

# **HABILITATION THESIS**

## **TEZĂ DE ABILITARE**

**Entrepreneurship, education and sustainable management**

**Research field / Domeniul**

**Engineering and Management / Inginerie și Management**

**Eng. Matei TĂMĂȘILĂ, Ph.D**

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## A. REZUMAT

Conceptul de cadru didactic universitar implică competență științifică validată prin studii și comunicări științifice, coroborată cu nevoia de perpetuă profesionalizare. Dezvoltarea unei baze solide de cercetare în domeniul ingineriei și managementului, având ca și suport fundamentul didactic al antreprenoriatului care este un demers de mare actualitate în societatea contemporană. Iar acest deziderat poate fi atins în primul rând prin experiența profesională și umană a cadrelor didactice implicate în acest domeniu.

Prezenta teză de abilitare relevă capacitățile și performanțele didactice și de cercetare ale candidatului dr.ing. Matei Tămășilă, care ocupă în prezent o funcție didactică de conferențiar universitar în statul de funcțiuni al Departamentului de Management al Universității Politehnica Timișoara, dezvoltate după susținerea publică a tezei de doctorat și până în prezent. Teza de abilitare este concentrată, în principal, pe acele realizări care atestă capacitatea autorului de a conduce activități de cercetare științifică în domeniul Inginerie și Management, cu aplicații în Antreprenoriat, Educație și Management sustenabil.

În aproape 21 de ani de **activitate didactică** continua în cadrul aceluiași departament, candidatul și-a dezvoltat capacitățile și performanțele didactice, desfășurând toate tipurile de activități: seminar, laborator, proiect, curs, îndrumare la elaborarea de lucrări de diplomă și disertație etc., urcând scara ierarhică a funcțiilor didactice. A contribuit la dezvoltarea de lucrări didactice, manuale universitare și îndrumătoare pentru lucrări aplicative.

Din perspectiva **activității manageriale**, începând cu anul 2012, candidatul a ocupat funcția de director al Departamentului de Management. În cei peste șapte ani de coordonare / management a departamentului, candidatul s-a preocupat de elaborarea elementelor relative la managementul strategic (misiune, obiective, strategii, politici, state de funcțiuni) și de gestiunea resurselor financiare, umane și materiale. Rezultatele înregistrate sunt apreciate la nivelul departamentului.

Prezentarea capacităților și performanțelor obținute în **activitatea de cercetare** a candidatului ocupă cea mai mare parte a conținutului tezei de abilitare. Astfel, în secțiunea introductivă autorul expune subiectele abordate și rezultatele obținute pe parcursul celor 21 de ani, cu trimitere la lista referințelor bibliografice. Așa cum se poate anticipa din titlul tezei de abilitare, aceste subiecte sunt dedicate antreprenoriatului, educației și managementului sustenabil.

Prezenta teza de abilitare este structurată pe 3 direcții importante și de actualitate în literatura de specialitate:

1. Antreprenoriatul și educația antreprenorială;
2. Influențe microeconomice și macroeconomice la nivel național și global;
3. Educația și dezvoltarea sustenabilă.

Prima parte a lucrării prezintă conceptul de antreprenoriat, importanța acestuia și imperativele asociate. Sistematizarea principalelor cercetări cu privire la teoriile antreprenoriale reprezintă un prim pas, o primă tentativă de ordonare a tentativelor de înțelegere a mecanismului, a capacităților și resurselor necesare susținerii și dezvoltării lui. Sunt realizate o serie de studii referitoare la economiile focalizate, economiile în tranziție și economiile focalizate pe inovare. Pentru identificarea nivelului de inovare s-a utilizat indicatorul global de inovare care a fost calculat pentru România, Bulgaria, Ungaria și Serbia. Totodată sunt prezentați facilitatorii, actorii pentru antreprenoriat: naționali, regionali și globali. Responsabilitatea socială corporativă (RSC) reprezintă un demers abordat în antreprenoriat. În acest context sunt prezentate o serie de abordări care integrează caracteristicile RSC în raport cu cele ale modelelor antreprenoriale. Deoarece în prezent, abordarea educațională este cea centrată pe student, cercetarea abordează direcțiile, obiectivele și factorii motivatori ai învățământului universitar centrat pe student. Evaluarea competitivității învățământului superior este o componentă importantă a educației antreprenoriale. Sunt identificate o serie de condiții pentru creșterea competitivității învățământului superior românesc.

În a doua parte a primei secțiuni, candidatul abordează atitudinea ca activ de cunoștințe și impactul acesteia asupra activității de antreprenoriat în Europa. Sunt prezentate diverse evaluări ale literaturii de specialitate, evaluări ale activității antreprenoriale în Europa. Totodată este realizată o analiză a incubatoarelor de afaceri din România, fiind prezentate detaliile, beneficiile, implicațiile și oportunitățile dezvoltate.

O altă direcție abordată în cadrul acestei prime secțiuni sunt evaluările și analizele referitoare la influențe micro și macroeconomice. Aceste influențe sunt direct tangențiale domeniului antreprenorial. Aceste influențe ajută leaderii și antreprenorii în dezvoltarea și desfășurarea activităților de afaceri, oferindu-le repere în dezvoltarea strategiilor sustenabile.

Ultima direcție abordată în cadrul acestei secțiuni este educația și dezvoltarea sustenabilă. Sustenabilitatea reprezintă o direcție intens abordată la nivel național și internațional. Din perspectiva antreprenoriatului, dezvoltarea sustenabilă reprezintă o provocare pe care o abordează majoritatea antreprenorilor. Candidatul abordează, totodată, importanța educației în dezvoltarea sustenabilă. În strânsă legătură cu educația sunt activitățile desfășurate de întreprinderi relative la energiile regenerabile, colectarea deșeurilor, reducerea pierderilor și alte demersuri adiacente.

Rezultatele activității de cercetare și publicare a candidatului au fost prezentate în cadrul unor manifestări academice și științifice naționale și internaționale, prin articole publicate în reviste sau în volumele de lucrări ale conferințelor. Candidatul a publicat un număr de 98 de articole. Distribuția pe categorii de publicații a acestor lucrări este după cum urmează:

- ☐ **4 în reviste indexate în baza de date Web of Science (Clarivate Analytics);**
- ☐ **37 la conferințe internaționale indexate în baza de date Web of Science (Clarivate Analytics).**
- ☐ 17 în reviste și volume indexate în alte baze de date internaționale (BDI);
- ☐ 40 în reviste sau volume neindexate în BDI;

De asemenea, candidatul este autor la 1 carte la editură internațională, 10 cărți la edituri naționale recunoscute și 9 materiale didactice inclusiv în format electronic - suport de curs/îndrumare.

**A doua parte** a acestei secțiuni prezintă perspectivele de dezvoltare. Aceste perspective sunt prezentate pe cele trei direcții: didactică, de cercetare și administrativă.

**Ultima parte** a acestei secțiuni este ocupată de referințele bibliografice.

## **A. ABSTRACT**

The concept of university teaching involves validated scientific competence through scientific studies and communications, corroborated with the need for perpetual professionalism. Developing a solid foundation of engineering and management research, supporting the teaching of entrepreneurship, is a very topical approach in contemporary society. And this goal can be achieved primarily through the professional and human experience of the teachers involved in this field. This habilitation thesis reveals the capabilities and didactic and research performance of the candidate eng. Matei Tămășilă, Ph.D who currently holds a teaching position as an associate professor in the state of affairs of the Management Department of the Politehnica University of Timișoara, developed after the public support of the PhD thesis until now. The habilitation thesis focuses mainly on those achievements that attest to the author's ability to conduct scientific research activities in Engineering and Management with applications in Entrepreneurship, Education and Sustainable Management.

In nearly 21 years of didactic activity within the same department, the candidate has developed his capacities and didactic performances by carrying out all kinds of activities: seminar, laboratory, project, course, guidance in the elaboration of diploma and dissertation papers etc., climbing the hierarchical scale of teaching functions. He has contributed to the development of didactic papers, university textbooks and tutorials for applied papers.

From the point of view of managerial activity, starting with 2012, the candidate was Director of the Management Department. During the seven years of department coordination / management, the candidate was concerned with the development of strategic management elements (mission, objectives, strategies, policies, function states) and management of financial, human and material resources. The recorded results are appreciated at department level.

The presentation of the capacities and performances obtained in the candidate's research activity occupies most of the content of the habilitation thesis. Thus, in the introductory section, the author discusses the topics addressed and the results obtained during the 21 years, with reference to the list of bibliographical references. As can be expected from the title of the

habilitation thesis, these topics are dedicated to entrepreneurship, education and sustainable management.

This habilitation thesis is structured on three major and topical directions in the literature:

1. Entrepreneurship and entrepreneurship education;
2. Microeconomic and macroeconomic influences at national and global level;
3. Education and Sustainable Development.

The **first part** of the paper presents the concept of entrepreneurship, its importance and its associated imperatives. Systematizing the main researches on entrepreneurial theories represents a first step, a first attempt to authorize the attempts to understand the mechanism, the capabilities and resources needed for its support and development. There are a number of studies on focused economies, transition economies and innovation-focused economies. In order to identify the level of innovation, we used the global innovation indicator that was calculated for Romania, Bulgaria, Hungary and Serbia. At the same time, facilitators, and actors for entrepreneurship: national, regional and global are presented. Corporate Social Responsibility (CSR) is an approach to entrepreneurship. In this context, there are presented a series of approaches that integrate CSR characteristics with respect to those of entrepreneurial models. As the educational approach is currently centered on the student, the research addresses the directions, objectives and motivating factors of the student-centered university education. Assessing the competitiveness of higher education is an important component of entrepreneurial education. A number of conditions are identified for increasing the competitiveness of Romanian higher education.

In the **second part** of the first section, the candidate addresses the attitude of active knowledge and its impact on entrepreneurial activity in Europe. Various literature reviews, assessments of entrepreneurial activity in Europe are presented. At the same time, an analysis of the business incubator in Romania is carried out with details, benefits, implications and developed opportunities.

Another direction addressed in this first section is assessments and analyzes of micro- and macroeconomic influences. These influences are directly tangential to the entrepreneurial domain.



These influences help leaders and entrepreneurs in developing and conducting business activities, providing them with milestones in developing sustainable strategies.

The last direction addressed in this section is education and sustainable development. Sustainability is an intense direction addressed at national and international level. From the perspective of entrepreneurship, sustainable development is a challenge that most entrepreneurs are addressing. The candidate also addresses the importance of education in sustainable development. Closely related to education are business activities related to renewable energies, waste collection, loss reduction and other related approaches.

The results of the applicant's research and publication activity were presented in national and international academic and scientific events, through articles published in journals or conference papers volumes. The candidate has published 98 of articles. The distribution by category of publications of these papers is as follows:

- **4 in journals indexed in the Web of Science database (Clarivate Analytics);**
- **37 at international conferences indexed in the Web of Science database (Clarivate Analytics);**
- 17 in journals or volumes indexed in other international databases (BDI);
- 40 in non-indexed journals or volumes in BDI;

Also, the candidate is the author of 1 book at the international publishing house, 10 books at recognized national publishers and 9 teaching materials including electronic course / course support.

The **second part** of this section shows the development perspectives. These perspectives are presented in the three directions: didactic, research and administrative.

The **last part** of this section is covered by bibliographic references.

## **B. RESEARCH RESULT**

### **1. Entrepreneurial phenomenon**

#### **1.1. Conceptual approaches and models**

##### **1.1.1. Introduction**

Entrepreneurship is the dynamic process of creating incremental wealth and innovative value things and services that are related to the welfare of an entrepreneur. It provides people with an enormous amount of goods and services that contribute to raising living standards and eradicating poverty. The entrepreneur is an action-oriented and highly motivated person who contributes to achieving the goals. Entrepreneurs engage in sustainable development and contribute sustainably to achieving Agenda 2030 goals (European Commission, 2018). In this context, entrepreneurship contributes to:

1. Increasing interest in national and international steps approaches
  2. Creating employment opportunities
  3. Innovation
  4. Impact on community development
  5. The consequence of business failure
  6. Political and economic integration of outsiders
  7. Develops entrepreneurship
  8. Improves the standard of living
  9. Promotes research and development
1. Increasing interest in national and international steps approaches – Entrepreneurship aims to materialize entrepreneurs' innovative ideas and to involve them in aligning business with national and international approaches. Thus, entrepreneurs are interested in the benefits of the circular economy, sustainable development (Agenda 2030, COP21 and others), energy efficiency (IPCC) and other actions. Thus, the growth or setting-up of small businesses is the specific contribution of entrepreneurship in every economy. Some statistics show that nearly

half a million small businesses are set up each year in the economy of major continents. Romania is no exception in this regard.

2. Creating employment opportunities - Established businesses are developing a number of jobs. Provides early-stage jobs as well as its development. Small businesses are the industry that generates annual jobs for the country's inhabitants. Moreover, entrepreneurial businesses prepare, provide and form a range of skills for their employees.

3. Innovation - Entrepreneurship is the incubator of innovation. Innovation creates imbalances in the current state of order, creates solutions and exceeds current limits. Innovation, research and development are found in entrepreneurship. Thus, entrepreneurship takes care of innovation, offers new savings, products, technology, market, quality of goods, etc.

4. Impact on community development - A community is better if its employment base is diversified among many small entrepreneurial businesses. Promotes abundant retail facilities, a higher level of property ownership, fewer buildings, better sanitation standards, and higher education spending, recreation and religious activities. Entrepreneurs are actively involved in streamlining organizational resources and understanding the issues of society.

5. The consequence of business failure - The collapse of the large industry has almost major effects on state development and on the state of the economy and on the financial situation of the relevant people. Customers are deprived of government goods, services and taxes. This can not happen in the case of entrepreneurial failure. There will be no measurable effect on the economy nor political repercussions.

6. International economic integration- entrepreneurship is the most effective way to integrate those who are willing and estranged in the economy. Minorities, migrants and women are certainly integrated into entrepreneurship.

7. Supports people with entrepreneurial spirit - entrepreneurship is the ground for developing people who take a range of risks and want to harness an identified opportunity. This is the area where a person can start the idea of risk, which can be concluded in a huge enterprise. All

major industrial enterprises started as a small entrepreneurial enterprise. Therefore, entrepreneurship offers a range of opportunities within each economy in each country.

