SIMULATION-BASED E-LEARNING FRAMEWORK FOR ENTREPRENEURSHIP EDUCATION AND TRAINING

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Abstract

The paper proposes an e-Learning framework in entrepreneurship. The framework has three main components, for identification the business opportunities, for developing business scenarios and for risk analysis. A common database assures the components integration. The main components of this framework are already available; the main challenging for those interested in using them is to design an integrated flow of activities, adapted with their curricula and other educational settings.

The originality of the approach is that the framework is domain independent and uses advanced IT technologies, such as recommendation algorithms, agent-based simulations and extended graphical support. Using this e-learning framework, the students can learn how to choose relevant characteristics/aspects for a type of business and how important is each of them according specific criteria; how to set realistic values for different characteristics/aspects of the business, how a business scenario can be changed in order to fit better to the business context and how to assess/evaluate business scenarios.

Keywords: e-learning, entrepreneurial, competences, software agents, simulations, risk analysis, business opportunities, business scenarios.

JEL Classification: L26, M13, C15

Introduction

Entrepreneurship is widely considered a major source of innovation, job creation and growth (Harper, 2003; Barth, Yago and Zeidman, 2006; Vicens and Grullón, 2011; Ragalie, Neagu, Muscalu, Russu, Badileanu, Bulearca, Sima, Dospinescu, Fistung, and Neacsu

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Dalu, 2007). According to Amway Global Entrepreneurship Report (A.G.E.R., 2013), even if there is great potential for self-employment everywhere, actual self-employment rates remain at a considerable low level, the main obstacle being the uncertain economic situation, which induce the "fear of failure". The conceptual framework developed by Global Entrepreneurship Monitor (Amorós and Bosma, 2014) includes the following key entrepreneurial conditions: the availability of financial resources, the presence and quality of governmental programs, entrepreneurship education (the extent to which competences for creating or managing business are developed by the education and training system at all levels), R&D transfer (the extent to which national research and development will lead to new commercial opportunities and is available to SMEs), commercial and legal Infrastructure (the presence of property rights, commercial, accounting and other legal and assessment services and institutions that support or promote SMEs), market entry regulation (for assuring market openness and dynamics), physical infrastructure and cultural and social norms.

The paper discusses the role of education and training in strengthening entrepreneurship and the challenges for entrepreneurship teaching. After the identification of the teaching characteristics and methods, the authors propose an e-learning framework for entrepreneurship education and training. The main components of this framework are already available; the main challenging for those interested in using them is to design an integrated flow of activities, adapted with their curricula and other educational settings.

1. The Role of the Entrepreneurship Education and Training

The entrepreneurial education was identified as being one of the main determinants of the entrepreneurship level in a specific country (Audretsch, Thurik, Verheul and Wennekers, 2002), (Valerio, Parton and Robb, 2014). According to European Union (2012), the entrepreneurship education has a positive impact on the entrepreneurial mindset of young people, on their intentions towards entrepreneurship, their employability and finally on their role in society and economy. The same study concludes that the objectives of entrepreneurship education should be the improvement of the young people's entrepreneurial competences, and increasing the role of entrepreneurs in the economy and society at large. European Commission launched several official documents, such as *Entrepreneurship 2020 Action Plan* and *Rethinking Education Communication*, to emphasize the need of embedding the entrepreneurial learning in all levels and sectors of education, including the non-formal one. Before leaving compulsory education, all young people should benefit from a practical entrepreneurial experience (EU, 2013).

Although the need for entrepreneurial education is growing, there are still many obstacles to its development. There is still a considerable controversy on the competences repository which should be taught in Entrepreneurship programs and courses and the extent to which they are really teachable. Entrepreneurship competences are often considered as being only a subset of managerial competences and, for this reason, extensive managerial subjects are included in the entrepreneurial educational programs. But, entrepreneurship can occur outside the corporate sphere, making the managerial competences as being in some context less important. Even if there are common elements, specific entrepreneurial competencies can be still identified and firstly considered by every educational program or course on entrepreneurship. Caird (1992) identified as the most important entrepreneurship competences the communication and career skills, knowledge, attitudes and personality

variables. Gibb (1998) considers that entrepreneurial skills include intuitive decision making, creative problem solving, managing interdependency on a *know-who* basis, ability to conclude deals, strategic thinking, project management, time management, persuasion, selling, negotiation and motivating people by setting an example. The DUBS model (Cotton and Gibb, 1992) structures the entrepreneurial competences into four dimensions: ideas (the corresponding competences are: opportunity seeking, investigation and creativity), planning (it includes planning and problem solving), doing (it refers to the risk taking, autonomy, commitment, persistence and initiative) and self-awareness (it encompasses the self-awareness, self-confidence, initiative and motivation). Van der Kuip and Verheul (2003) define the following types of entrepreneurial competences: achievement motivation, need for autonomy, creativity, initiative, risk, opportunity seeking or recognition, goal setting, self-awareness, internal locus of control and persistence.

