

Developing an Entrepreneurial Mindset among Engineering Students. A Comparative Analysis of Entrepreneurship Curriculum in Romanian Technical Universities

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Abstract

Current research shows entrepreneurship potential among technical university graduates is particularly high given the immediate applicability of their skills and expertise in many different fields. Yet, entrepreneurship teaching among technical universities in Romania remains quite underdeveloped. European Union development strategies name entrepreneurship and social entrepreneurship initiatives as a particular driver of employment and means for reducing unemployment rates among the young population. The paper we propose aims to comparatively analyse the curricula for entrepreneurship teaching among six Romanian technical universities. The added value of the article lies in the fact that it offers the first analysis of this kind. The article is the first step in a more in depth analysis aimed at illustrating means for better adapting the curricula within the technical field to the needs of the labour market. It is particularly aimed at university staff who can use the results in order to better adapt the offering to the current context of sustained entrepreneurial support.

Keywords: entrepreneurship, technical universities, Romania.

JEL classification: M31, L26.

1. Introduction

Entrepreneurship is currently one of the main strategies employed by the European Union in its efforts to reduce unemployment and youth unemployment in particular. Furthermore, the European Commission emphasises entrepreneurship as a tool to reduce social exclusion and stimulate innovation among young people (European Commission, 2017a). Entrepreneurship and fostering youth entrepreneurship are core objectives of the Europe 2020 Strategy, as well as the EU Youth Strategy (European Commission, 2017a). These efforts are conducted in a context of unemployment rates among the young which continue to remain high at EU level. According to European estimates, the youth unemployment rate in EU28 in 2016 was 18.4%, 2.2 times higher than the general unemployment rate of 8.3%. Also, in 2015, more than 6,6 million young people (aged 15-24 years) were neither in employment nor in education or training (NEETs) in EU28 (European Commission, 2017b). Reducing unemployment rates among the young is a goal in line with the wider EU target of achieving a 75% employment rate among the working age population (20-64 years). The EU Youth Strategy also recognises the importance of youth work in reducing this risk. One of the solutions identified for tackling youth unemployment is represented by the development and setting of entrepreneurial initiatives among this group. As mentioned above, the Europe 2020 strategy “recognizes entrepreneurship and self-employment as key for achieving smart, sustainable and inclusive growth” (European Commission, 2017c).

At the same time, research shows the young generation today is generally tech savvy, self-starters with a high potential for developing entrepreneurial ventures, willing to seize the

opportunities presented to them by the current environment in order to put their ideas into practice (Paquette, 2015). This natural interest of the new generation towards the technical field is also visible when analysing their choice of careers. A recent Manpower Group (2015) study published in Romania indicates technical studies as ranking first in undergraduates choices. According to the aforementioned study, in 2013/2014, most highschool graduates chose to complete their tertiary education in the technical field (31%), followed by teaching training (25.8%) and economics (18.6%).

Young people today are also entrepreneurial in nature. Two in ten young people aged between 18 and 24 years old in Romania indicated they wanted to start their own business in the following year, according to a GfK Romania study (Mazurchevici, 2016). This percentage is much higher when strictly considering undergraduate and postgraduate students. A recent EY Romania study indicated 52% of Romanian students wanted to start their own business in the following years (EY, 2014), while technical students, more precisely civil engineering students, ranked second when asked how willing they were to start their own venture (Jurnalul de afaceri, 2016).

In this context, and considering data from other research indicating that technical university students should not only be focused on the technical subjects, but should also acquire social awareness, as well as economics competences (Crawley et al, 2014), we propose an analysis of the educational curricula offered by the top six technical universities in Romania with regards to entrepreneurial education. The added value of the article lies in the fact that it offers the first analysis of this kind. The article is the first step in a more in depth analysis aimed at illustrating means for better adapting the curricula within the technical field to the needs of the labour market. It is particularly aimed at university staff who can use the results in order to better adapt the offering to the current context of sustained entrepreneurial support.