8. Improves the standard of living - The standard of living is based on increasing household consumption of goods and services over a period of time. Entrepreneurship offers, through their innovation, sustainable and expected products on the market. In addition, the income of people who engage in entrepreneurial business increases. It also allows employees to consume more goods and services. In fact, entrepreneurship increases the living standards of people in a country.

9. Promotes research and development - entrepreneurship is an innovation through its function, and therefore innovative ideas for goods and services need to be researched and developed in line with the needs and desires of the market.

By definition, entrepreneurship, as observed over time, is a dynamic process of vision, change and creation (Kuratko, Hodketts, 2004), therefore requires passion and much energy before creativity and the ability to implement new ideas or to find creative solutions. Starting from these perceptions, it was assumed that the essential ingredients that the phenomenon would imply would be: the desire to take calculated risks, the desire to develop a remarking career, the ability to formulate - to identify new business ideas and to find the necessary resources and, last but not least, the ability to recognize an opportunity in which most can only see only instability, chaos and confusion.

Due to the lack of genuinely relevant research on the entrepreneurial process, but especially due to the lack of interpretations and emerging / relevant conclusions, inevitably as many researchers have specified, it has offered at some point the possibility of asserting numerous prevailing tendencies of beliefs from "folklore" in an attempt to explain the entrepreneurial phenomenon, as long as they have not been removed from the results of recent research. For example, so-called "myths" of entrepreneurship have been stated (Da Rin et al., 2011):

1. *Entrepreneurs are people of action, not thinkers*: which is largely true, they are much more likely to act, but often they have to carefully plan their movements, in other words, the full tandem is "work and think".

2. *Entrepreneurs are born, not made*: it starts from the idea that the characteristics of an entrepreneur such as: initiative, aggressiveness, predisposition to take risks, ability to be analytical, ability to lead and communicate with people can not be educated, learned. However, time-based research has demonstrated that entrepreneurship is a set of processes, models that allow the study, respectively the acquisition of the necessary knowledge.

3. *Entrepreneurs are always inventors*: it is the result of a poor understanding, because even practice has proven that although many inventors are entrepreneurs, there are many successful entrepreneurs who were not great inventors, but they only showed ingenuity, finding new ways to use some concepts already existing, in other words invented.

4. *Entrepreneurs are socially and academically inadequate*: it is a belief that has formed because some businessmen have started their business after dropping out of school for some reason or been fired from a big company. True thing, however, is far from being able to truly assert that this is the unique portrait of the entrepreneur.

5. *Entrepreneurs must fit into a template*: is the consequence of several articles or books that show checklists about the characteristics of successful entrepreneurs but which have never been complete or generally accepted. But the last concerns have found that it is almost impossible to standardize such a thing, but it is more relevant to identify potential axes on which something can be built in this respect in a particular context from an individual perspective.

6. *Money is all that entrepreneurs need*: indeed, a business to survive needs capital, but often the existence of the funding source is only a necessary but not enough condition to fail, usually the most common causes of failure are: managerial incompetence, lack of understanding of financial issues, bad money investing or superficial planning.

7. *Luck (chance) is all that entrepreneurs need*: in other words, being in the right place and the right moment is always an advantage, but the chance only occurs when you are ready to meet it, to do it. In other words, in reality what seems to be good luck in a great deal is: knowledge, determination, desire, training, inventiveness, etc.

8. *Ignorance is the happiness of entrepreneurs*: is based on the idea that too much planning and evaluation inevitably leads to the identification of new mistakes. On the other hand, ignoring the problems turned out to be by no means the ideal solution to solve them.

9. *Entrepreneurs are looking for success, but experience shows that the rate of failure is higher:* a fact that confirmed in practice, many successful business people have experienced failures, but failure can teach you more than just a success, and on the other hand it is said that "it does not matter how many times you fall but how many times you get up "!

10. *Entrepreneurs are "Players" (they love extreme risk):* indeed, the ability to take risks, in other words risk is one of the key points of the entrepreneurial process. But the research done so far has confirmed that entrepreneurs are rational players who accept the risk but who, through careful planning and training, they come to assume a calculated, minimized risk.

We consider that the presentation of these so-called ten myths of entrepreneurship is particularly relevant at the beginning of the paper from at least two perspectives: to draw attention to a more detailed picture of the background of the studied concept but at the same time to delimit the boundaries of current entrepreneurial thinking and perspectives of future research.

Therefore, in order to better understand the nature of the entrepreneurial process and its importance in the knowledge-based economy, namely the economy based on innovation, it is absolutely necessary to know and understand the development of some theories in this plan as a first step.

The research of the entrepreneurial phenomenon has increased exponentially and directly proportional to the dynamics and implications it has had and has from different perspectives (we can mention for example the economic and social one), developing various research methodologies based on contextual empirical studies or oriented on certain processes in the attempt to define a theory of entrepreneurship, in fact to formulate a logical, coherent, possibly verifiable relationship that would underline the principles or explain the entrepreneurial process or foresee the entrepreneurial activity (eg to characterize the favorable conditions for a new business), to provide / suggest "what are the correct actions under certain circumstances "( Mariasole et al.,2014).

Starting from these premises, at the beginning of a new millennium, it is more than obvious that we need approaches, consistent theories or well-defined classifications to better understand an interdisciplinary or emerging field. Therefore, first of all, in order to analyze the entrepreneurial phenomenon in its complexity, it is necessary to know and clearly outline the ways of its approach

and its dissection, "which contain various approaches that can lead to the improvement of the understanding of this field" (Katz et al., 1988).

One of the ways of examining these theories is what is known as "thinking schools" and involves studying the entrepreneurial phenomenon by decomposing it at the level of specific activities that can be grouped at two levels, or from two perspectives: micro and macro to better understand the conceptual nature of entrepreneurship.

The macro approach presents a variety of factors that can influence the success or failure of entrepreneurial initiatives, including phenomena or processes beyond the contractor's control limits, being more than obviously being handled by external forces. The most comprehensive approach in this case is that focusing on the environmental axis, external environmental factors that can affect the individual entrepreneurial potential of: institutions, value systems, and more, so by grouping them with socio-political factors that strongly influence the development of entrepreneurs (Van den Ven, 1993).

The second approach focuses on the process of identifying financial sources, highlighting the primordial, vital role of funding sources, capital in the development of any entrepreneurial manifestation, but there are also bibliographic sources that are aware that this analysis is only a segment of the entrepreneurial process (Brophy and Shulman, 1992).

The third macro-level approach also focuses on a group of phenomena that clearly affect entrepreneurial activity at the individual level, stating that individuals will not be interested in taking the risks of their own business unless they are prevented or forced to give up other activities. This school of thought also reveals three types of reallocation: political, cultural, and economic.

The micro-approach, we could say in opposition to the macro approach, examines specific entrepreneurial factors, but which are included within the entrepreneur's control limits. Entrepreneurial potential in this vision is the ability to control, direct, adjust each result of these major influences (Kuratko, Hodketts, 2004). The first approach from this perspective is based on identifying a set of common characteristics of successful entrepreneurs, relying on the results of studies that had as subjects successful people who tended to manifest themselves in the same way, trying to establish a set of characteristics necessary for entrepreneurial behavior such as creativity,

determination, technical knowledge, education or family experiences. The theory supports the hypothesis that if these characteristics are promoted and developed early, it is the premise of successful entrepreneurship. The second approach on this level focuses on highlighting the key role of creativity in capitalizing on opportunities. Of course, the opportunity by which through an interdisciplinary training grows the ability to recognize them when they appear and to take proper steps to take advantage of the facilities they offer. The third way of thinking about the entrepreneurial mechanism bases its assertion on the approach of entrepreneurial theory from the perspective of the strategic formulation, the role of the planning process for the development of successful entrepreneurial activities (Hytt et al., 2010). Pragmatically speaking, the idea is that strategic success is based on: unique markets, unique personalities, unique products and unique resources.

Systematizing the mainstream thinking about entrepreneurial theories is a first step, a first attempt to authorize the attempts to understand the mechanism, the capabilities and resources needed to support and develop it.

### **1.1.2. Entrepreneurial Models**

Another way to examine the entrepreneurial phenomenon is the procedural approach. The specialized literature reveals a wide variety of ways of structuring the entrepreneurial process and the multitude of factors of influence, it is necessary in our opinion to establish criteria for their grouping and evaluation in order to select and present those models capable of forming the integral starting point , integrator and relevant to the research to be undertaken. Considering that it is extremely important to study the entrepreneurial process, approach from the following perspectives: individual, environmental and multidimensional, we consider that the fundamental structures for the process of entrepreneurship approach are the models that we will continue to outline.



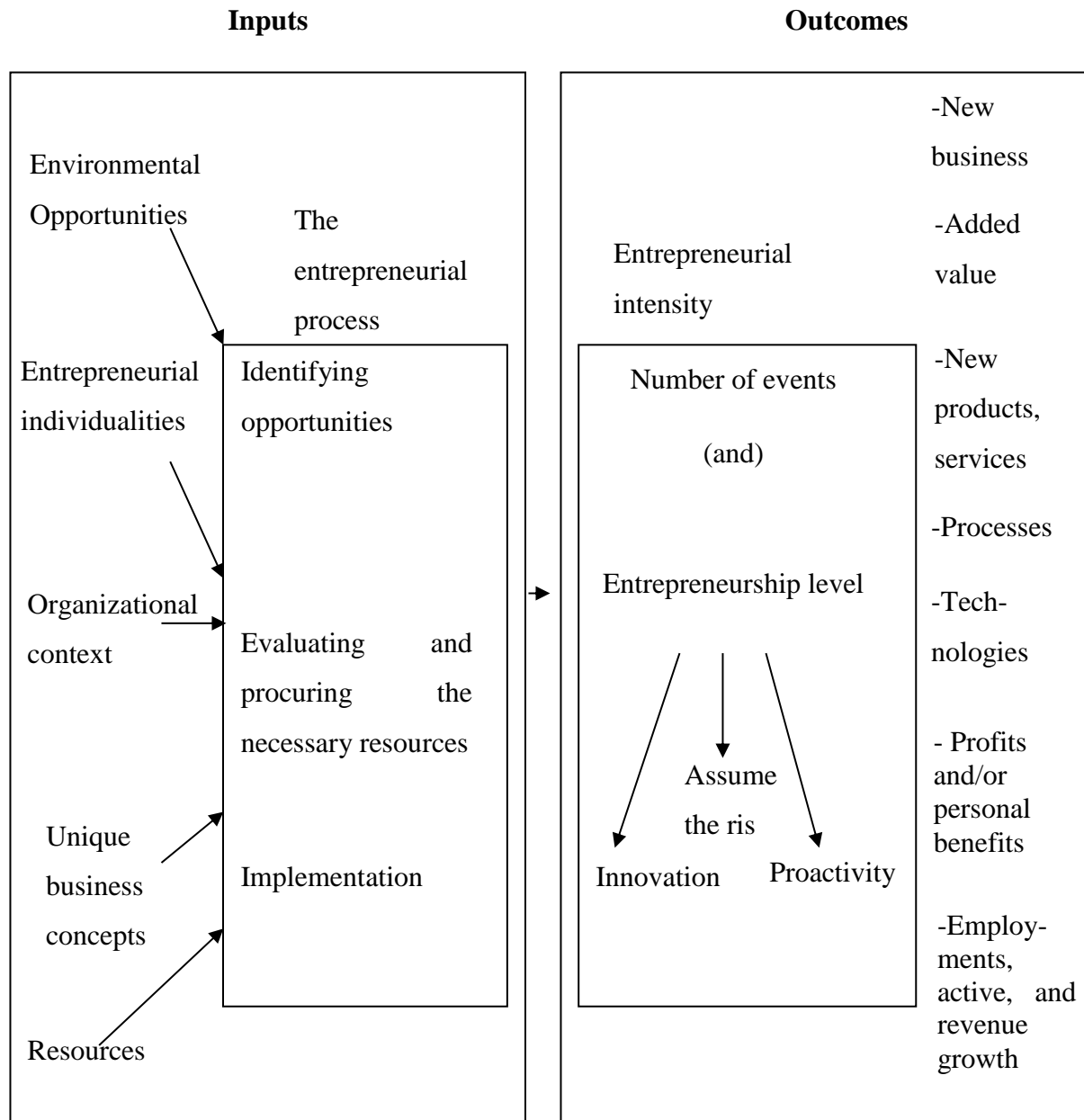


Figure 1.1. Integrative entrepreneurship model inputs - outcomes (Morris et al., 1994)

Due to the interdisciplinary character of the entrepreneurial phenomenon, the most integrative image of the entrepreneurial process is provided by Morris's "integrative inputs-outcomes model" (Morris et al., 1994). The model is built around the concepts of inputs and outputs or the results of the entrepreneurial process. The model therefore identifies on the one hand the entrepreneurial

process itself with five key elements: environmental opportunities, entrepreneurial individualities, organizational context, unique business concepts and resources.

All of these elements act directly on the entrepreneurial process, constituting the inputs into the system and depend on: their identification, access and accuracy of implementation.

On the other hand, the model suggests, given the intensity and magnitude of the entrepreneurial phenomenon, a variety of terms of a wide variety that can be assimilated to the results of the entrepreneurial process such as: one or more business, added value, new products or processes, new technologies, profit, individual benefits, jobs and economical growth.

The usefulness of the model and its relevance not only provides a complete picture of what entrepreneurship is, but at the same time reveals the possibility of using it at different levels: a new business, department or corporate strategic unit of a corporation.