The study on the effects and impact of entrepreneurship programmes in higher education, which was undertaken by the Entrepreneurship Unit of the European Commission, the Directorate-General for Enterprise and Industry, in 2012 (European Union, 2012), has structured the entrepreneurial competences into the following categories: attitude ***(s***ense of initiative, risk propensity, self-efficacy, need for achievement, structural behaviour), skills (creativity, analysis, motivation, networking, adaptability), and knowledge (understanding role entrepreneurs, knowledge of entrepreneurship). Among these competences, initiative and understanding role entrepreneurs are the most important one.

As the key entrepreneurship competences are mainly associated with behaviour and personal attitudes, entrepreneurship cannot be taught in a classical educational setting, using the common methods for knowledge transfer. Instead, the entrepreneurship should be taught in an active and experiential way, stimulating students to think creatively and to act entrepreneurial. Van der Kuip and Verheul (2003) argue that for facilitating entrepreneurial learning, the principles of theory of generative learning and experience-based learning should be systematically applied. The theory of *experience-based learning* (learning by doing) promotes the active involvement of the students in real-life problem-solving situations with a high personal relevance (Wittrock, 1990; Kourilsky, 1996).

2. Challenges in Teaching Entrepreneurship

Developing behavioural competencies and strengthening personal attitudes required by entrepreneurship may be a very difficult job for educators and trainers (Bodea, Mogoş and Dascălu, 2012). Although the researchers did not reach a consensus on what are the key entrepreneurial competencies, they all agree on the modes of teaching and learning entrepreneurship. They consider that students should experience the concept of entrepreneurship, rather than just learn it in conventional manner (Gibb, 2002). According to (Van der Kuip and Verheul, 2003), the learning approach should be process and student-oriented, with teachers acting as facilitators rather than experts, organized in flexible and interactive sessions with negotiated learning objectives and multidisciplinary problem focus. The student-centred and competence-based programs increase the students' employability (Starta-Etan, 2003; Kohn, 1997). The students should be engaged with what they are doing, in order to achieve a deeper understanding of the domain. Passman (2001) studied the benefits of the student-centred model of teaching, and found out that the learning process is improved if the students have to make decisions and to manage their consequences.

For facilitating the entrepreneurial learning, the learning environment should stimulate students to get involved in different activities, by experience in real-life context, risk taking and making mistakes, by creative problem solving, by feedback through social interaction, by role playing. The learning environment should help students to discover themselves how to learn, only support them in designing their own learning process. Entrepreneurship does not necessarily involve a specific school subject; but rather it requires a way of teaching, with experiential learning and project work playing the main role (European Union, 2013).

3. Entrepreneurship Teaching Methods and Tools

Several methods and tools were identified, as being appropriate, for teaching entrepreneurship (Arasti, Falavarjani and Imanipour, 2012; European Union, 2013; Fayolle, 2007; Nistoreanu and Gheorghe, 2014). Simulation is considered one of the most important learning methods in entrepreneurship, due to its effectiveness in providing valuable learning experiences. Simulations performed during the training sessions are usually referred as *educational simulations*, in order to differentiate them from other simulation activities, such as: experiments for decision support, entertainment and imitation (Oren, 2009). Simulations began to be used in business education in late 1950s (Gredler, 1996) and, progressively, the usage of games, simulations and case-based models became a well-established paradigm, especially for marketing and strategic policy issues.

Educational simulations are considered as one of the most effective methods for teaching higher order skills, such as: analysis, synthesis, creation of knowledge (Leger, et al., 2011). Well-designed educational simulation allows learners to test different problem-solving strategies, to experience the consequences of their decisions and to adjust their actions accordingly, basis for an accelerated competency development process, with a deeper understanding of domain (O'Neil, Wainess and Baker, 2005).

The following simulations packages are considered by Schindehutte (2006) as being relevant for entrepreneurship education:

- **Threshold Entrepreneur** (www.prenhall.com/threshold). It develops abilities for start-up enterprises (planning, organizing and controlling the organization). It is available in two versions: Team Entrepreneur (student team) and solo Entrepreneur.
- **The Business Disc** (http://online.sfsu.edu/~cmgaglio/BizDiscSimulation.PDF) Students are supposed to develop a business plan for a new start-up company and the software make a simulation for one year of operation.
- **GoVenture** (www.goventure.net). Students are entrepreneurs setting up a new company. Students choose the Quick Start feature, if they want to be assigned to a particular simulated company or choose to start a business of their own choice.
- **VCommerce** (http://misweb.bus.msu.edu/acc890/resources/vc-EntreGuide.pdf). A small group of entrepreneurs will design and implement some companies that use the web to market goods and services.
- **Venture.SIM** (http://simventure.co.uk/index.php). The simulation is used in entrepreneurial finance to study alternative strategies, to assess financial needs, to assess risk and uncertainty of cash flows, and to compare different contract terms.
- **Entrepreneur** (http://home.att.net/~simulations/entre2.htm). The simulation involves the takeover and continuing operation of a retail clothing store. The students act as a management team.

