide range of disciplines in the unity of theory and practice [2].

Previous research by Caune, Lapiņa, Gaile-Sarkane, Ozoliņš, Borkus [3] on managers competences and capabilities confirmed specific competencies that are the most important for successful management of a company. These competences were grouped in four groups: professional, social and communication, personal and responsibility, leadership and innovative and learning competencies, with detailed description of each [4]. Very good analysis of competences that are essential for new entrepreneurs is described by E. Frank, in "The UK's Management Charter Initiative: the first three years" [6].

In order to achieve better results in development of methodology, there are many other factors that are important, for example – strategic orientation, strategic background, voice of customer, possibility to apply integrated management systems etc. [4,5,6].

Cross-disciplinary methodology was based on:

- Open innovation concept developed by Chesbrouh in 2003;
- the value model;
- holistic functional-structural model;
- skills and competences that should be developed during the study process.

For testing purposes of developed methodology, step by step approach to testing process form successfully completed Leonardo Da Vinci Innovation Transfer project Nr. LLP-LdV-ToI-12-CY-1671210 „YOUNG LEADERS: Developing and enhancing leadership skills for young managers in times of crisis: an innovative training package for European young professionals, 2012.-2014. were taken. Project results assured that methodology can be tested within study process.

A. Open innovation concept

Open innovation concept has been discussed since beginning of the 21st century and becomes very attractive in many areas. Firstly it was announced by Henry W. Chesbrough in 2003 and up to now many scientists have discussed open

innovation paradigm and concepts in their researches. Eelko K.R.E. Huizingh in his article „Open innovation: State of the art and future perspectives” has mentioned „Many open innovation studies focus on specific industries, such as consumer electronics (Christensen et al., 2005), food (Sarkar and Costa, 2008), financial services (Fasnacht, 2009), automotive (Ili et al., 2010), and biotechnology (Fetterhoff and Voelkel, 2006; Bianchi et al., this issue). Other studies confirmed that there are minor differences in adoption rate between industries (e.g., Chesbrough and Crowther, 2006; Keupp and Gassmann, 2009; Lichtenthaler, 2008; Lichtenthaler and Ernst, 2009; Van de Vrande et al., 2009), whereas Gassman (2006) suggests the nuclear and military industries as typical examples of closed innovation industries” [9]. There are a lot of different researches published on this topic in manufacturing, service industries, education and other areas.

Basically open innovation is defined as the use of knowledge that exists inside and outside of organizations and can increase or create significant value for innovation, usually by exploiting ideas, intellectual property and technologies that drive a company towards better business model than competitors have [8].

In his book “Open innovation: the new imperative for creating and profiting from technology” Henry W. Chesbrough claims: “If you were trying to develop mechanisms to access useful knowledge today, you would start by surveying the surrounding knowledge landscape. The factors that promote knowledge diffusion create new opportunities. Knowledge diffusion rewards focused execution: You need not invent the most new knowledge or the best new knowledge to win. Instead, you win by making the best use of internal and external knowledge in a timely way, creatively combining that knowledge in new and different ways to create new products or services.” [8].

Trott and Hartmann claim: „If open innovation is in essence nothing new, why then has this concept been so readily embraced by firms and the R&D community? Much of this surely is due to its simplicity (it is appealing because it is simple and retains the linear notion of science to marketplace) and the partial deception which was created by describing something which is undoubtedly true in itself (the limitations of closed innovation principles), but false in conveying the wrong impression that firms today still follow these principles.” [10]

B. The value model

The value model – value for customers’ creation approach described by Lindstedt, Burenius [7] is a holistic model on theory of how to create customer value in products (including systems and services). The model explains how customer value works and how customer value is made. The model describes entrepreneurial approach of developing an idea and turning it into value that can be turned into a profitable business. The model deals with agile product development approach in a multi project environment [7].

Value is a fundamental term in management and is used in several meanings. One of them, immaterial values, Schwartz defines as “desirable transsituational goals, varying in importance, that serve as guiding principles in the life of a person or other social entity... Values are the criteria people use to evaluate actions, people, and events” [11], [12]. Stakeholders’ values play important role in different stages of product development. Each group of stakeholders have dominant values that influence their decisions, interests and actions. Also perception of products’ material value. At each stage of the process, it is essential for all stakeholders to be aware of the value divergence and have an internal agreement on it to ensure most effective results.