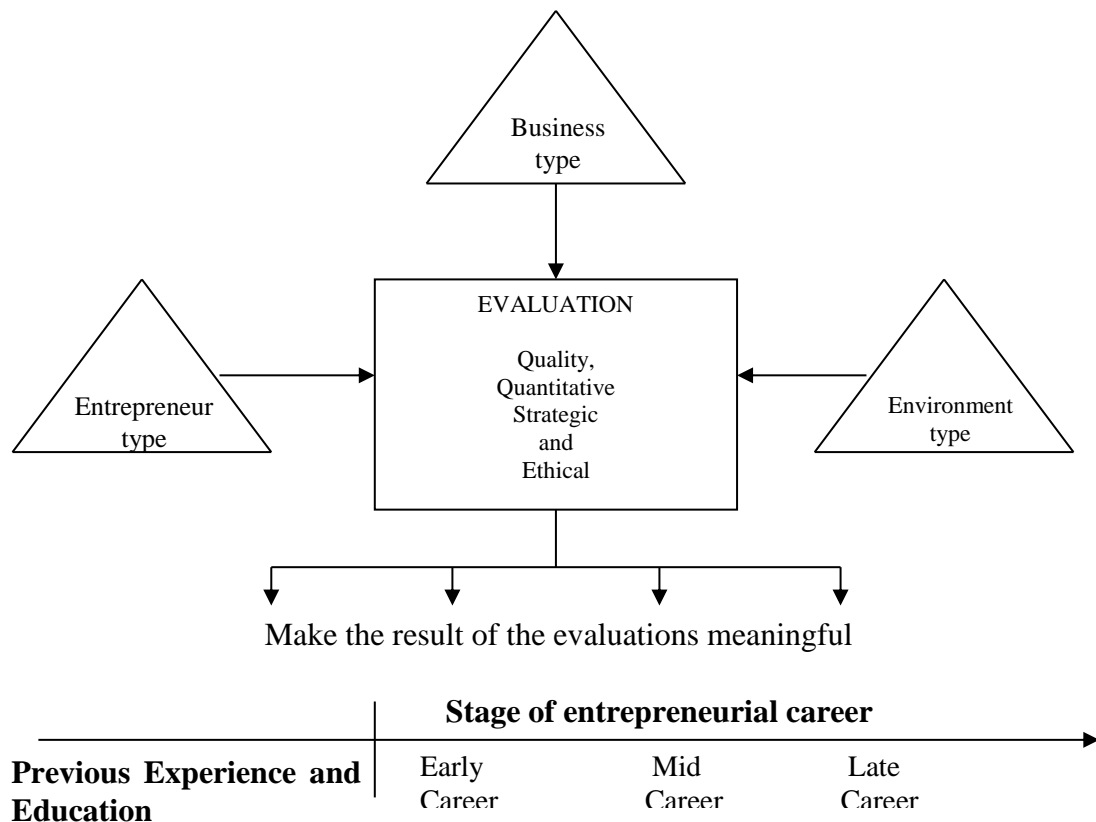


Figure 1.2. Entrepreneurial evaluation model (Ronstadt, 1984).

Another relevant model in our opinion is that developed by Robert C. Ronstadt, which proposes a four-dimensional approach: qualitative, quantitative, strategic and ethical from the perspective of: the entrepreneur, the business and the environment (see Figure 1.2). The idea that the model suggests is that examining the entrepreneurial process, moreover the results of this assessment must be analyzed, compared, interpreted in a context dependent on the stage of the entrepreneurial career, or what the author of the model calls an "entrepreneurial perspective". The model therefore emphasizes that the role of the individual characteristics in the entrepreneurial process is essential and the individual perspective can be the starting point in the attempt to study and explain this phenomenon.

The third model we are presenting manages to combine the two major directions proposed by previous models plus the processual approach in the organizational context (see Figure 1.3). The third proposed vision is, as you can see, a complex multidimensional nature that highlights four major axes of the entrepreneurial phenomenon: the individual, environmental, organizational and processual-internal aspects of the new business, highlighting the interdisciplinary character but especially interactive and particularly dynamic of the entrepreneurial process. At the same time, it reconfirms what the first models have gradually proposed and moreover, it crystallizes the role and position of the "individual axis" in the perspective of the entrepreneurial process, highlighting variables or factors of influence from this perspective, among which education. Moreover, the notion of a learning process at an individual level in the entrepreneurial spirit is present in the opinion of many authors concerned about this link. For example, there is an opinion explaining how information, by practical means, influences the entrepreneurial process (Vyakarnam, 2008). On the other hand, entrepreneurship education generally has a positive impact on entrepreneurial attitudes and there may be differences that diminish the impact due to: gender, cultural values, the industrial sector, the regional context (Packham, 2010).

In this context, starting from the premise of knowing how to approach the entrepreneurial process, and considering that entrepreneurial behavior is considered in the literature, almost unanimously, a type of planned behavior justifies the idea that it can be learned, educated.

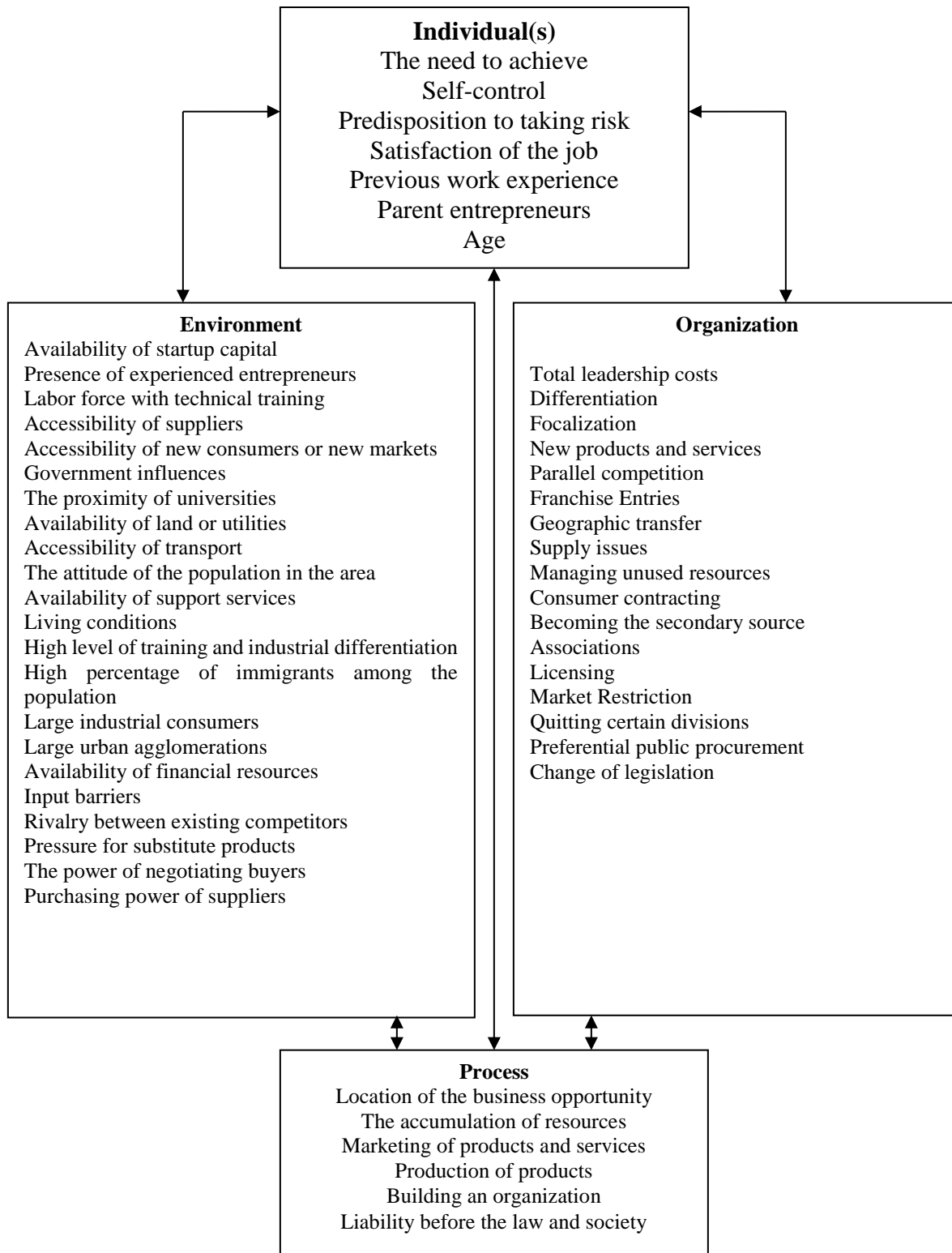


Figure 1.3. The multidimensional model (Gartner, 1985).

Therefore, our main concern in the following subsection of the paper will be first of all to delimit the concept of education in an entrepreneurial context as clearly as possible, and then to study some potential correlations, respectively its influences on the dynamics of the entrepreneurial phenomenon.

## **1.2. Education in entrepreneurial context**

### **1.2.1. Conceptual delimitation**

The perception of the lack of a real entrepreneurial culture as well as of a harmonious manifestation of small enterprises / businesses in our country compared to the European Union space and at the same time at European level compared to other areas of the world was one of the reasons for which we will try to find relevant explanations and potential viable solutions to improve the situation. On the other hand, understanding the entrepreneurial intent, especially *why?* and *how?* Entrepreneurs creating new businesses seems to be the best starting point for our research. The European Commission's Report , “Entrepreneurship in Europe” suggested a series of measures to be taken to improve the quality, relevance of entrepreneurial knowledge and entrepreneurial student experience: defining the purpose of entrepreneurship education more clearly, taking into account the local context when designing , developing and running entrepreneurship programs, developing a critical mass of entrepreneurship educators, and ensures high mobility to facilitate the exchange of experiences, the sharing of best practices, etc. All these measures are necessary, as I have already argued, from the premise that education generally has a positive impact on entrepreneurial attitude, which in turn is an important part of the puzzle attributed to individual characteristics and entrepreneurial experience (Sowmya and Majumdar , 2010) but can also be a prerequisite for entrepreneurial intent.

From a conceptual point of view, defining education in an entrepreneurial context was made using an extremely varied terminology. For example, an ongoing, active debate refers to the modalities of the educational process, the levels of deployment and the possible differentiation that may arise, for example, between enterprise education and entrepreneurship education ("graduate enterprise or graduate entrepreneurship"). Thus, beyond the vertical approach to cycles specific to national, classical educational systems, is the bivalent, horizontally approach of education from an

entrepreneurial perspective, namely: it refers to enterprise education "a minimum set of skills that every student needs to possess" (Gibb, 2005) as a prerequisite for entrepreneurial education, "intercourse between graduating a faculty and predisposition to entrepreneurial behavior" (Nabi et al., 2006) that requires: attitude, creativity, motivation, relationship, organization.

In the same context, the intellectual and pedagogical fundamentals for the development of enterprise education were established, including the appropriate observation that entrepreneurs thrive in changing conditions and uncertainty (Gibb, 2002). However, one can not elucidate the recursive theme that there is a cultural division in education between bureaucratic-corporative and entrepreneurial values manifested by the polarization between didactic and the entrepreneurial learning pathways that persist in the educational plan (Gibb, 1993; Rae and Draycott, 2009).

Entrepreneurship, seen from the most focused perspective, implies the practical ability to create a new organization, to start a new business. Starting from this idea in order to elucidate the enigma of "entrepreneurial education" there were voices proposing a certain typology of courses for the training of businessmen and entrepreneurs focusing mainly on providing information about entrepreneurship opportunities and encouraging participants to think in terms of developing an entrepreneurial career. Subsequently, the spectrum of educational concerns was extended to start-up training, thinking about training programs capable of developing skills to be self-employed, to be able to achieve a level of financial autonomy, or in terms of concerns the growth and survival of relatively small businesses. Subsequently, the spectrum of educational concerns was extended to start-up training, thinking about training programs capable of developing skills to be self-employed, to be able to achieve a level of financial autonomy, or in terms of the growth and survival of relatively small businesses. Of course, traditionally speaking, in civilized economic systems, entrepreneurial education was a concern in business schools, based on case studies, overall concerns about the development of curricula for non-business students, but especially in terms of developing practical skills in starting a business beyond or before the academic sphere, is a matter of not long "under the magnifying glass" (European Commission., 2008).

Another approach to entrepreneurial education (Hannon, 2004) implies the transition to experimental learning, suggesting learning more "for" than "about" entrepreneurship, suggesting rather focusing on the tangible results of a business plan rather than on entrepreneurial skills. For

this purpose, the educator can adopt different roles, explicitly using entrepreneurial education tools to achieve "greater consistency, clarity and coherence of purpose, process and practice" (Hannon, 2005), of course, educational. In the literature, regarding the term of entrepreneurial education, there is also the expression "entrepreneurial learning", which implies: active learning, individual involvement, development of identity and practical ability, theorizing through learning not least "learn to recognize and act on opportunities and interact socially to initiate and organize business" (Rae., 2005).

As I have already said, a distinction, imposed on contextual and procedural reasons, can be made between enterprise education and entrepreneurial education. As education generally seeks to focus on learning and assimilating new pedagogical methods and technologies, it is inevitably subject to: institutional control, order, institutional responsibility, and last but not least teaching and learning what is programmed to achieve certain measurable prescribed results. Entrepreneurial education in turn, implies to a large extent exactly the contrast, it is based on creativity-driven learning, information, curiosity, emotion and its applicability in the context of real personal problems and opportunities. Moreover, the literature on entrepreneurship suggests that the possible "targets" for entrepreneurship education must derive from the goals of the entrepreneurial process, which, in the most comprehensive sense, refers to (Hytti, Stenholm, Heinonen 2010):

- 1-increasing the level of entrepreneurial knowledge
- 2- developing the entrepreneurial skills of individuals and businesses
- 3- starting new business.

Starting from these premises, but especially in the current context, we must recognize that learning for entrepreneurship goes beyond the boundaries of the formal framework of the educational act at the level of a classroom or seminar, assuming the possibility or the chance to learn through experimentation, discovery and challenge.

Of course, the overwhelming majority of studies that highlighted student's positive attitude towards entrepreneurship have been achieved in developed countries where there are formal and

informal education systems, with only a few researches showing significant results at the level of economic and social systems of another nature and caliber

The importance of education and entrepreneurship education is supported by this context as defined above and by the most recent reports of bodies such as the World Bank and the World Economic Forum ("Doing Business 2011: Making a Difference for Entrepreneurs", "The Global Competitiveness Report 2011-2012", and "Global Entrepreneurship and the Successful Growth Strategies of Early Stage Companies"), which estimates the opportunities for business development in any economic system from analyzing so-called critical factors, defining them 9, including labor education.

A comparative picture from this perspective, as regards the former communist EU member states of Central and Eastern Europe, is presented in Figure 1.4, Figure 1.5, Figure 1.6, Figure 1.7, (World Economic Forum. The Global Competitiveness Report 2010-2011. Geneva, 2010. p. 4).