Students typically enjoy using the games and simulations, rating these methods quite highly in their list of preferences. Students reported that the simulations developed their abilities to solve problems systematically, perform forecasts in uncertain environments and to measure objectives (Klassen and Willoughby, 2003). Although the measurement of student learning is a difficult endeavour, there were numerous attempts to assess the level of learning for the participants in simulation sessions. Gremmen and Potters (1997) divided their students into two groups: those who played the game and those who had been exposed only to traditional lecture. All students were assessed using the same multiple-choice exam, covering different concepts. They found that students who had participated in the game performed much better. In another experiment, described by Santos (2002) a financial system simulator was used in order to reveal to students the consequences of the monetary policy decisions. Post-simulations surveys showed that students gained a better understanding of the monetary policy. Klassen and Willoughby (2003) applied two assessment instruments: before and after questionnaires and playing the game twice, to see if student performance improved the second time. The conclusions were the simulation games provide good learning experiences because students make decisions, and after that, they has to make further decisions based on the first results. The students better remembered the educational material learned from games than a classical lecture. Besides this, the students developed positive feelings toward the course, improving the chance of paying attention and learning even during other class sessions.

4. Developing an e-Learning Framework in Entrepreneurship

The objective of e-learning framework is to contribute to the development of students' entrepreneurial competences in identification of business opportunities and taking decisions about the product/service to be produced, the start-up strategy and the marketing and selling strategy. The e-learning framework has several components, which can be used together or separately, according to the educational settings. The main components of the framework are the following:

- The module for *identification the business opportunities*. This component is based on a *meta-search engine,* which screens the web to find information (statistic data about business activities, main competitors, success story and other case studies etc.) about the opportunities to start a business. The students introduce some parameters required to guide the search (business domain, product/service type, the financial resources). The module will find web documents, will classify and summarize them, in order to be more accessible to the students. This component of e-learning platform will provide valuable examples to the students on how the business opportunities could be identified, how the search can be performed and the relevant retrieved documents can be organized and analysed. A clustering functionality can be called to group the materials related to business opportunities, but it is not integrated yet in the module.
- *The module for developing business scenarios*. This component assists students to develop business scenarios, based on decisions about the product/service characteristics, the start-up and marketing strategies. Using the output of the module for business opportunity identification or not, the students will introduce the parameters required for their business scenarios. In parallel, the teacher will develop a reference scenario, named pattern scenario that is used for the evaluation of scenarios proposed by students. The scenario evaluation is made via a negotiation process, which allows the students to gradually improve their decisions about the product/service characteristics, the start-up and marketing strategies. The students have access to the simulation results, in every negotiation phase, in order to learn how different business scenarios are assessed and which the impact of different business decisions is.

- *The risk analysis module,* which assist students to perform quantitative risk analysis for business scenarios. This component has a powerful graphical interface, which provides support to the students for understanding the results generated by different probabilistic methods usually applied in the risk quantitative analysis, such as Monte Carlo methods.

The figure 1 shows these components and how they interact with each other: through a central database. The framework can be exploited by the student-entrepreneur, but also by his trainer and by the learning community.

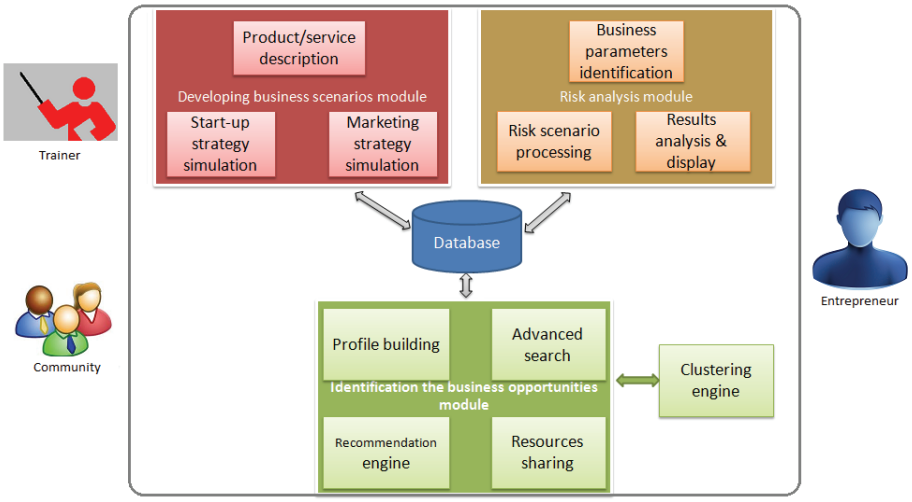
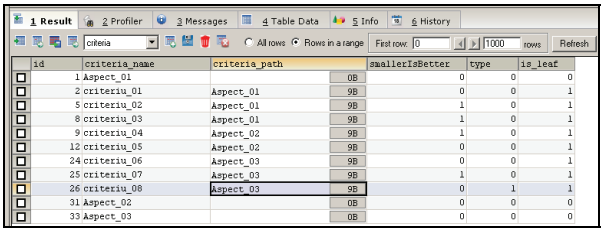


Figure no. 1: The overall structure of the e-learning framework

The e-learning platform is domain-independent; this is why for each learning session the students should declare the business domain, type of product/service and available financial resources. In order to simulate different business scenario, more detailed characteristics of the business should be stated. The business type will be inferred by the platform, based on the initial information offered by student. Different characteristics of the product/service, the start-up and marketing strategies are generically named "aspects" and should be selected and set by students. For each aspect, the evaluation criterion used in the negotiation/evaluation process should be identified and declared (figure 2.a). All information is stored in the framework database (figure 2.b) and will be used by different component of the e-learning framework.