C. Holistic functional-structural model

Holistic functional-structural model describes entrepreneurship as a holistic system where participants identify, generate and realize opportunities into new personal, social or economic values. Model emphasizes the unity of theory and practice. The successful results are ensured by personal interest and involvement in the process. The model suggests active involvement of students in the process of product development in all phases of the course where professor performs as a coach [2].

D. Methodology for cross-disciplinary education

Inspired by thoughts of Chesbrough, simplicity of open innovation concept, holistic functional-structural model of entrepreneurship, and value creation model that is essential for delivering value to customers, group or Riga Technical university researchers have developed methodology for cross-disciplinary education.

Methodology consists of 8 different steps and matrix-type structure for competence development. Main steps are following:

- 1) Idea/ problem development
- 2) Identification of customer needs;
- 3) Identification of potential functions of the product (system or service);
- 4) Development of concepts;
- 5) Analysing of concepts;
- 6) Prototyping and testing;
- 7) Development of sales plan;
- 8) Economic justification of the project.

Ideas from Lindstedt and Burenius value model have been adapted for graphical description of cross-disciplinary methodology for development of entrepreneurial and innovation skills.

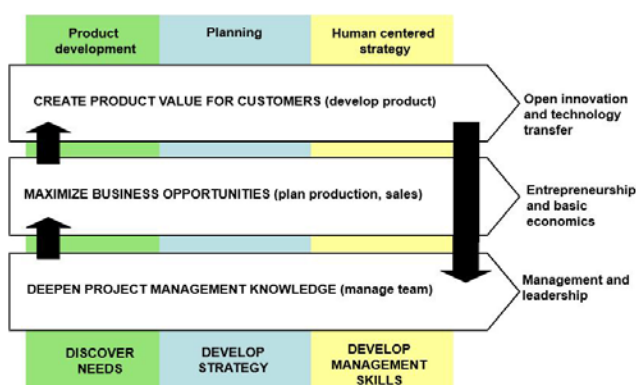


Figure 1 Methodological Model of Cross-Disciplinary Methodology in Education and Holistic Approach in study process.

Methodology was tested in academic year 2014./2015. in Riga Technical University, faculty of Engineering Economics. For testing purposes two groups of 30 students in each were involved. Both groups were part time postgraduate students, typically employed. Testing phase was done within one study semester.

III. TESTING OF THE METHODOLOGY

Survey was performed on a representative sample – 57 students who studied Entrepreneurial and Innovation Skill Development course (thereinafter – ESID). Test results have good internal consistency – Cronbach’s alpha 0,83.

Students were tested with 360 degree test before starting ESID course. Students had to rate their own skills, scale 1 to 5 (self-assessment). Scores above 4 are considered strengths, 3-3.5 are considered moderate and can be further improved. Scores below 2.5 are considered weaknesses and need improvement. Test uses [4] classification of management skills:

- Self-management skills (self-confidence, optimism, trustworthiness);
- Business management skills (making analytical decision, strategic thinking and planning, creative problem solving);
- People management skills (collaboration and team work, interpersonal communication, building networks and connections, motivating others).

Same test was given to student’s friend, manager and colleague to rate the skills of particular student – i.e. each person has three external evaluations and as external test result is used mean of all three results.

Test results show that for all students self-evaluation is always lower than external evaluation except male students’ self-evaluation of interpersonal communication. There are certain tendencies depending on the gender of the student. Men rate themselves quite close to external evaluation, women are more critical of themselves. Men rate themselves higher than

women in all questions. Women rate themselves lower than 4 in all questions. Also employers and friends evaluate men higher than women in all positions except building networks and connections. Though external rating of women is close to the one of men except strategic thinking and planning where women are rated significantly lower.



Figure 2 Variety of self-management skills rating before ESID course

Both, men and women, give highest rating to self-confidence. And all students rate highest following skills: self-confidence, interpersonal communication, creative problem solving, motivating others. External evaluation gives highest rating of following skills: self-confidence, motivating others, trustworthiness, collaboration and teamwork. Self-evaluation does not match with external evaluation except for self-confidence.