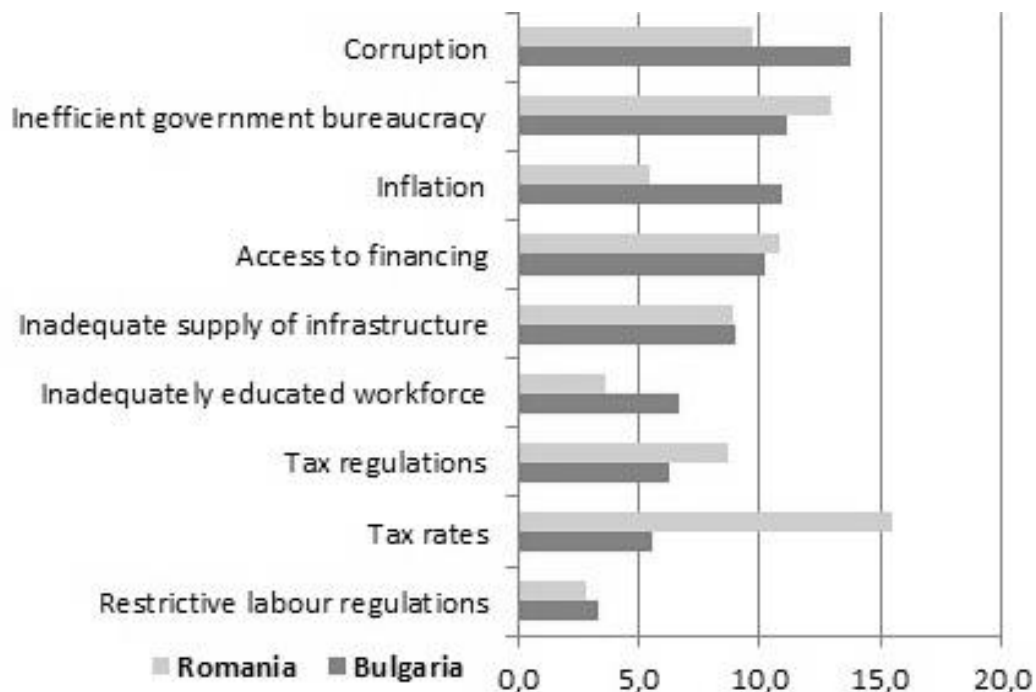


Figure 1.4. Economies focused on efficiency (Bulgaria & Romania)



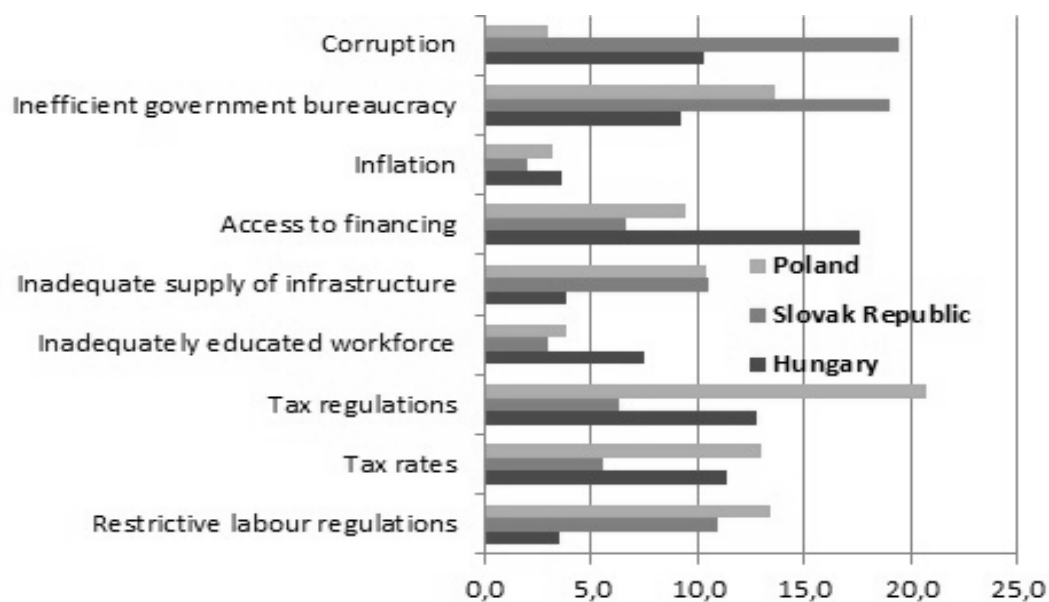


Figure 1.5. Economies in transition (from economies focused on efficiency to innovation focused economies: Polonia, Slovakia & Ungaria)

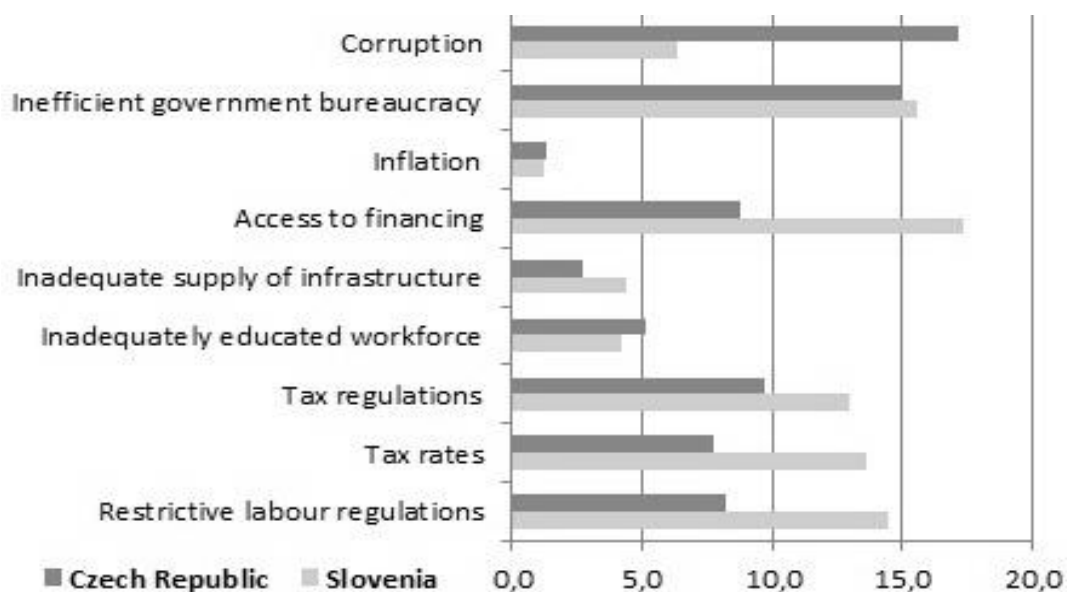


Figure 1.6. Economies focused on innovation (Slovenia & Cehia)

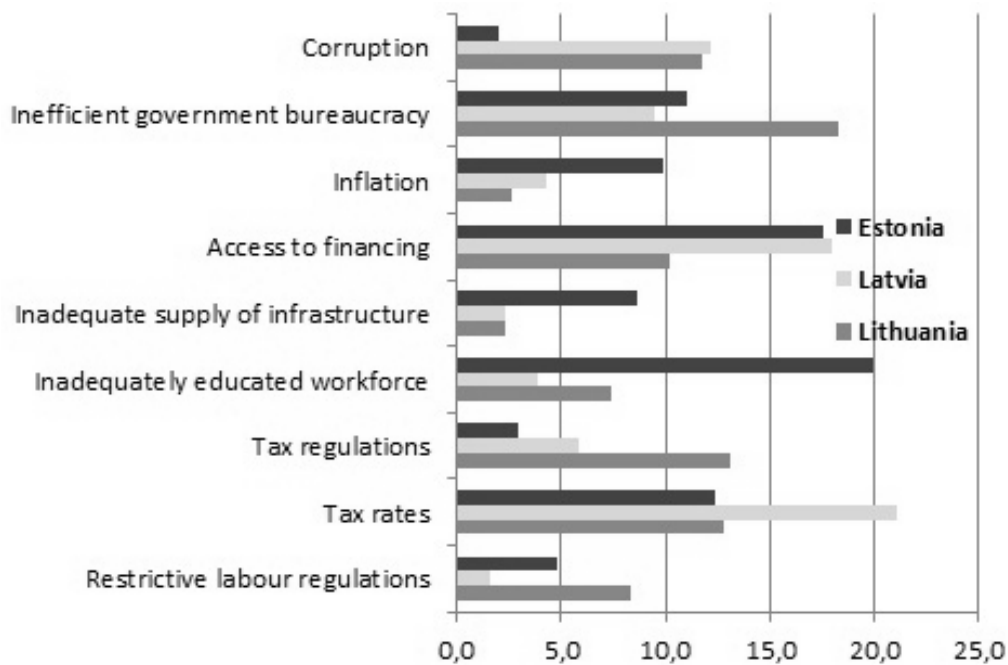


Figure 1.7. Economies in transition (Estonia, Letonia & Lituania)

In view of these aspects, we will continue to try to present, as a whole, beyond formal boundaries but of course, without excluding them, all entities capable of providing support for entrepreneurial education in Romania and, on the other hand, group them to national and regional level and eventually assess their potential.

This is necessary both from the researcher's perspective and from the potential interested, at least from the following perspectives:

- to know where it is possible to find relevant information on both formal and informal training programs available at national or regional level.
- to learn how we can get support information with the support of resource ministries, or other national, governmental or other programs.
- to know the role of the facilities available at universities and research institutes that promote and support entrepreneurship.

- to know and understand other forms of existence / manifestation of entrepreneurs and entrepreneurship.

*Entrepreneurial culture trainings* contribute to: foundation of the entrepreneurial process, psychosocial processes in entrepreneurship, innovation and business strategy, marketing planning, human resources management and negotiation, logistics and production management, management information systems, legal framework of business creation, investment and financing analysis, financial planning and short-term financial management, taxation, and financial analysis and management control systems.

### 1.2.2. Evaluation of the educational offer

In this context, where it is more than obvious that education in general and entrepreneurship education are particularly necessary, because their role is important for the evolution and if necessary, the redefinition of entrepreneurship (but of course we are referring to new-interactive-creative-innovative teaching and learning methods), we intend to further analyze the level of innovation offered by entrepreneurship education facilitators in Romania, implicitly education, and then to make a comparative analysis with the countries in our immediate neighborhood.

The methodology I propose in this regard involves identifying the level of innovation based on a global innovation indicator –  $I_I$ , the level of which is obtained by summing up three indicators: the Satisfaction Indicator of Education -  $I_{ES}$  (corresponding to the delightful features of Kano's model (Kano, 1984)); the Inventiveness Indicator -  $I_{IN}$ , associated with Altshuler's five levels of inventiveness (Altshuller, 1999) and the Ideality Indicator -  $I_{ID}$ . Thus, the level of the global innovation indicator can be determined using the following relationship:

$$I_I = I_{ES} \cdot p_{ES} + I_{IN} \cdot p_{IN} + I_{ID} \cdot p_{ID} = I_{ES} \cdot p_{ES} + I_{IN} \cdot p_{IN} + \left( \sum_{k=1}^9 i_k \cdot q_k \right) \cdot p_{ID} \quad (1)$$

where:

- $p_{ES}$  – share of the satisfaction indicator;
- $p_{IN}$  – share of the inventiveness indicator;
- $p_{ID}$  – share of the ideality indicator;

- $i_k$  – subindicators of the degree of ideality;
- $q_k$  – share of the subindicators of ideality.

It is recommended, of course, that both in the first situation and in the second the sum of the shares be equal to 1, at the same time it is possible that certain shares may be zero according to the analyzed field.

If we start with Noriaki Kano's model, the characteristics of a particular product or service (especially in our analysis) in terms of customer satisfaction are three: unsatisfactory features, satisfying features and delightful features.

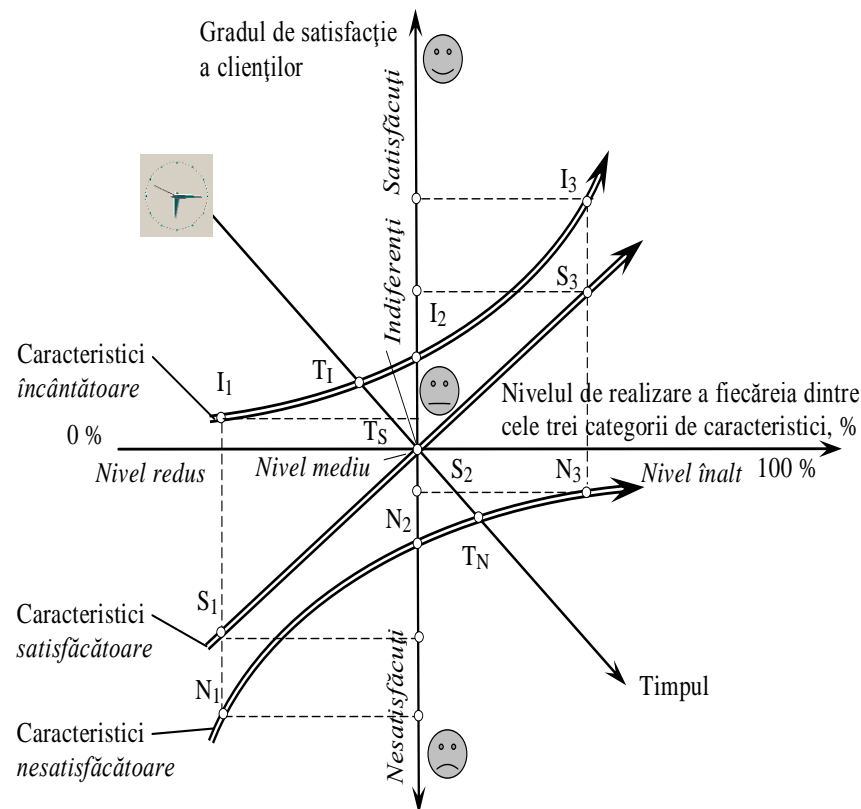


Figure 1.8. Customer satisfaction model (Kano, 1984)

The unsatisfactory features, in the sense of dissatisfaction, are those features of a service/product that cause dissatisfaction to customers when they are missing or are at a low level, and cause indifference, when they exist and are not made at a high level. Unsatisfactory features are "expected quality".

Satisfactory features are those features of a product that customers know, want and ask about when they buying products. When they do not find the product, customers are unsatisfied, and if they are made, they are satisfied.

Delightful features are surprising, attractive or enthusiastic features, and are "enthusiastic quality" or "unexpected quality."

In the Kano model (see Figure 1.8), the horizontal axis indicates the level of accomplishment or achievement on the product of each of these three categories of characteristics, and the vertical axis shows the degree or level of customer satisfaction determined by the three categories of characteristics.