Business	Aspects	Criteria
Business type	Aspect_1	Criterion_1
		...
	Aspect_2	Criterion_k
		...
	.....	Criterion_m
		...

a)



b)

Figure no. 2: The structure of parameters

4.1 The Module for Identification the Business Opportunities

The component assists students to learn how to identify business opportunities. There are many ways to identify business opportunities, such as: screening the web and reading business materials, talking to people and asking questions such as: What are the limitations of the existing products and services? What would you like and is not available on the market? Which are the most innovative ways to use or to provide existing products?

The Business Opportunities Identification Module is a web-based component, which recommends web documents related to students' business profiles: it was designed using JAVA technologies in NetBeans IDE and can be access via any browser. More than that, it is a collaborative learning environment, in which the users can share useful learning materials. The module can be used within the entrepreneurship e-learning framework or as a stand-alone product. The main steps which have to be made by the students are available in figure 3 and described below:

a) Registration: it can be done with a social network account, as well.

b) Filling in the profile:

- the business domain they want to approach: they can choose several domains from our predefined list;
- the product/service type they are interested in offering: multiple choices can be made;
- the financial resources they want to use (including possible national/European funds they want to access);
- education and professional experience (if any): these can be extracted automatically from the social network account, if the account was used at registration also; the step is optional, but necessary for a more accurate identification of business opportunities.

c) Selecting a functionality from the User Page:

- shortcuts: they recommend learning materials related to how to start a business in the chosen domain, providing the selected service/manufacturing the declared product and accessing the chosen funds taking into account the user profile; the education and previous professional experience are not taken into account yet; the recommended bibliography is taken from the local database or from the web; the web search is implemented with Selenium Web Driver, a suite of tools that is used for web browser automation across many platforms (http://docs.seleniumhq.org/projects/webdriver/) .
- suggestions: they make more complex recommendations based on the materials considered useful by other users with the same profile: an adaptation of the item-based collaborative-filtering recommendation algorithm featured in the "Mahout in Action" (Owen, Anil, Dunning and Friedman, 2011) is used here; the success of recommendation algorithm is based on the participatory behaviour of all users, as they have to rate the suggestions they receive and to add materials considered valuable to the local database.
- adding/viewing articles from the local database: in order to exploit the benefits of collaborative learning, this component allows sharing of materials between our users.

d) Logout.

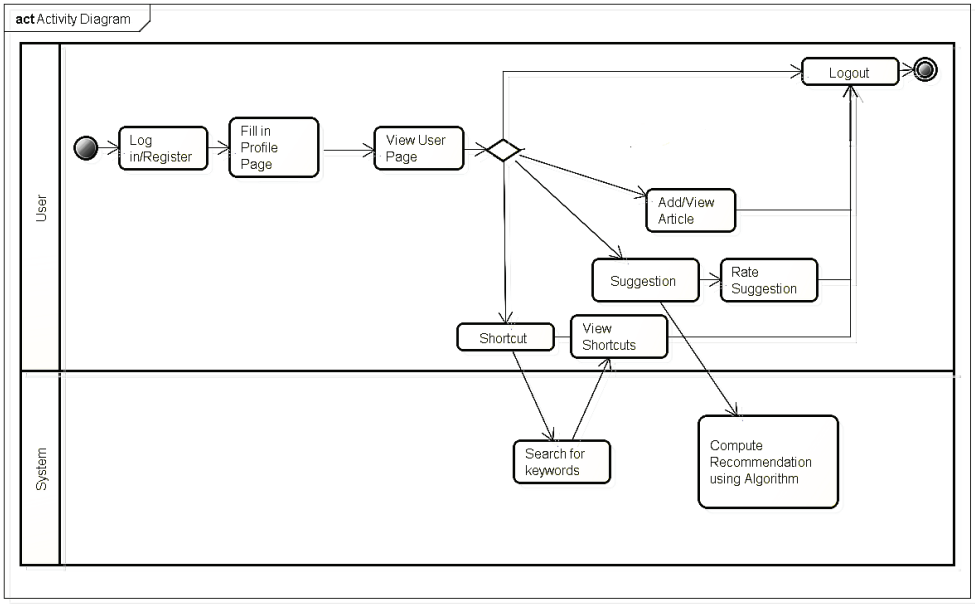


Figure no. 3: The workflow for identification of business opportunities

Besides searching for materials on the web/local database, the component also presents the materials in thematically homogenous groups, which we consider to be helpful to our students. The clustering of search results consists in the following phases:

- obtaining the web page list/set of documents (pdf, doc, docx, ppt, pptx);
- pre-processing the documents: lexical analysis, elimination of stop words and tags, extraction of word roots and, finally, establishing the index words, meaning the words representative for the considered document/concepts;
- transforming the documents into vector representation, for calculating the occurrences of each concept in our document set;
- K-means clustering, which consists in grouping the documents in clusters, all documents in the same cluster being useful for understanding the same concept;
- designing the cluster representation for final results: label extraction and displaying the clusters of documents, as available in figure 4.

For the moment, the clustering functionality is not directly integrated in the module for identification the business opportunities, but accessible via it and realized as a Firefox add-on as can be seen in figure 4.