2. Research methodology

The article aims to identify the degree to which technical universities in Romania include entrepreneurial or related courses in their curricula, given the increased potential for entrepreneurial development registered among technical university graduates.

According to Romanian National Institute of Statistics, there are currently over 140.000 students pursuing an engineering degree, representing a quarter of the total number of Romanian students (INSEE, 2017). The years following the economic crisis witnessed an increase in the number of young people opting for a degree in economic engineering. According to Mirea (2012), the number of students currently enrolled in a management and engineering study domain exceeds 20.000, representing approximately 14% of the total number of students in the technical sector.

In this context, the operational objectives of the article are the following:

- To analyze the entrepreneurial content of the curricula proposed by the technical universities in order to cluster the courses by entrepreneurial subjects;
- To compare the propensity for entrepreneurial education by field of study or program of study, among the most representative six technical universities in Romania.

Both qualitative and quantitative data analysis were performed based on the educational plans of the five technical universities selected. The sample included the top six technical universities as indicated by the 2019 annual university ranking (4icu, 2019): The Technical University in Cluj-Napoca (UTCN, 2019), The Technical University Gheorghe Asachi in Iasi (UT Iasi, 2019), The University Politehnica of Bucharest (UPB, 2019), The Politechnic University of Timisoara (UPT, 2019), The Stefan the Great University in Suceava (USV, 2019) and The Technical University of Civil Engineering Bucharest (UTCB, 2019).

All the universities in the sample are public universities. The analysis included the educational plans available on the universities' websites for all the study programs offered at bachelor and master level. A total number of 37 faculties were evaluated. In order to achieve the second operational objective, we considered the length of a conventional lecture of 2 hours. As such, for the quantitative analysis courses of different duration (e.g. 1 hour or 3 hours) were adjusted using multipliers (e.g. 1.5 and 0.5, respectively). Also, when a lecture comprised two disciplines belonging to different categories, we weighted each subject as 0.5. The analysis was conducted between October and November 2019.

3. Results and discussion

3.1 The entrepreneurial content of the curricula in Romanian technical universities

After the evaluation of the entrepreneurial related curricula of the technical universities in the sample, the disciplines were clustered in five categories: economics subjects, financial related lectures, marketing related, management related and communication.

Economics subjects

In this cluster we included subjects such as General Economics, Micro and Macro Economics, Fundamentals of Economics, Economic Politics, Industrial Economics, Economics and legislation, European Union Economic Policies, Economics and Economic Analyses, Business economics and Environmental Economics. It is important for an entrepreneur to have a good knowledge of the main macro-indicators of an economy, the existing correlation between them along with their interpretation. Additionally, an entrepreneur must understand the offer and demand general process. All the universities in the sample included a description of the content of each courses on their websites. It is worth noting that General Economics is included in the first years of study (first or second) for most universities. It was only in the case of The University Politehnica of Bucharest that this subject was taught in the fourth year. The more advanced economic disciplines are generally taught in the final year (third or fourth, depending on the bachelor structure). The educational plans for master level specializations included no economic subjects as comprised by this cluster.

Financial related disciplines

The following subjects regarding the financial aspects a company would be faced with were included in the educational plans of the universities under analysis: Financial Management, Economical and Financial Analysis, Finance and Credits, Finance and Banking, Accounting Fundamentals, Investment Economics and Social Efficiency, Economic Administration, Business Financials, Economic and Financial Control and Audit and related.

Based on the subjects descriptions available in the educational plans, all courses focused on the specific knowledge regarding an enterprise's finances, the main financial mechanisms of the enterprise, the processes for consolidating investment decisions, preparing the financial statements of an enterprise, enterprise risk analysis and assessment, elaboration and evaluation of the technical, economic and financial flows at the business level. Subjects in this category were present in the educational plans of the universities in the sample for all years of study, especially for the engineering and management domain.