In the proposed work methodology, we consider it appropriate that the Satisfaction Indicator of Education -  $I_{ES}$ , should only refer to the unsatisfactory features defined by Kano's model, because in the analyzed case, their elimination implies an innovative effort on the part of the suppliers and at the same time they represent most often the decisive factor for the appearance of the delightful features and the success of the service on the market.

In this regard, a possible scale for consumer satisfaction (student) is presented in the following table:

Table 1.1. Scale for the level of "satisfaction" of education

Notes	1	2	3	4	5	6	7	8	9	10
Features	$\geq 5$		4		3		2		1	

As can be seen in Table 1.1, it is proposed that the Satisfaction Indicator of Education -  $I_{ES}$  level be set from 1 to 10 depending on the number of unsatisfactory features identified.

To determine the Inventiveness Indicator -  $I_{IN}$ , associated with Altshuler's five inventiveness levels, the qualification will be awarded following the following procedure:

- note 10 – for level 5: involves products and services resulting from rare scientific discoveries that are completely new, which involve overcoming the known borders of science at some point;
- note 8 – for level 4: involves new products and services, or new generations of products and services, for which new principles have been used and solutions are the result of clarifying the phenomena from various fields;
- note 6 – for level 3: involves fundamental improvements to existing products and services by known methods, seeking solutions in related fields or in other areas;
- note 4 – for level 2: involves minor improvements to existing products and services, sources of inspiration coming from the same industry;
- note 2 – for level 1: does not imply any invention, the possible improvements being the result of routine and the use of known methods from the same field of activity, the source of inspiration being their own knowledge.

According to the relation (1), the determination of the third main subindicator, the ideality indicator -  $I_{ID}$ , involves the determination of some secondary indicators - which are nine, from case to case, as follows:

- the system dimensionality indicator ( $i_1$ ), highlights system levels;
- the aggregate status indicator ( $i_2$ ), refers to increasing the system's flexibility in terms of entries, rules, etc;
- indicator of the type, nature and frequency of interventions on the system ( $i_3$ ), take into account the frequency with which modifications are made and their nature;
- the porosity indicator of the system ( $i_4$ ), highlights the increasing flexibility of the system by its evolution from a closed system to an open system;
- system dynamism indicator ( $i_5$ );
- the human involvement indicator ( $i_6$ ), focuses on human involvement in the evolution of the system;
- system multiplicity level indicator ( $i_7$ );

- indicator of the nature, type and dimensionality of the functions and properties of the system ( $i_8$ );
- the convolution rate indicator of a system ( $i_9$ ), determined on the basis of the convolution coefficient of a system ( $C_c$ ) which is defined as the ratio between the number of fields and the number of elements of the system or between the number of functions and the total number of elements involved in performing the function of the system having values in the interval  $[0, 1]$ .

Considering the above, we propose in Table 1.2 how to grant grades at different levels reached by the indicators presented.

Table 1.2. Scale for the level of "idealism"

Grades	1	2	3	4	5	6	7	8	9	10
$i_1$		0		1		2		3		$\geq 4$
$i_2$		0		1		2		3		$\geq 4$
$i_3$	$\geq 4$			3		2		1		0
$i_5$	annual		biannual		quarterly		monthly		bi-monthly	
$i_6$			reduced			medium			big	intense
$i_7$		1		2		3		4		5
$i_8$		1		2		3		4		5
$i_9$	0-0.25		0.25-0.45		0.45-0.65		0.65-0.85		0.85-1	

Further, with the help of the presented working methodology, we will assess the level of innovation for entrepreneurship facilitators in Romania and their educational offer.

This has led to the following results:

1) When determining the Satisfaction Indicator of Education -  $I_{ES}$ , at least four unsatisfactory features can be considered, such as:

- the promotion and implementation of the concept "learning by doing" (eg: projects, virtual business, the possibility of using theoretical knowledge in practice) is still at the challenge level because, with regard to the practice activity that students have to carry out annually, the majority of universities (whether state-owned or private) have adopted the version of it, merged at the end of the study year, before the summer vacation, or this activity remains exclusively the responsibility of the students during the summer vacation. In both variants, we consider that only a formality is achieved or marked a moment, remaining a long way to achieving the stated European objectives that argue that genuine entrepreneurial skills must be initiated, developed and amplified especially at university level;

- the involvement of entrepreneurs and local companies in the development and implementation of entrepreneurship courses and entrepreneurial skills development activities is often only in documents (we refer to the functioning of the boards that should include people coming from the business environment and who should effectively participate in the establishment of education plans and curricula). If we analyze for example the 5th West Region, the activity of the four counties is recorded: almost ten business incubators (Business Incubator Software Timișoara - UBIT, The business incubator and the center for technological transfer, integrated in the Industrial and Technological Park Timisoara - PITT, The cross-border business incubator, Business Incubator Jimbolia, Timis, Business incubator for retired military personnel, Timis, Business and Technology Incubator Deva -ITA-BMTECH, Business Incubator Pecica, Arad, Business Incubator ITA, Arad, Business and Technology Incubator UAV-IT Arad), Chamber of Commerce, Regional Development Agency, and other programs (The Entrepreneurship Program - a career alternative for the West Region). Unfortunately, 8 incubators out of 9 are concentrated in the counties of Timis and Arad, so a totally uneven distribution and inversely proportional to the level of economic development. Also collaboration between universities and local business companies (Alcatel, Siemens, Continental etc.) is increasingly difficult, probably due to the financial crisis, their involvement in conceiving, implementing and developing study programs being extremely meteoric and inconsistent , with a few exceptions:



- the level of motivation of teachers (financial but not only) is very low compared to developed countries where there is indeed an entrepreneurial education, as a consequence, most often the most competent people leave the system;

- the lack of correlation and coordination of the efforts of entrepreneurial education promoters to ensure continuity, efficiency and effectiveness, in the context where there is no clearly regulated (public - private) partnership. Thus, there are often overlaps that lead to waste of efforts and resources, or uncovered areas, more specifically: poorly managed and dubiously implemented projects, companies hiding behind the privacy screen, and more or less theoretical rather than dynamic, innovative, entrepreneurial study programs.

Considering the above, and according to the proposed scale, the rating is 3.

2) When determining the Inventiveness Indicator -  $I_{IN}$ , it was assumed that the possible "targets" for entrepreneurial education must derive from the goals of the entrepreneurial process, which, in the most comprehensive way, refers to: 1 - increasing the level of entrepreneurial knowledge; 2 - developing entrepreneurial skills of individuals and 3 - starting new business (Hytti, Stenholm and Heinonen, 2010). Therefore, entrepreneurship education implies in our opinion more than obtaining fundamental improvements of existing products or processes. Moreover, the multidimensional model of entrepreneurial approach (Jhonson, 1990), which presents entrepreneurship as a complex, multidimensional process involving the individual, environmental, organizational and business aspects, clearly highlights the fact that the results of entrepreneurial education involve: new products / services or new generations of products / services for which new principles are used and solutions are the result of clarifying phenomena from various domains;

Considering these premises, the rating is 8.

3) When determining the ideality indicator -  $I_{ID}$  the following ratings were granted:

- the system dimensionality indicator ( $i_1$ ), received a note 7 because the entrepreneurial education "manifests" more consistently only in high school, university and sometimes in some projects;

- the aggregate status indicator ( $i_2$ ), refers to increasing the system's flexibility in terms of entries, rules, received a note 6, because in the analyzed case the entrepreneurial education in reality is only available through participation in master programs or within short-term training on certain projects;
- the indicator of the type, nature and frequency of interventions on the system ( $i_3$ ), received a note 2 because in the last period (especially in the last 20 years), in Romania, the education system has been the subject of numerous legislative amendments, unfortunately without benefiting a clear strategy including a long-term perspective of entrepreneurial education;
- system dynamism indicator ( $i_5$ ), received a note 1 because the internal dynamics of the education system is relatively low, for example it is possible to change the formal education plans to 3 or 5 years in order to authorize or accredit a study program;
- the human involvement indicator ( $i_6$ ), focuses on human involvement in the evolution of the system, the rating is 10, because in this process the human resource is the most important;
- the multiplicity degree indicator of the system ( $i_7$ ), the note given is 5, because at least four characteristic major axes: individual, organizational, environmental and procedural, have been identified.
- indicator of the nature, type and dimensionality of the functions and properties of the system ( $i_8$ ), the note given is 6 because the functions of entrepreneurial education derive from the goals of the entrepreneurial process, which, in the most comprehensive sense, refers to: 1 - raising the level of entrepreneurial knowledge; 2 - developing the entrepreneurial skills of individuals and 3 - starting new business;
- the convolution level indicator of a system ( $i_9$ ), received a note 4 because the ratio between the functions of entrepreneurial education (3 in number as previously defined) and the number of perspectives to approach entrepreneurship at the individual level (which is 8: the need for affirmation, self-control, risk assumption, work satisfaction, previous work experience, family entrepreneurial experiences, age and education) is 0.37.

The shares used in this case were:  $q_1=0.05$ ;  $q_2=q_5=q_6=q_8=q_9=0.15$ ;  $q_3=q_7=0.10$ ;

In the same context, to determine the global innovation indicator –  $I_I$ , the shares of the three indicators are: for the satisfaction indicator -  $I_{ES}$ ,  $p_{ES} = 0.30$ ; for the inventiveness indicator -  $I_{IN}$ ,  $p_{IN} = 0.40$  ; for the ideality indicator -  $I_{ID}$ ,  $p_{ID} = 0.30$ .

Thus, the value obtained for the global innovation indicator –  $I_I$  for our country is 5.49 on a scale from 1 to 10.

Of course, beyond the score obtained in our country, before highlighting the possible causes that led to this result, we consider it more than appropriate first of all, to present the result of a comparative study (see Table 1.3), the level of innovation obtained in the case of three other European neighboring countries (which presents from many points of view, including from the educational perspective, similarities with our country), using the same methodology and the data provided by certain studies on entrepreneurship education. (Ruset et al. 2010, Tamasila and Foltean 2011, Todorova et al., 2011, Kelley et al., 2012).

Table 1.3. Comparative results

<b>Indicators</b> <b>Countries</b>	<b>I<sub>ES</sub></b>	<b>I<sub>IN</sub></b>	<b>I<sub>ID</sub></b>								<b>I<sub>ID</sub></b>	<b>I<sub>I</sub></b>
			<i>I<sub>1</sub></i>	<i>I<sub>2</sub></i>	<i>I<sub>3</sub></i>	<i>I<sub>5</sub></i>	<i>I<sub>6</sub></i>	<i>I<sub>7</sub></i>	<i>I<sub>8</sub></i>	<i>I<sub>9</sub></i>		
<b>Shares</b>	<b>0.3</b>	<b>0.4</b>	<i>0.05</i>	<i>0.15</i>	<i>0.10</i>	<i>0.15</i>	<i>0.15</i>	<i>0.10</i>	<i>0.15</i>	<i>0.15</i>	<b>0.3</b>	1
<b>Romania</b>	4	7	7	6	2	1	9	5	6	4	4.95	<b>5.49</b>
<b>Bulgaria</b>	4	7	7	6	6	1	9	5	6	4	5.35	<b>5.61</b>
<b>Ungaria</b>	7	8	8	5	6	1	8	7	6	4	5.30	<b>6.89</b>
<b>Serbia</b>	5	8	5	6	6	1	7	6	6	4	5.05	<b>6.22</b>
<b>Average</b>	5	7.5	6.75	5.75	5	1	8.25	5.75	6	4	5.16	<b>6.05</b>

As can be seen, the level of the global indicator according to the proposed methodology is between a minimum threshold of 5.49 (Romania) and a maximum limit of 6.89 (Hungary). Another observation is that both Romania and Bulgaria (at a very short distance) are below the average of 6.05.

In our opinion, the relatively low level of the global indicator, especially in the case of Romania and Bulgaria, is a consequence of: the low level of promoting and implementing the concept of "learning by doing", the more theoretical involvement of entrepreneurs and companies than practical in designing and developing / implementing educational programs and actions aimed at cultivating and developing entrepreneurship, low level of motivation of teachers (financial but not only), lack of correlation and coordination of the efforts of entrepreneurship education

promoters to ensure continuity, efficiency and effectiveness, a relatively inflexible educational system, but at the same time, as an irony of fate, too dynamic in terms of: structure, principles or legislative amendments.

The obtained results reconfirm the variety of influence factors of the education in general and the entrepreneurial education in particular, influences of intrinsic and extrinsic nature of the variable complexity from the perspective of: economic situation, market changes, environmental restrictions, social-political situation and legislative, available resources, technological, psychological and cultural - individual and group (see Figure 1.9).

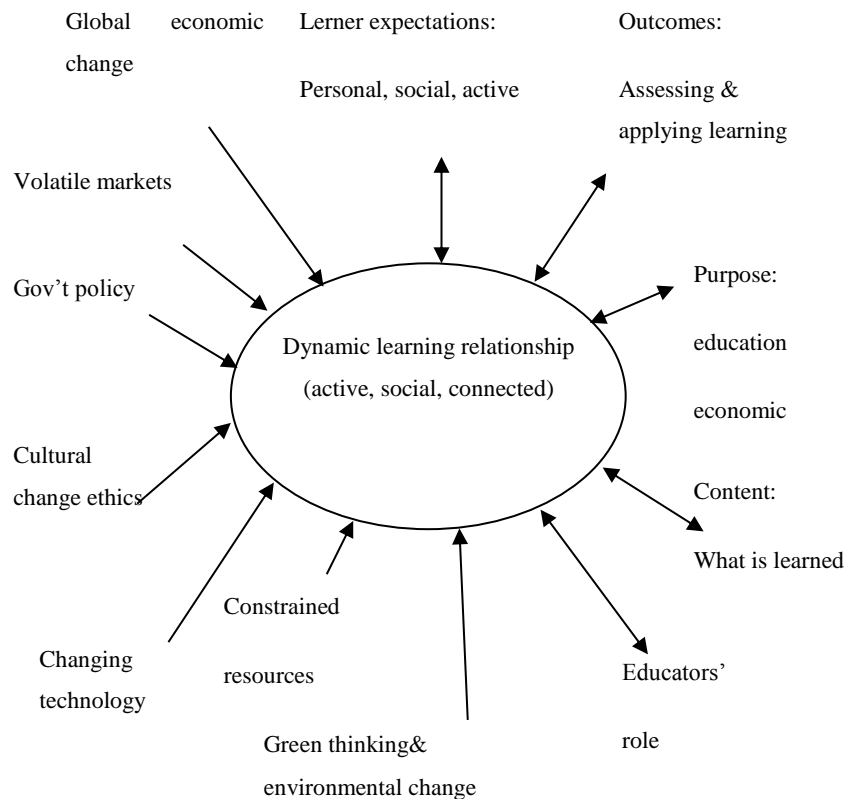


Figure 1.9. Entrepreneurial education in a new age (Rae, 2010)

Starting from this context we tend to believe that the key to elucidating the "education-entrepreneurship equation" can be found by focusing our attention on the variables in the system capable of producing influences, and more to provoke the intellectual assumption of the

entrepreneurial phenomenon, to determine a positive entrepreneurial attitude as a prerequisite for entrepreneurial intent.