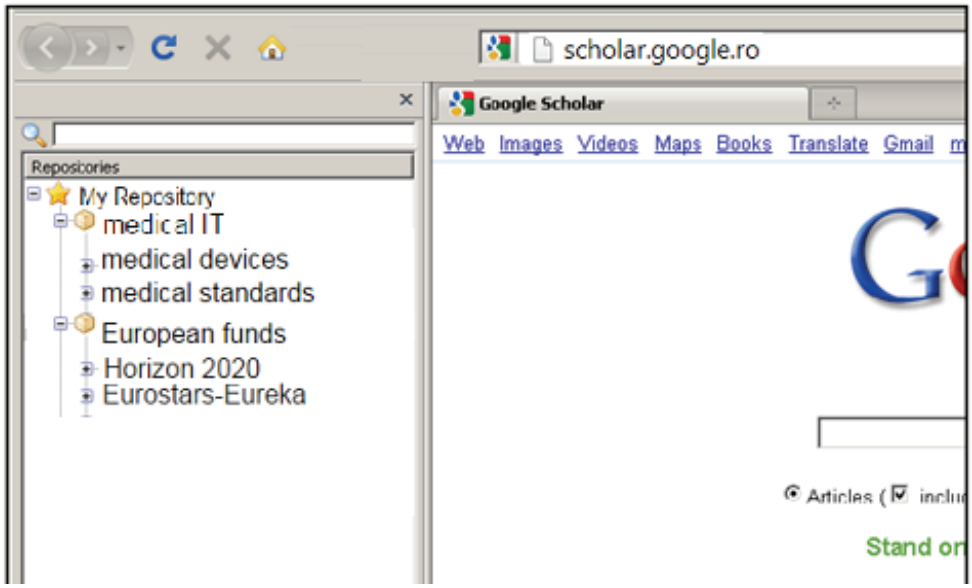


Figure no. 4: The representation of document clusters

4.2 The Module for Developing Business Scenarios

The component assists students to learn to define a start-up strategy and a marketing strategy. An entrepreneur can decide to produce an existing product/service for an existing market, a new product/service for a new market, a new product/service for an existing market or an existing product/service for a new market. In order to decide what product or service to provide, the entrepreneur should consider many factors, including the idea's market potential, the competition, financial resources, risks and its own skills and interests. Then, the entrepreneur should decide the start-up strategy, meaning innovation, differentiation, or niche specification. Another important decision is about the marketing and selling strategy to be adopted. The start-up and marketing strategies are considered as parts of business scenario, together with other characteristics of the business initiative.

The simulation module is a multi-agent system, with three types of actors and agents (entrepreneur/student, teacher and platform). Figure 5 presents the workflow for the simulation sessions.

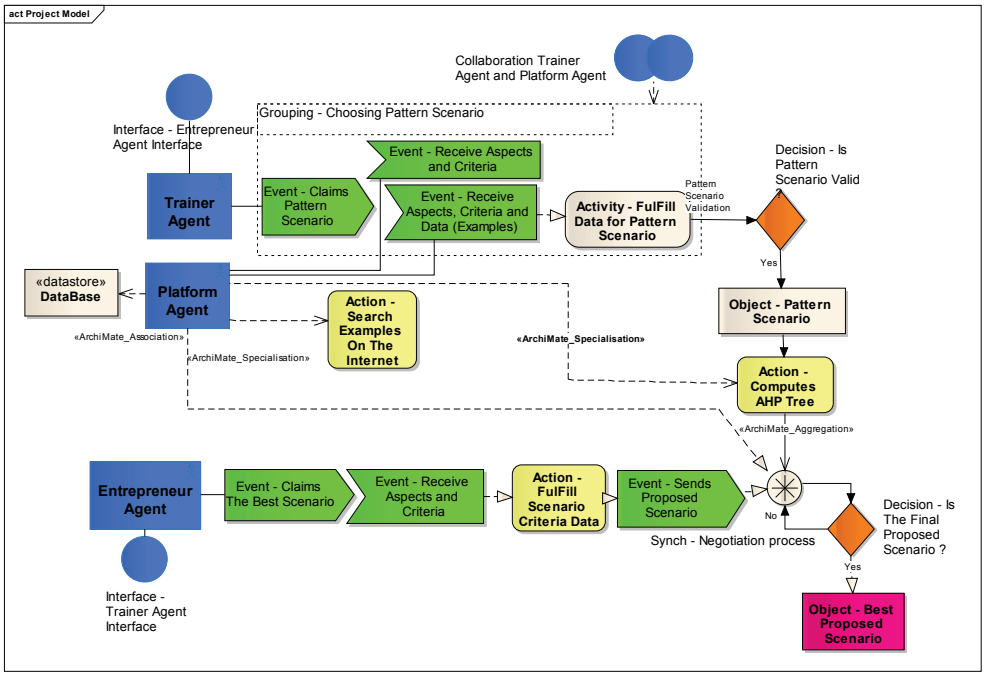


Figure no. 5: The workflow for the simulation of business scenarios

The evaluation of business scenario is performed as a negotiation process, using the tree representation of the objective which should be achieved, the aspects and criteria defining the business scenario. The algorithm for creating the Analytic Hierarchy Process (AHP) tree is the following (Saaty, 1994):

a) The tree root is represented by the objective, the second level is represented by aspects, next levels include the criteria and the leaves are represented by the values assigned to criteria. The objective and the aspects form a sub-tree, allowing the evaluation of the alternatives according to criteria.