Marketing related disciplines

The educational plans of the technical universities in the sample are quite poor with regards to marketing related disciplines. The content available is generally referring to the following issues: environmental factors that affect marketing strategies, market research, strategic analysis for allocating marketing resources for product development, description of

market segments, matrix of appropriate marketing strategies, proposals for the product's price strategy, profitable choices of product distributors, proposals for the appropriate marketing mix of a product, in a national and international context. Courses included in this category were selected considering the various topics and approaches to marketing. As such, besides the classical Fundamentals of marketing course, we also considered as belonging to this cluster: Market research, E-commerce, Marketing communication, Commodities strategies, Commercial transactions, Suppliers management, Marketing and project promotion, Product value management, International Marketing, Strategic Marketing, Marketing data analysis or Marketing for a distinctive (technical) branch. The courses are addressed to both undergraduate and master students and are present during the entire educational cycle.

Management related disciplines

Management education seems to be considered the most important subject in the economics spectrum included in the Romanian technical universities curricula. Based on the analysis conducted, it appears that understanding the managerial functions is considered crucial by the universities in this sample. The educational plans tend to favor general courses in management, but also specific lectures are offered. Project management is the most common, followed by production (operational, or process management). The Management and Engineering domain offers the possibility for students to also study Human Resources Management, Strategic Management, Comparative Management and International Management. For the other engineering domains, the following courses are available: Environmental Management, Sustainable Development Management and Innovation Management. The subjects included in the discipline plans mainly aim to develop students' ability to assess different decision-making alternatives and select the most appropriate strategy for a given context, to facilitate systemic thinking in identifying the opportunities/threats of the external environment as well as the strengths/weaknesses of the organization, to formulate and implement strategies, assigning tasks and group leadership, to effectively coordinate a team, to efficiently organize the company's activities. This group of disciplines is mainly designed for students in the third year or above.

Communication disciplines

Communication disciplines are connected to entrepreneurial education by building transversal abilities for students. Disciplines such as Managerial Communication, Business Communication, Negotiation, Communication and Professional Ethics are present in the curricula of the technical universities assessed. The description for communication courses includes issues related to communication as a combination of art and knowledge, appropriate communication through speaking, writing and behaving, working in teams, presenting information effectively in a variety of formats, negotiating etc. These disciplines are mainly addressed to students in their first, third or fourth year of studies. The majority of these subjects are taught optional ones.

3.2 Comparing the propensity for entrepreneurial education by field or program of study, among the most representative five technical universities in Romania.

The quantitative analysis consists in studying the number of entrepreneurial disciplines or related based on the categories above as presented in the curricula of the five technical universities in the sample. The Management engineering (ME) domain was indicated separately. The data obtained are depicted in the Table 1 and Figure 1 below.

Table 1. The number of entrepreneurial related courses included in the educational plan of the technical universities in the sample

The sample	Politehnica Bucharest	Politehnica Timisoara	Technical Univ. Iasi	Civil Engineering Bucharest	Suceava Univ	Technical Univ. Cluj	Total
Economics	13	10	8	5	3	9	48
Economics (ME)	6	5	2	2	3	4	22
Finances	8	4	4	8	4	13	41
Finances (ME)	5	2	3	6	5	11	32
Marketing	8.5	5	5	4	5	18	45.5
Marketing (ME)	4.5	1	1	3	5	7	21.5
Management	19	4	9.5	4	15	36	87.5
Management (ME)	9	1	2	3	11	13	39
Communication	1	0	0	0	0.5	6	7.5
Communication (ME)	0	0.5	0.5	0	0	4	5

Source: own data computed

Results indicate management subjects to be most present in the educational plans of the technical universities analyzed. Subjects included in this cluster obtained 87 points (disciplines), out of which 39 are offered to students pursuing a degree in economical engineering. The next category is economics (48 points/22 points for economical engineering specialties), followed by marketing (45.5 points and 21.5 points for ME) and finances (41 points and 32 points for ME). It therefore seems that technical universities management consider students need to first acquire relevant management knowledge and skills and then develop competencies regarding general macro and micro-economic indicators, financial flows and capitalizing on market opportunities. Basic education in economics appears to carry equal importance for the all specializations. Education regarding communication skills is almost neglected (7.5 points, with 5 for ME).