The European Commission (EC) defines Entrepreneurship as the mind set and process (needed) to create and develop economic activity by blending risk-taking, creativity and/or innovation with sound management, within a new or an existing organization (Euractive Network 2003). Since 2002, Eurobarometer surveys found that European citizens are less inclined to become entrepreneurs, and more risk-averse than their American or China counterparts. Once a new company has been created, it also tends to grow at a slower rate than in the United States. Moreover, conditions for start-up companies vary widely across Europe.

Europe has limited levels of high-expectation entrepreneurship – just 4 in every 1,000 European adults are entrepreneurs with high-growth expectation – the lowest proportion of all world regions (Tracona (2009)). In the same time, the last GEM report has demonstrated a consistent U-shaped association between a country's level of economic development and its level and type of entrepreneurial activity (Bosman et al. (2008)).

The EC recognized the problem and made entrepreneurship one of the main objectives of the Lisbon agenda in 2000. The Commission launched a series of initiatives aimed at fostering support for small businesses in Europe. In January 2003, it adopted a “Green Paper on Entrepreneurship in Europe” to stimulate the debate amongst policy/decision makers, businesses, representative, organizations and experts on how entrepreneurship can be better promoted in Europe.

At European level there are actors, trainings and portals such as: European Certification & Qualification Association (ECQA, with databases on trainers and courses/training sessions); EU-Project (free virtual community for communication between EU-Project coordinators, partners, experts and interested people); European network to promote women's entrepreneurship (WES); Entrepreneurship in higher education; Promoting entrepreneurship; financing possibilities and access to financing - The European Entrepreneurs Exchange Programme. All these actors and tools support in different ways the European entrepreneurship. Also, there are entrepreneurship training

programs at the national and regional level, linked with the university curricula for graduate and postgraduate studies.

Consequently, our approach for building a database of facilitators accessible and updated permanently will be part of an entrepreneurial center digital library. The research results will be extended to EU level and will have the possibility of inter-correlation with other databases for increasing the number of potential beneficiary. The research approach will have a positive impact upon the young entrepreneurs.

### **Facilitators structures. Case study**

The identification, analyses and structures of the main facilitators; a database of facilitators accessible and update permanently; the first steps for creating and developing an entrepreneurial center. The research can be extend to euro-regional level; the possibility of inter-correlation with other databases and to increase the number of potential beneficiary. A database is a collection of information that's related to a particular subject or purpose. Using Microsoft Access, you can manage all your information from a single database file. Within the file, you can use: tables to store data; queries to find and retrieve just the data you want; forms to view, add, and update data in tables; reports to analyze or print data in a specific layout; data access pages to view, update, or analyze the database's data from the Internet or an intranet. Regarding the entrepreneurship facilitators, a database was created for this research, as a first step and a part of an entrepreneurial center digital library. Here we have a databases of facilitators with two tables: “facilitators” and “activities” in a relationship defined as many-to-many (one facilitator can have many activities and one activity can be made by many facilitators) (Figure 1.10, Figure 1.11).

Facilitators

Facilitator ID	Facilitator Name		
1	Universitatea "Politehnica" din Timisoara		
Address		Region	
		5 West	
City	County/Province	Postal Code	Country
Timisoara	Timis	300006	
Phone Number	Fax Number	Email Address	Internet Address
Entrepreneurial activities:			
Activity_1			
Activity_2			
Activity_3			
Activity_4			
Activity_5			

Record: 1 of 20

Figure 1.10. Facilitators table form

Activities

ActivityID	Activity Name	Facilitator ID	What
T001	Course	1	Course
How			
Notes			

Record: 1 of 11

Figure 1.11. Activities table form

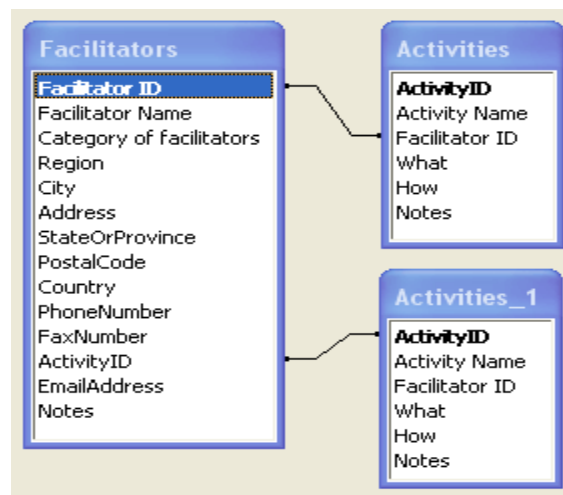


Figure 1.12. Database table relationships

The design and use of this database can be developed and extended, based on the future research intended in the field of entrepreneurship education and research. The research have implications on mentioned target group (best young researchers and entrepreneurs) because it give the possibility to access, analyses and use an important and considerable volume of information, which is actual, structured, elaborated, adapted and relevant with an major regional impact in entrepreneurship education and research. The identification, analyses and structure of the relevant regional entrepreneurial facilitators based on key criteria, the design and use of this database with the possibility of extension, correlation and update with the information which are addressed especially to best postgraduate students, top young researchers and entrepreneurs.

From the perspective of entrepreneurial education, the evaluation of university education is important. The research continues to outline the implications of student centered education.

Entrepreneurship focuses on student education. Below are the directions of student-centered education. University student education is a non-negligible part of the educational system that contributes significantly to both social and cultural growth as well as to economic growth through the employability process. Education requires the acquisition of knowledge, skills and practices in social sciences. This section conducts research to identify which are the most effective teaching methods used in the faculty, and which of these methods influence students in the learning process. At the end of this s a series of recommendations are addressed to students and teachers concerned with increasing the motivation and autonomy in learning, respectively by diversifying teaching strategies for teachers to help students in the learning process. These are relevant facts because students see this topic necessary for their later career. Learning is a process that contributes to changing the behavior of an individual, being conditioned by an individual experience. This process includes a strictly cognitive side, materialized by knowledge, the development of cognitive functions, the ability to comprehend, but also a practical side which refers to the learning of general methodologies, the formation of skills and abilities, the acquisition of social actions (Bonchiş, 2004; Klement, 2015). Higher education is characterized as a process of training through which a person acquires a system of information and activities that he then transforms into knowledge and experience. This process of training takes place between the two factors: the teacher and the



student. Among these factors there is an interaction, namely teaching-learning; teaching from the teacher's point of view, learning from the student's point of view.

Learning methods can be defined as "ways of action by which students, independently or under the guidance of the teacher, acquire knowledge, form skills, qualifications, attitudes, conception of the world and life" (Ionescu et. al., 2001). The forms of education in the university present a series of differences in pedagogical approach by the teachers. Over time, it has been noticed that the methods of education have been transformed, new ones have been created and some have disappeared. Currently, prominent methods are modern ones such as active teaching, e-learning and coaching. It has been noticed that universities are pursuing a distance from educational methods based on memory and rehearsal. Methods based on active participation are adopted, following the development and evolving of the student.

The quality of the teaching-learning-evaluation process can be increased if it is done in a stimulating, motivating, detained environment, based on a cooperated communication between teachers and students, the latter recognizing the right to ask further explanation for a more good interpretation of the information received as well as for their understanding. The concept of student-centered learning can be defined by various learning features such as flexible learning (Taylor Concept), experience-based learning (Burnard's Concept) or self-directed learning (Concept presented by O'Neill and McMahon) (Merriam, 2013; Păunescu et. al., 2014).

Student-centered education is an approach of teaching directly related to its constructive theories adopted within higher education institutions. This type of education is characterized by modern teaching methods that promote effective communication among learners, methods that help students develop their skills, knowledges and abilities. Within this type of learning all participants have to make their contribution to the learning process to have the expected results. It is intended to become an active participant alongside the teacher in the learning process. The student must strive to acquire and absorb the new knowledge, this being favored by his / her skills and motivation to learn (Beer et al., 2010; Merriam, 2013).

*What determines the student to show concern for research, to learn new information and absorb it, to solve, to ask for help from the teacher, to communicate and to cooperate with colleagues and*

*teachers?* Student-centered education directs the teacher to become a student mentor in the process of building his academic path. Another major role in this process is the higher education institution, which has to provide favorable conditions for a good development of the education process in which students actively contribute to the teaching-learning process (Mocan et. al., 2017). It is recommended that teachers adapt their teaching methods to meet the learning needs of the student. The student should be interested in new knowledge, have an initiative to learn, solve problems, have opinions, communicate and co-operate with colleagues and teachers.

These methods for improving the student-centered learning process have a number of advantages including the following: the student's power of expression, the student's ability to engage in building the teaching-learning process, the short-term mastery of information, the retention in the long run, the depth of the course material, the acquisition of critical thinking or problem-solving skills, the positive attitude towards the course, or the level of confidence in the acquired skills. Students are academically motivated when they have a positive relationship with their teacher, clear expectations, setting short-term goals, verbal and written appreciation (from teacher's side), stimulating discovery, exploitation and curiosity, giving more freedom in choosing methods demonstration of knowledge. Motivation requires trust. Students with professional performances do this because they get to work with passion and they have a certain desire to get their limits.

The method used to carry out this research is the *questionnaire survey*. This is a qualitative approach in order to identify the wishes and needs of the students. This questionnaire contains 19 questions and addresses to students from the higher education, regardless of the year of study (bachelor, master and doctorate). The sample of this questionnaire consists of 101 students. Of the respondents, 84.6% go to full-time education, 12.1% are distance education and 3.9% are minorities in low-frequency education. This questionnaire integrates questions about teaching methods, and which of these methods influences students in learning. Based on this study, a series of recommendations are addressed to students and teachers concerned with increasing motivation and autonomy in learning, and diversifying professor's strategies for teachers to help students in the learning process.

A questionnaire was applied to carry out the proposed investigation. The purpose of this questionnaire is to *assess students' degree of satisfaction with the teaching-learning process of university education*. In this chapter are presented the results obtained after applying the questionnaire on students in higher education.

From the perspective of the educational cycle followed, Figure 1.13, 74.7% follow the license, 20.9% master cycle and 4.4% doctoral cycle. The sample is formed predominantly by students from license cycle.

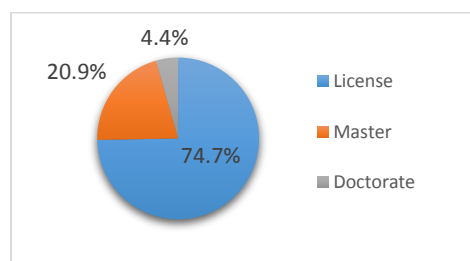


Figure 1.13. Education cycles

The profile of the faculty followed by each respondent is mostly divided between the three areas: 71.4% follow the technical profile, 14.3% the economic profile, 8.8% the human profile (science, medicine) and 5.5 % other faculty profiles that the institute offers, Figure 1.14.

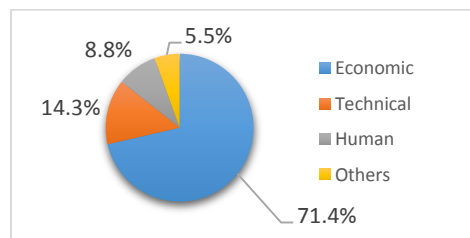


Figure 1.14. Profile of the faculty followed

To the question about the study year followed, Figure 1.15, we have a series of answers, from which 59.9% of the respondents currently are in study year 3, 20.9% in year 2, in year 1 we have 8.8% followed by 4th year with 5.5%, year 5 with 3.3% and for year 6 it was 2.2%.

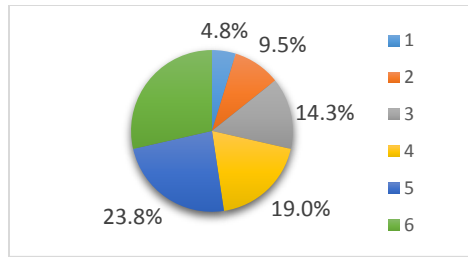


Figure 1.15. Year of study

To the question regarding the quality of the learning process carried out in the faculty, Figure 1.16, 16 of the persons gave the maximum rating, 16 of the persons note 8, 16 grades 7, 13 of the persons surveyed note 6, 8 people scored 9, 7 gave Note 2, 6 Note 4, 5 Note 3, and only 3 of the people gave the grade 5. The widest sample is covered by notes 7, 8 and 10, which leads to an above-average quality of the learning process.

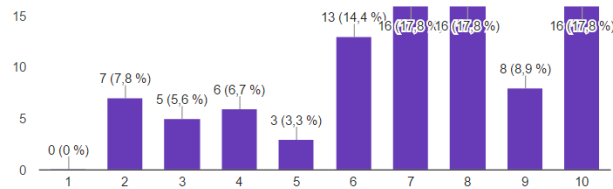


Figure 1.16. Learning process evaluation

The question about the importance of the process addressed by teachers in the teaching activity, Figure 1.17, shows that 58.9% responded that it is very important, 34.4% important and 6.7% are indifferent.

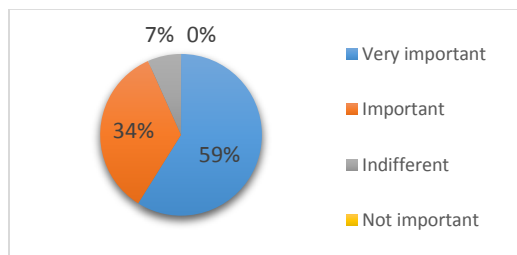


Figure 1.17. Teaching activity importance

As a result of the research carried out, Figure 1.18, from the perspective of the method used mainly by faculty teachers, it is observed that 44% of the respondents considered that the classical method

of teaching (monologue, exposure) is the most used, a percentage of 31.9% the method of free talks with 9.9% responded to the workshop method, 11% to modern / interactive methods and 3.3% to other methods. It can be noticed that almost half of the respondents appreciate that teachers use the monologue or exposure to the teaching hours, being at a distance from the free discussion method, which contributes to the conclusion that there is an adaptability of the human resource to the conditions of the current environment.