b) Pair-wise Comparison (PCM) matrix and B matrix are created. The elements of B matrix, b_{ij}, with i,j-1, ..., n, where n is the number of aspects, are calculated according to the following formula:

$$b_{ij} = 1/ b_{ji}, \text{ for } i \# j, \text{ and } b_{ii}=1 \qquad (1)$$

c) The principal eigenvector, M is calculated:

$$M_i = \sum_j^n b_{ij} (i = 1,2,...,n) \qquad (2)$$

M is used for setting the importance of each decision element in connection with the upper level of the APH tree.

d) The aspects weights, W_{ci} are calculated:

$$W_{ci} = M_i / \sum_i^n M_i \qquad (3)$$

e) The consistency index, CI of the B matrix and the Random Consistency Ratio (*CR*) are calculated.

$$CI = \frac{\lambda \max - n}{n-1} \quad \text{and} \quad CR = \frac{CI}{RI} \qquad (4)$$

where: $\lambda \max$ represents the maxim eigenvalue from B and RI represents the Random Index, with a value that are depending on the number of criteria. If CR has the value less than 0.1, the consistence of the PCM based analysis is accepted, otherwise the B should be redefined.

f) The alternative weights, W_{Aij}, for alternative j (j = 1, 2, … , m) in connection with aspect i are calculated, then the total weight for each alternatives are set according with the following formula:

$$w_{Aj} = \sum_{i=1}^{n} w_{Ai,j} * wci \qquad (5)$$

The simulation component is implemented in Jade and figure 6 presents the Interface for running multi agent system.

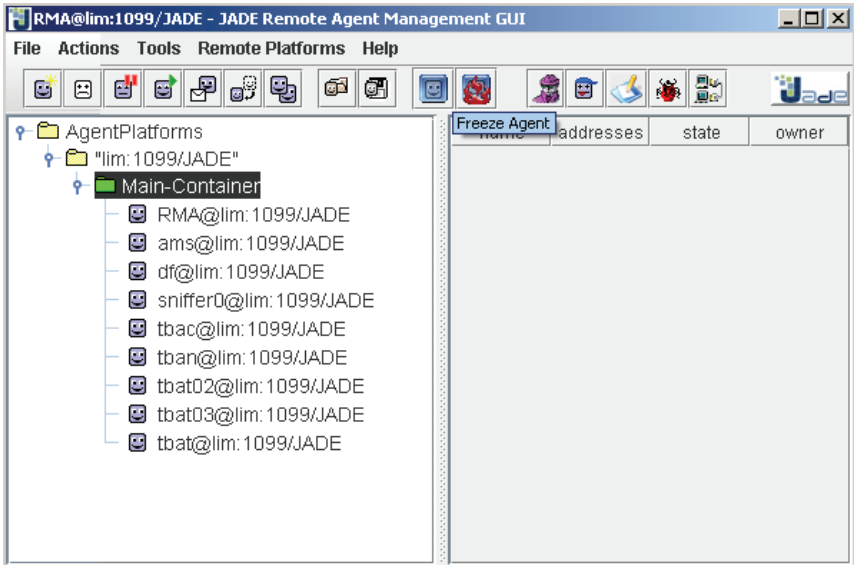


Figure no. 6: The Jade interface of the component for business scenario simulation

4.3 The Risk Analysis Module

The Risk Analysis Module assists the students to quantify and to understand better the effect of risk factors upon their decisions, using the Monte Carlo simulation method. The aim of the simulation is to settle the business strategy and the marketing conditions. The module is linked with the business parameters list identified in the previous components and allows the students to perform successive simulations in order to improve their decisions (figure 7).

For a chosen parameter, the student will select a risk scenario which will be saved into the database. Each risk scenario is characterized by a target value for the chosen parameter and another three values: optimistic, most probable and pessimistic. The parameter target value is defined by the student taking into account the business strategy. The optimistic, most probable and pessimistic values are defined based on the identified risks.

The Monte Carlo method (Bodea and Purnus, 2012) first generates artificial variable values, using a random number generator uniformly distributed in the interval [0, 1] and the associated cumulative distribution function. Then, the Monte Carlo method uses the obtained results to extract values from the probability distribution that describes the behaviour of the stochastic variable. For discrete stochastic variables, the list of possible values and the corresponding probabilities form a discrete probability distribution. In the terminology of probability theory, one can note the stochastic variable as X, xi being a particular value of the variable X. The probability that the value of a variable X equals to xi is denoted as P(X = xi) = P(xi). The probability that the value of variable X exceeds a certain value xi is called the cumulative distribution function and it is denoted as F(xi). The most common theoretical discrete probability distributions are the discrete uniform distribution, the binomial distribution and the Poisson distribution. The risk analysis module can use one of the following distributions: triangular, beta, or log-normal.

The simulation consist of running several scenarios with the same target parameter value and different optimistic, most probable and pessimistic values. For each scenario, the student will obtain a current probability to achieve the target value, the probability distribution and the cumulative probability curve.