Figure 3 Business management skills before ESID course

Both genders rate low following skills (these skills will be trained in ESID course): building networks and connections (team management), strategic thinking and planning (enterprise

economics), making analytical decisions (enterprise economics), optimism. Colleagues and friends rate low following skills: building networks and connections, strategic thinking and planning, making analytical decisions, interpersonal communication. Self-evaluation coincides with external evaluation.

Largest gap between self-evaluation and external evaluation (external evaluation is higher) is for following skills: trustworthiness, strategic thinking and planning, building networks and connections.

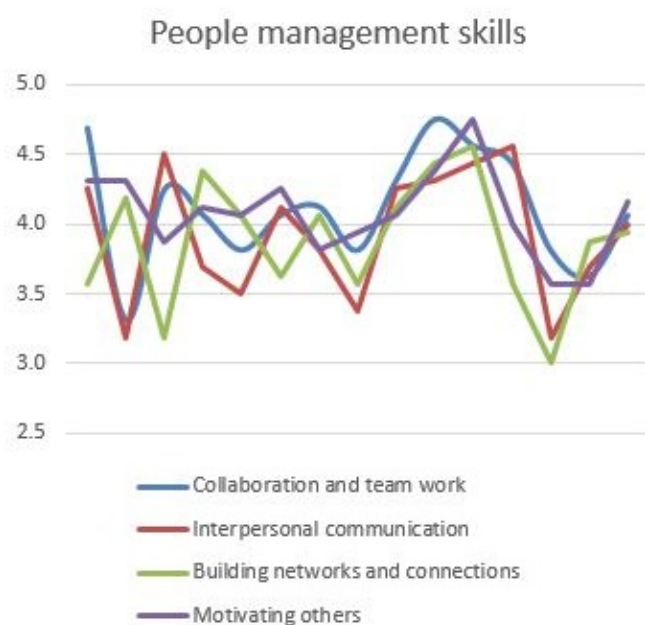


Figure 4 Evaluation of people management skills before ESD course.

After finishing ESID course students were tested again by asking them to evaluate themselves by answering same questions as before starting the course. From 57 students after finishing this testing module we received 52 filled questionnaires.

External evaluation of students was not performed since the course lasts for one semester. Students' skills and behavior may change at the end of semester, close to the moment of testing. Even if students' friends, managers and colleagues would have noticed changes in students' skills and behavior, they might not recognize it or might not perceive it as stable results. Thus, as a future work, 360 degree test will be performed one year after students' finished the course and the results will contain also external evaluation and describe how permanent are the new skills.

Self-evaluation showed improvement of results in most of the areas. Out of all tested self-management skills most improved were self-confidence and optimism. Trustworthiness had not changed.

Business management skills need long-term practice and experience. Test results show that skills "making analytical decision" and "strategic thinking and planning" have minor

improvement. On contrary self-evaluation of "creative problem solving" improves significantly since methodology gives both – theoretical basis and practice of different creativity techniques throughout the course.

Most improving people management skills are "collaboration and teamwork" and "interpersonal communication" since both are practiced constantly within the group of course participants. Skill "building networks and connections" improve although less than the other two. This skill improves because students apply it within the group but for significant improvement they need long-term practice outside the group boundaries. Skill "motivating others" improves for few students since it depends on the person's role in the group or the company. Team leaders train the skill while others stay on the same level.

Feedback from participants in testing methodology was positive. Most of the participants agreed that participation in ESID course has broadened their knowledge on the topics covered, improved their skills, increased their competitiveness in the business environment, helped them to adopt new and modern ways of communication, increased their self-confidence and stimulated to recognize their strength and weaknesses.

IV. CONCLUSIONS

The Cross-Disciplinary Methodology for Entrepreneurial and Innovation Skill Development, based on open innovation concept developed, the value model and holistic functional-structural model has good success in first stages of its' testing. Results approved that main skills and competences can be developed by applying this methodology in education process of higher education institutions. At the same time there are a lot of fundamental points for improving, testing and verifying in the future.

First test results confirmed that methodology should be modified for graduate students since they have no work experience and thus need to improve basic skills. Differences in skill development also can be tested in multicultural environment.

Holistic approach requires change of didactic approach starting from teaching theory issues and content of teaching up to organizational forms and methods, that should be changed towards coaching.

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