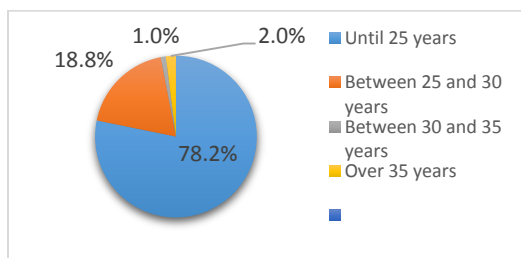


Figure 1.18. Methods used by teachers

To the question, "What learning method do you prefer?", Figure 1.19, 58.9% said the visual association method is the most preferred, 18.9% prefer the actual memorization method, 14.4% method based on auditory association and 7.8% prefer other learning methods. The visual association method helps to keep information more readily.

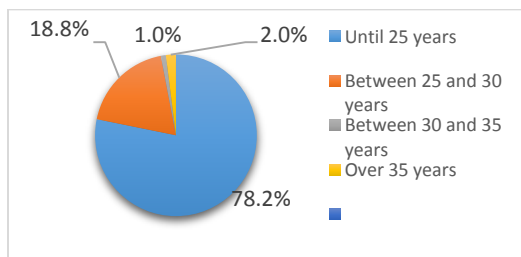


Figure 1.19. Preferred learning methods by respondents

Evaluating the results to the question "how do you appreciate the teaching methods currently used in your faculty", Figure 1.20, 25.8% appreciated the methods used as +4, 32.6% appreciated +3, 21.3% appreciated the methods as +2, 15.7% rated the methods as +1, 2.2% rated neutral and 2.2% rated -1.

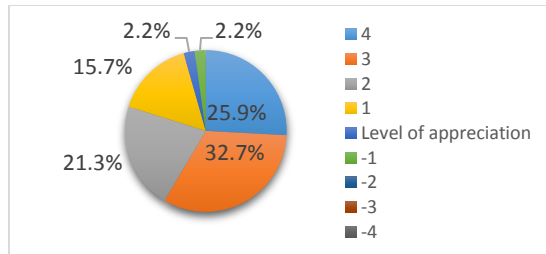


Figure 1.20. Appreciation of teaching methods

To the question, "Which of the following attributes are relevant in the teaching process of the professors?", Figure 1.21, 53.4% of respondents said that real life exemptions are the most important, 18.2% responded as an important attribute the theoretical model, 10.2% theory, 11.4% case studies as important and 6.8% theoretical exercises.

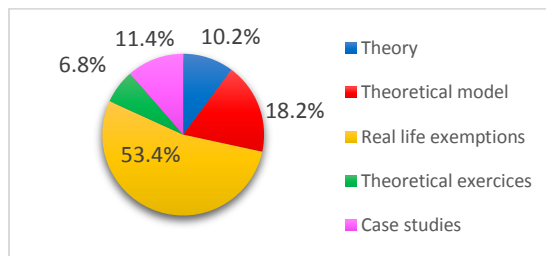


Figure 1.21. Relevant attributes

From the research it is observed that 69.2% participated in an open lesson where one of the colleagues presented the lesson instead of the teacher and 30.8% did not participate in such activities, Figure 1.22.

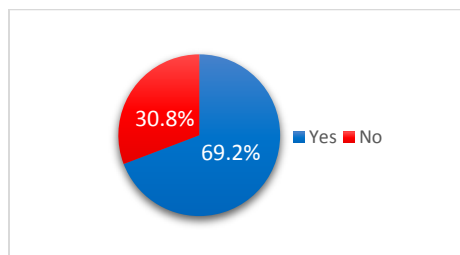


Figure 1.22. Attending in an open lesson presented by a colleague

After evaluating the answers regarding the degree of satisfaction with the way a colleague presents the lesson, Figure 1.23, it is noticed that 31.3% evaluated a level of 3 out of 5 possible, 22.9% rated satisfaction as 4, 20, 5% rated 2, 13.3 as 5 and 12% 1.

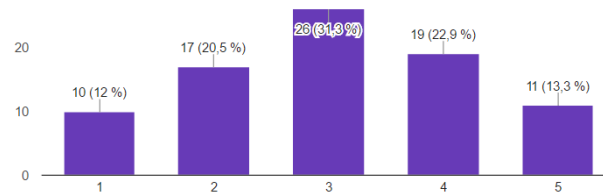


Figure 1.23. Contentment level of the lesson presented by the colleague

After evaluating the answers to the question "Do you consider the method of teaching by your own colleague suitable for learning?", Figure 1.24, it was found that 45.5% responded affirmatively and 54.5% had a negative answer regarding a colleague teaching a course. It is noticed that students are not attracted to this proposal to teach a course by another colleague due to their lack of experience and knowledge.

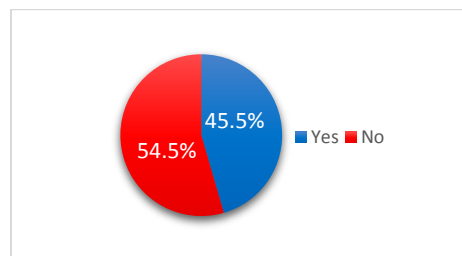


Figure 1.24. Appreciation of the teaching method by a colleague

Of the respondents in this research, Figure 1.25, 42.9% are interested in participating in this challenge, attending courses supported by students, 30.8% are not interested, and 26.4% are abstaining. And this part of the research emphasizes that this approach is not seen positively by the interviewed students.

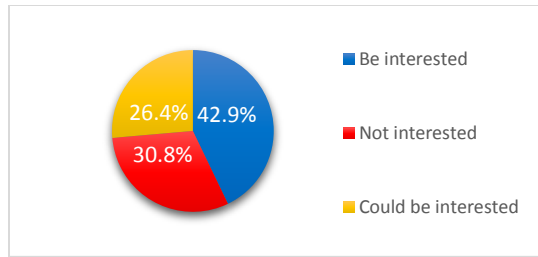


Figure 1.25. Agreement on matter curriculum

At the same time, the respondents' choice was given to the type of accepted and preferred lesson, Figure 1.26. A percentage of 56.2% was found to think that group-based lessons are easy, 38.2% prefer case studies, and 5.6% prefer theoretical lessons. Therefore, teamwork and case studies are preferred by the questioned students.

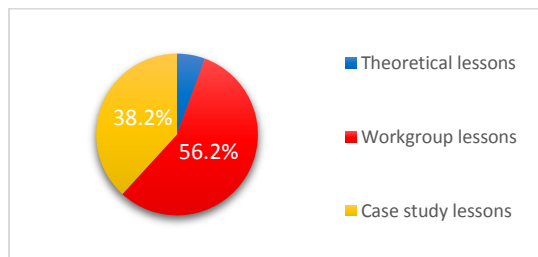


Figure 1.26. Types of lessons attending on open classes

Following the assessment of the answers to the question of student's provenance, Figure 1.27, it was found that 78.2% came from the urban area and 21.8% came from the rural area.

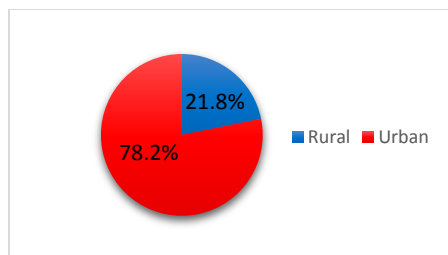


Figure 1.27. The environment of origin



Following the evaluation of the answers about the graduate high school profile, Figure 1.28, we find that 44.6% followed the real profile, 35.6% covered the technical profile and 19.8% followed the human profile. This percentage also supports previous responses which highlight that respondents prefer case studies, practical examples and teamwork.

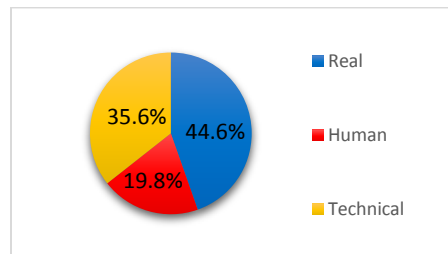


Figure 1.28. Graduated high school profile

After analyzing the answers, Figure 1.29, it is noticed that 78.2% are aged up to 25 years, 18.8% are aged 25-30 years, 1% aged 30-35 years old and 2% aged over 35 years old.

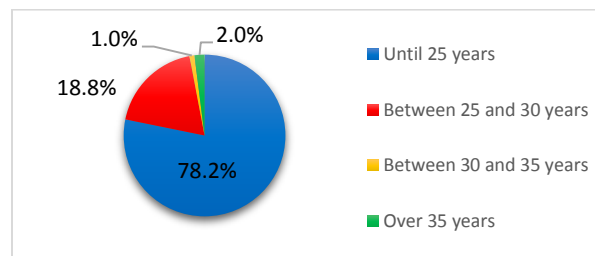


Figure 1.29. Age category

Factors that help to increase student motivation is very important. Motivation is defined as "desire or wish to achieve something" (Oxford Dictionary 2013), the desire to act, a force or an influence that causes someone to do a certain thing (Merriam, 2013). In the literature, there are two types of motivation: intrinsic and external. Intrinsic motivation comes from the individual inner and is associated with joy or passion of the learner, rather than any reward (Gedera et. al., 2013). External motivation is developed by outside factors associated with external activities, such as evaluation. External factors may also be linked to training strategies, learning conditions, educational technologies, educational infrastructure and other elements of the teaching-learning process systems. Motivation is also a sense of success, when the individual is engaged in learning. Student

motivation and involvement are elements that are directly proportional to the educational system's ability to meet learner expectations (Draghici et. al., 2016).

It is stated that, despite the fact that there is no universally accepted definition of what engagement includes, the success of students and colleagues, student retention and student motivation are always linked to engagement (Berr et. al., 2010).

Involvement of students through active participation in learning activities contributes to their own satisfaction and significant professional results. Motivation is considered an essential element for engaging students in different activities. Motivation can be achieved if the established objectives are common and accepted by all stakeholders. Following the research of the specialized literature and the realization of the survey through the questionnaire can and underline a number of factors that motivate the students. These include: the attitudes of teachers and group / year colleagues, the groups developed in practical activities, the interaction between colleagues and the teaching staff, the technology and infrastructure of the educational unit, the methods and examples used by the teachers, the reputation of the university and the faculty, the various activities carried out by faculty in which the students are involved and all elements adjacent to the human factor. A systematization of the main factors identified in this research is presented in Figure 1.30.

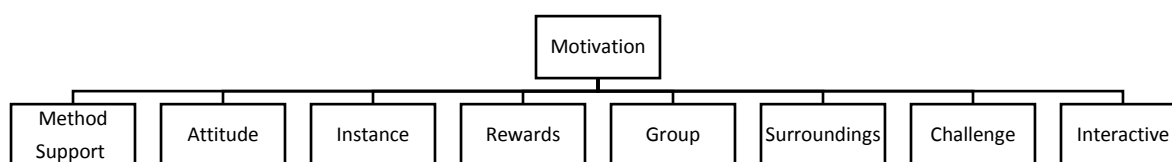


Figure 1.30. Motivational factors

As a result of the questionnaire, it was found that the students surveyed prefer the method of visual association, although the methods used by the teachers are the classical ones (monologue, exposure). Students also prefer real-life examples, and methods of teaching by other colleagues of matter are predominantly accepted among students.

However, the case study is limited due to the fact that students' open responses were not taken into account. Following the methodology performed, it can be emphasized that the methods used by

the teaching staff are the classical ones, although the main attention in university didactics is to distance themselves from the educational methods based on conditioning, memorization and repetition and the promotion of those who have active participation in the center, of the student's own formation and development. Students prefer modern methods to encourage individual or collective reflection, social interactions and debates among students present at training, direct experiments by them on objects, phenomena and processes of reality as a preparation for integration into society.

As it is intended that education should be focused on the student, both university students, teachers, and last but not least, the higher education institution through existing legislation must contribute to this process.

It is advisable to switch from a master discourse teacher, an author of academic treatises, to a neutral student, to the student's mentor teacher in the process of knowing and building his own academic path. Together with the student and the teacher, an important role is played by the higher education institution, by ensuring optimal conditions for the development of the educational process, including appropriate endowments, resources, programs, services and regulations. It is also recommended to use modern teaching methods by which the student's concentration power is increased. The results obtained will be compared each year. Future research will focus on more research to improve methods of teaching and learning. Conditions for enhancing the competitiveness of the romanian higher education system is an important direction for entrepreneurship education.

The teaching-learning process is directly related to the competitiveness of higher education. Below are some aspects of the competitiveness of higher education.

The purpose of this part is to identify opportunities and conditions for the development of a competitive higher education. The Romanian education system is based on Law no.1 / 2011. According to Article 118 of the Education Law, the national higher education system is based on 13 principles, including: the principle of transparency, the respect for the rights and freedoms of students and teachers, the freedom to national and international mobility and the principle of student centeredness. In accordance with national norms, education is free of charge for a certain

schooling number approved by the national authorities, but also for a tuition fee (The Law of National Education, 2018). The Bologna system requires a series of reforms in national higher education structures, the change of education plans and the alignment of learning across Europe. The methodology specifies that each country must maintain its national domain area and continue to introduce innovative and educational ways to increase the competitiveness of higher education (EHEA, 2018).

As shown in studies in specialized literature, the strategy to support higher education development should accelerate the implementation of modern technologies and the involvement of industry clusters (in which these methods apply) in the learning-teaching process (Turi, Mocan and Ivascu, 2017). One of the important directions in the development of information technology (Kabok, Radisic, and Kuzmanovic, 2017) is the use of integration platforms and software for modeling and simulation of processes (Al-Samarraie, and Hurmuzan, 2018). Another directive that needs to be followed is the integration of methods, techniques and tools used in industry in practical activities (Draghici et al, 2015). Based on these directions, higher education can be improved to become competitive and attract foreign students (Jackson, 2015). In this manner, interculturality and professional development are directions that can be accessed in higher education (Nugaras, and Ginevičius, 2015).