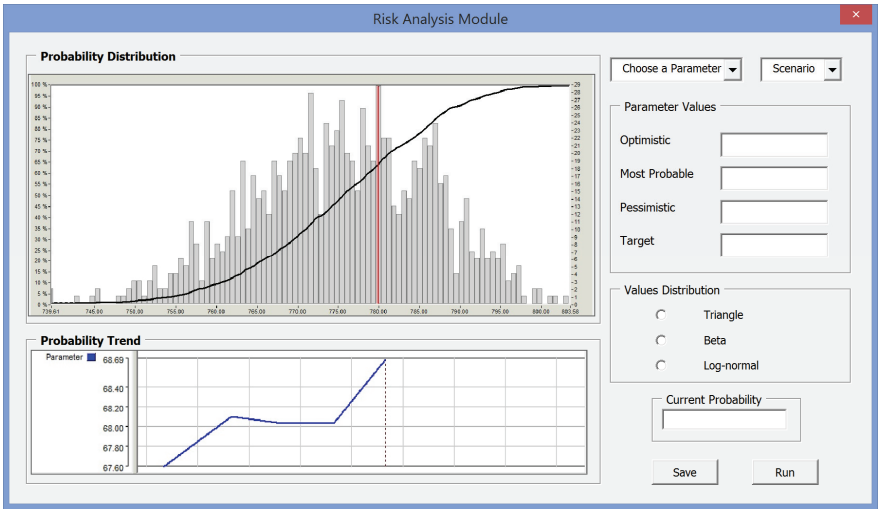


Figure no. 7: The risk simulation

Monitoring the probability trend will help the student to improve entrepreneurial abilities for the selected business scenario in risk conditions and to take better decisions.

Conclusions and future work

The paper proposes an e-Learning framework in entrepreneurship. The originality of the approach is that the framework is domain independent and uses advanced IT technologies, such as agent-based simulations and extended graphical support. Using this e-learning framework, the students can learn how to choose characteristics/aspects for particular type of business and how important is each of them according specific criteria; how to set realistic values for different characteristics/aspects of the business, how a business scenario can be changed in order to fit better to the business context (business reality), modelled through by the scenario pattern and how to assess/evaluate business scenarios. The main limitations of the model are: the degree of detail (the model is not yet very detailed) and the limitation in regard of information volume and sources types that are accessed in real time (to assure the efficiency of the platform operation). The recommendations offered by the framework are mainly based on limited data available during the simulation session.

As future work, we consider to enrich the architectural model, mainly by assuring a collaborative environment for simulations. In this case, the student will be able to collaborate with other students/ entrepreneurs when she/he defines a business scenario. A data mining component will be added in order to extract knowledge about the evolution of the business environment in time, analysing the scenario templates defines in different moments of time. Also, the motivational aspect will be included in the simulation environment.

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References

Amorós, J.E. and Bosma, N., 2014. *Global Entrepreneurship Monitor 2013 Global Report*. [pdf] Global Entrepreneurship Research Association, Universidad del Desarrollo, Santiago, Chile. Available at: <http://www.gemconsortium.org/docs/download/3106> [Accessed 19 September 2014].

Amway Global Entrepreneurship Report - A.G.E.R., 2013. *Encouraging Entrepreneurs – Eliminating the Fear of Failure*. Nuremberg: GfK.

Arasti, Z., Falavarjani, M.K. and Imanipour, N., 2012. A Study of Teaching Methods in Entrepreneurship Education for Graduate Students. *Higher Education Studies*, 2(1), pp.2-10.

Audretsch, D.B., Thurik, R., Verheul, I. and Wennekers, S. eds., 2002. *Entrepreneurship: Determinants and Policies in a European-US Comparison.* Kluwer Academic Publishers.

Axtell, R., 2000. *Why agents? On the varied motivations for agent computing in social sciences*. Working paper 17, Center on Social and economic dynamics, Brookings Institution, Washington D.C.

Barth, J.R., Yago, G. and Zeidman, B., 2006. *Barriers to Entrepreneurship in Emerging Domestic Markets: Analysis and Recommendations*. Available at: <http://assets1b. milkeninstitute.org/assets/Publication/ResearchReport/PDF/entrepreneurship.pdf> [Accessed 2 September 2014].

Bodea, C-N., Mogoş, R.I. and Dascălu M.-I., 2012. How e-Learning Experiences Enhance the Social Presence in Community of Practices: an Empirical Analysis. In: C. El Morr, P. Maret, eds., 2012. *Virtual Community Building and the information Society: Current and Future Directions*. Hershey, PA: Information Science Reference. pp.75-120.

Bodea, C.-N. and Purnus, A., 2012. Project Risk Simulation Methods – A Comparative Analysis. *Management & Marketing Challenges for the Knowledge Society*, 7(4), pp.565-580.

Caird, S., 1992. Problems with the identification of enterprise competencies and the implications for assessment and development. *Management Education and Development,* 23(1), pp.6-17.

Cotton, J. and Gibb A.A., 1992. *An Evaluation Study of Enterprise Education in the North of England*. Enterprise and Industry Education Unit, Durham University Business School, Durham City, UK.

European Union, 2012. *Effects and impact of entrepreneurship programmes in higher education.* Entrepreneurship Unit, Directorate-General for Enterprise and Industry European Commission.