Figure 1 below presents a more detailed analysis of the disparities between the different categories of entrepreneurial disciplines.

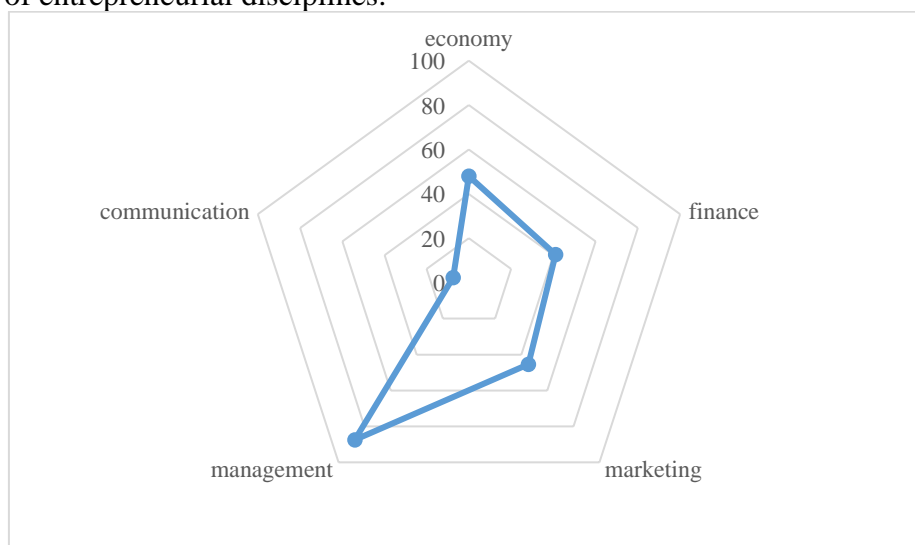


Figure 1. The disparities between the entrepreneurial categories of disciplines

Source: own data computed

The analysis consolidates the conclusion presented above that Communication abilities are the most neglected in the entrepreneurial education curricula available within the Romanian technical universities in the sample. It is also worth noting that *the comparative evaluation between universities is not representative*, because the curricula for some of the study domains was not available. For example, the score obtained by the Technical University in Cluj-Napoca, where we assessed 9 faculties, could not be compared with Polytechnica University of Timisoara (with the same number of faculties studied) because of differences in the number of study domains. Another important aspect is that there are four purely entrepreneurial disciplines in the curricula of universities in the sample: three subjects proposed by the Technical University in Cluj-Napoca (Entrepreneurship, Entrepreneurship and Technology Transfer, Responsible entrepreneurship - all disciplines offered for master students in the fifth year of study, one for ME) and one subject offered by The University of Suceava.

4. Limitations

The analysis was conducted based on the educational curricula available on the websites of the universities in the sample. It is therefore possible that the electronic search performed did not retrieve all curricula available for a given university and that some courses were not taken into consideration. We do believe, however, that the results retrieved allow for a good image of the entrepreneurial curricula available within the Romanian technical universities. Further research will include a more in-depth analysis aimed at illustrating means for better adapting the curricula within the technical field to the needs of the labour market.

Conclusion

In conclusion, the analysis of the entrepreneurial curricula of the Romanian technical universities in the sample indicates a propensity toward management disciplines (40%), followed by economics, marketing and finances (approx. 20%). More specific disciplines such as communication and entrepreneurship are still scarce suggesting they are at the beginning of being introduced in the curricula. We believe an increased focus on such disciplines could contribute to reducing the gap between graduates' competences and the requirements of the labor market, especially with regards to transversal skills and abilities. At the same time, increasing the emphasis placed on entrepreneurship and economics education could foster employability among the technical university graduates by increasing their interest in new venture creation. Based on the research findings, we also suggest including disciplines in the entrepreneurial curricula as early as possible in the educational plans and doubling these efforts by increased opportunities for familiarizing students with the labor market demands and opportunities in their area.

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