European Union, 2013. *Entrepreneurship Education – A Guide for Educators*. Directorate-General for Enterprise and Industry European Commission.

Fayolle, A., 2007. *Handbook of Research in Entrepreneurship Education, A General Perspective.* Volume 1, Edward Elgar Publishing Limited.

Gibb, A.A., 1998. Entrepreneurial core capacities, competitiveness and management development in the 21st century. In: Klandt, H. ed. *IntEnt98 Internationalizing Entrepreneurship Education and Training.* Proceedings of the IntEnt98-Conference, European Business School, Scholss Reichartshausen, Germany, July 27-29, 1998, pp.1-32.

Gibb, A.A., 2002. Creating conducive environments for learning and entrepreneurship – living with, dealing with, creating and enjoying uncertainty and complexity. *Industry and Higher Education*, 16(3), pp.135-148.

Gredler, M., 1996. Educational games and simulations: a technology in search of a (research) paradigm. *Technology*, 1, pp.521-540. [online] Available at: <http://www. aect.org/edtech/ed1/17/index.html> [Accessed 2 September 2014].

Gremmen, H. and Potters, J., 1997. Assessing the efficacy of gaming in economic education. *The Journal of Economic Education*, 28, 4, pp.291-303.

Harper, D.A., 2003. *Foundation of Entrepreneurship and Economic Development*, Routledge, New York.

Hindle, K., 2002. A grounded theory for teaching entrepreneurship using simulation games. *Simulation & Gaming*, 33(2), June 2002, pp.236-241.

Klassen, K. and Wiloughby, K.A., 2003. In class simulation games: assessing student learning. *Journal of Information Technology Education*, 3. [pdf] Available at: <http://jite.org/documents/Vol2/v2p001-013-59.pdf> [Accessed 2 September 2014].

Kohn, A., 1997. Students don't "work", they learn. *Education Week*, 3 Sept.

Kourilsky, M.L., 1996. *Mini-Society.* Kauffman Center for Entrepreneurial Leadership, E.M. Kauffman Foundation

Macal, C. and North, M. J., 2009. Agent-based modeling and simulation. In: *Proceedings of the 2009 Winter Simulation Conference*, Austin, USA, 13-16 Dec. 2009, pp.86-98, IEEE.

Macal, C. and North, M.J., 2010. Tutorial on agent-based modeling and simulation. *Journal of simulation*, 4, pp.151-162.

Nistoreanu, B.G. and Gheorghe, G., 2014. The Perception of the Academics and Students Regarding the Entrepreneurial Education in Economic Education. *Amfiteatru Economic*, 16(37), pp.811-826.

O'Neil, H.F. and Wainess, R., Baker, E.L., 2005. Classification of learning outcomes: Evidence from the computer game literature. *The Curriculum Journal*, 16, pp.455-474.

Oren, T., 2009. Modeling and simulation: a comprehensive and integrative view, in: L. Yilmaz and T. Oren, eds., 2009. *Agent-based Simulation and Systems Engineering.* Berlin, Germany: Wiley.

Owen, S., Anil, R., Dunning, T. and Friedman, E., 2011. *Mahout in Action*. Manning Publications.

Passman, R., 2001. Experiences with student-centered teaching and learning in high-stakes assessment environments. *Education,* 122(1), pp.189-199.

Ragalie, S., Neagu, C., Muscalu, M.S., Russu, C., Badileanu, M. Bulearca, M., Sima, C., Dospinescu, A., Fistung, D. and Neacsu Dalu, I., 2007. Modalitati de îmbunătățire a productivității la nivel de organizație, sectorial şi național. *Journal of Industrial Eonomics*, 5(4), pp.7-14.

Saaty, T.L., 1994. How to make a decision: The analytic hierarchy process. *Interfaces*, 24(6), pp.19-43.

Santos, J., 2002. Developing and implementing an internet-based financial system simulation game. *The Journal of Economic Education*, 33(1), pp.31-40.

Schindehutte, M., 2006. *Entrepreneurship Simulations.* [pdf] Available at: <http://old.ied.econ.msu.ru/cmt2/lib/c/198/File/simulations.pdf> [Accessed 2 September 2014].

Starta-Etan Expet Group, 2003. *Higher education and research for the ERA: Current trends and challenges for the near future*. Bruxelles, Belgium: European Commission, DG Research.

Valerio, A., Parton, B. and Robb, A., 2014. *Entrepreneurship Education and Training Programs around the World: Dimensions for Success.* Washington, DC: World Bank.

van der Kuip, I. and Verheul, I., 2003. *Early Development of Entrepreneurial Qualities: the Role of Initial Education*. [pdf] SCALES-paper N200311, EIM Business and Policy Research, Netherlands. Available at: <http://www.ondernemerschap.nl/pdf-ez/n200311.pdf> [Accessed 18 September 2014].

Vicens, L. and Grullón, S., 2011. *Innovation and Entrepreneurship: A Model Based on Entrepreneur Development*. Inter-American Development Bank. [online] Available at: <http://www.iadb.org> [Accessed 2 September 2014].

Wittrock, M.C., 1990. Generating processes of comprehension. *Educational Psychologist* 24(4), pp.345-376.