In order to develop *a framework for improving and increasing the competitiveness of higher education*, data obtained from market researches and data obtained from online metrics related to the website of the Faculty of Production and Transport Management were used. For this part two tools were used to achieve the results:

1. Research questionnaire applied to students enrolled in the 2017 / 2018 academic year at the bachelor's course (120 students) and at the master's degree course (30 masters). This questionnaire was divided into three parts: the attractiveness of the teaching-learning methods, the willingness to engage in research and development and the changes they want to bring to higher education. These respondents are students at the Polytechnic University of Timisoara.
2. In-depth interviews have been applied to experienced teachers in the field. They were coordinated in two directions: the evaluation of the current education system and new opportunities identified for increasing competitiveness.

### 3. Metrics used to evaluate statistics on accessing online information.

The structure of the research is presented in Figure 1.31.

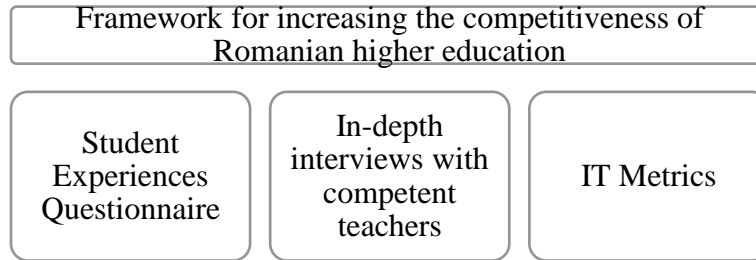


Figure 1.31. The structure of the present research

The present research was conducted at the Faculty of Management in Production and Transportation (FMPT). This faculty is part of the Polytechnic University of Timisoara (UPT). UPT has 10 faculties with different fields. The domains of FMPT in which they operate are: Engineering and Management, and Administrative Sciences. The faculty offers three types of university studies: bachelor, master and doctorate. They are all under the Engineering and Management. For bachelor cycle there are 8 semesters (IM) and 6 semesters for (AS). The master cycle takes place for four semesters. The doctoral degree that can be achieved in IM is carried out for a period of three years. The students and teachers involved in this research work in this structure.

The questionnaires were applied online using the Google Form platform. These questionnaires were structured on the three targeted directions and were applied to the respondents between September 2017 and January 2018. Respondents are characterized by ages 18-22 and 22-28 years old, from different regions of the country. Respondents' employability status falls into the following categories: part time engineers, full time engineers, or unemployed students. In-depth interviews were conducted between December 2017 and February 2018. The present research is based on the following elements: Higher Technical Education in Timisoara / Politehnica University of Timisoara; students of the Faculty of Management in Production and Transportation (FMPT); The 8 experienced teachers involved in this research are defined by: FMPT teachers who have undertaken research activities (with impact in international databases - Thomson Reuters, Scopus, Google Scholar), having background in management or entrepreneurial capacity.

Information technology metrics have been obtained from various simulations obtained from the control panel of the faculty website [www.mpt.upt.ro](http://www.mpt.upt.ro).

I. *The market research* conducted with FMPT students was oriented in three directions. In this manner, the results are presented below. The analysis of the obtained results contributes to the definition of the expected conditions of students and master students from the perspective of the development of higher education.

*a) The attractiveness of teaching-learning methods*

From the perspective of learning methods, 40% of respondents prefer the listening and watching method, Table 1.4., Figure 1.32. Of the students, 20% prefer methods based on watching, 15% based on listening or speaking, and only 10% are based on read-based methods. We calculate the variance of these methods compared to 2016 when we conducted another market research. Compared to 2016, it is noticed that the reading-based method has begun to decrease as intensity in student preferences, and listening and watching-based methods gain percentages in student preferences.

Table 1.4. Variation of methods compared to year 2016 (source: my calculation)

Method	Percent	Variation (2016)
reading	10%	-20%
listening	15%	-10%
watching	20%	+5%
listening+watching	40%	+15%
speaking	15%	-10%

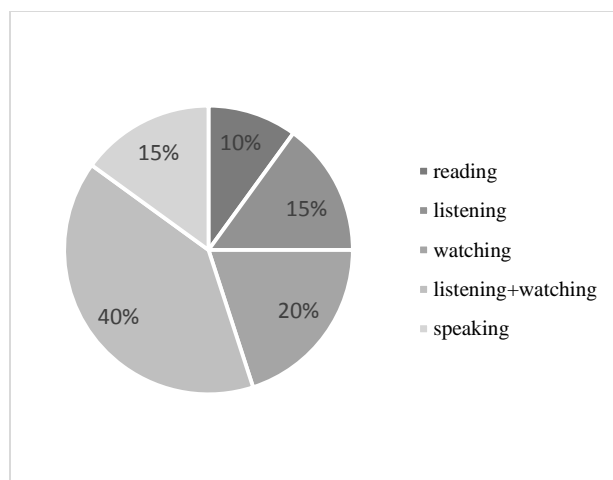


Figure 1.32. Teaching-learning methods (source: my calculation)

*b) Desire to engage in research and development*

From the perspective of student and master students' involvement in research, there is an increase in students' interest. At the same time this area is attractive for them. As shown by the research in the field (Strehl, Reisinger, and Kalatschan, 2007), (Al-Samarraie, and Hurmuzan, 2018), students are starting to get actively involved. As a percentage, at the level of the bachelor cycle, 10% of students engage and publish scientific articles in existing university or international journals.

At the master's level, in 2014, a student communication session is held. The number of master students who have submitted research papers is presented in Table 1.5. There is an increase in the interest of the master students in the presentation of some requested applications. Each work is done together under the guidance of a teacher. As a percentage of all master students, at the level of 2017, over 70% of the master's involvement in this research activity is recorded. The year 2014 was the first year in which this activity was launched, being organized in the year between June and July. In 2017 there was an increase of about 3.5%.

Table 1.5. Number of master students who presented scientific papers (source: my calculation)

Year	Number of papers
2014	29

2015	24
2016	35
2017	38

From the perspective of the respondents, over 85% consider that their involvement in research contributes to their training as a specialist and represents support for the activities they will carry out in the business environment.

*c) Changes to higher education*

For this section, the questions addressed went in two directions: improvements to the bachelor cycle and improvements brought to the master cycle.

From the perspective of the bachelor cycle, the following results were recorded:

- the digitization intensity of the teaching process (67%)
- updating course content every 2 years (53%)
- updating the content of annual seminars (58%)
- performing corporate social responsibility activities (78%);
- Developing laboratories with the involvement of companies in the field (67%)
- From the master cycle perspective, the following results were recorded:
- carrying out study programs in different foreign languages (92%)
- updating teaching methods and course support, annually (89%)
- use of discussion and discussion-based methods at lecture hours (76%)
- conducting courses along with companies in the field (95%).

It can be noticed that, as a result of the survey, the respondents prefer the current methods of teaching-learning. In the bachelor cycle, the methods are based in particular on teaching and taking notes. At the masters cycle, respondents prefer methods based on discussions and debates.

*II. In-depth interviews* were conducted with teachers with experience in developing and increasing the competitiveness of higher education. These interviews were directed to two directions: the assessment of the current education system and new opportunities identified for increasing competitiveness.



a) *Assessment of the current education system*

Among the strong points found in the strategic plan of the faculty (FMPT, 2018): the formation of many quality graduates that integrate with ease in the business environment, the occupation of competitive positions by the graduates of the faculty, the collaboration with many economic agents, having many partnerships with foreign universities and the organization of a prestigious International Symposium (SIM) once every two years that is indexed by Thomson Reuters (Clarivate Analytics). The quality of the education performed at our faculty is superior. In 2011, as a result of the assessment made in 2011, the dominant profile of our faculty - Engineering and Management - was ranked in the excellence category A alongside the other 5 national university programs that were included in this category.

b) *New opportunities identified for increasing competitiveness*

Opportunities that are systematized by experts in the field are: increasing the degree of promotion of study programs, intensifying collaborations with the business environment, launching forms of learning in different foreign languages. From this perspective, the basis of developing an English master is made. Because, as a result of market research, it has been found that there is an increased demand for a master in English to integrate the study of the quality and competitiveness of industrial processes, this opportunity has been analyzed. This proposal is equivalent to a series of existing programs at the level of the European Union and the following similitudes presented in Table 1.6 are obtained.

Table 1.6. Assessing the opportunity by identifying similarities at international level

No.	Master's study program in the country / abroad	Discipline from the education plan	Similar discipline from the educational curriculum of the proposed master
1.	Engineering and Quality Management (Master's) – School of Engineering, University of Minho, Portugal <sup>a</sup>	Implementation and certification of quality management systems	Methods and tools used in quality engineering
		Lean Six-Sigma	Six Sigma
		Statistical techniques	Advanced Statistics
		Human factors in engineering	Occupational health and safety
		Organizing and managing maintenance	Total productive maintenance
		Performance measurement systems	Economic analysis and costs

		Engineering and Quality Management	Process management and leadership
		Strategic and organizational management	Strategic management
		Process safety	Risk Management and Competitiveness
2.	M.Sc. Management and Production Engineering - Global Production Engineering and Management, Warsaw University of Technology, Faculty of Production Engineering	Industrial technologies	Lean manufacturing
		International trade, business and economy	Economic analysis and costs
		Design, Innovation, Technology, Engineering and Management	Process management and leadership
		Design and analysis of manufacturing systems	Total productive maintenance
		Interim design	Project Management
		Engineering and Quality Management	Methods and tools used in quality engineering
		Quality control	Total productive maintenance
		Service engineering	Process management and leadership
		Industrial Management	Strategic management

### III. Metrics used to evaluate statistics on accessing online information

In this direction of the realization of a study program in foreign language, the access of the website was also analyzed by potential candidates from other countries. These metrics were obtained by analyzing the [www.mpt.upt.ro](http://www.mpt.upt.ro) website. That is, the interest of foreign students to study in Romania has been assessed. In this respect it can be seen in Table 1.7 that during the admission session the interest for the faculty website is increasing.

In December, as a result of the completion of the semester and the vacation, it is noticed that the access level has dropped by more than 30%.

Table 1.7. Accessing of FMPT website (source: my simulation)

Summary by Month					
Month	KBytes	Visits	Pages	Files	Hits
Feb-18	12242359	4112	12485	43907	51191
Jan-18	23291465	6669	15137	69251	80302
Dec-17	16784505	5578	12708	44085	54657
Nov-17	26060511	6510	14489	58828	69477
Oct-17	24696682	7262	16457	72417	84005

Sep-17	39050825	9548	26934	131909	155609
<b>Totals</b>	<b>142126347</b>	<b>39679</b>	<b>98210</b>	<b>420397</b>	<b>495241</b>

From the perspective, Table 1.8., of locating those who have accessed the faculty website it can be seen that in a ranking of 10 places there are: Romania, United States, Russian Federation, Germany, Ukraine, Japan, Austria, France, and India. It is noticed that the United States has accessed over 2577 pages, amounting to 2.73GB. This perspective can be considered for increasing international promotion and attracting foreign candidates.

Table 1.8. Location of FMPT website access (source: simulation)

Country		Pages	Hits	Bandwidth
Romania	RO	3,706	26,851	6.37 GB
United States	US	2,577	3,140	2.73 GB
Russian Federation	RU	742	832	1.94 GB
Unknown	ZZ	275	1,685	1.76 GB
Germany	DE	109	648	1.60 GB
Ukraine	UA	105	129	716.55 MB
Japan	JP	68	91	609.66 MB
Austria	AT	62	448	363.55 MB
France	FR	56	398	246.80 MB

Proposed framework conditions for increasing competitiveness:

- gradual integration of the digitization of the teaching-learning process, aimed at satisfying the students' wishes and increasing the national and international competitiveness;
- Use of existing material support in libraries and international databases and reduction of cheating among students (the use of plagiarism detection programs in each academic year);
- Creating modern educational means and increasing the attractiveness level contributes to attracting students to the bachelor cycle and maintaining them in the master's cycle.
- Increasing the quality of the research level contributes to improving employer branding and to improving the performance of teachers.
- Achieving alignment of programs across the European Union and in different foreign languages contributes to the widening of the teaching-learning spectrum.

Continuous development of higher education requires remarkable investment (Rae, 2010). The emphasis should be on updating curricula and teaching materials. Comprehensive

computerization, ongoing teacher training, existing institutional mechanisms for increasing scientific impact are directions that contribute to the development of higher education and to increasing its competitiveness. Globalization of higher education attracts foreign candidates so access to scientific research can be achieved with greater ease. It is noticed that at the level of the faculty analyzed, students and masters want the updating of the materials to be done periodically, new laboratories, but also to get involved in research.

### **1.3. Entrepreneurial intent: models and factors of influence**

#### **1.3.1. Conceptual delimitation**

Entrepreneurship has been for a considerable time an important research field among scientists and practitioners. Some reasons supporting this prolonged and heightened interest in entrepreneurship are: the entrepreneurial activity revitalizes stagnated economies, represents a solution for unemployment problems, is a potential catalyst and incubator for technological progress, product and market innovation, encourages economic growth and wealth creation (Zahra et al., 2014). There are many researches that reveal different types of factors that influence the entrepreneurial behavior, namely individual, social, economic and environmental factors.

In parallel with developing interest in entrepreneurship throughout the world, we have also witnessed an increasing research interest in social responsibility. Social responsibility is an ethical theory which means that first of all the people, and then the organizations, must behave with sensitivity towards social, cultural and environmental issues. Consequently, social responsibility means sustaining the balance between the economic development and the welfare of the society and of the environment. As Winston Churchill said, “we make a living by what we get, but we make a life by what we give”. The analysis of the social responsibility of firms has particularly resulted in the corporate social responsibility (CSR) theory. As Coppa and Sriramesh (2013) state, the CSR became popular in the 1950s with Bowen’s (1953) book “Social responsibilities of the businessman,” commissioned by the Federal Council of the Churches of Christ in America. In addition, with the Enron and Worldcom scandals in the US, and the Parmalat scandal in Italy, the CSR gained increased attention (Hsu and Cheng, 2012).

However, on the one hand, there is no common accepted definition of the CSR (see Castka et al., 2004; Gallardo-Vázquez and Sanchez-Hernandez, 2014). The World Business Council for Sustainable Development states that “CSR is the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life” (WBCSD, 1999). Castka et al. (2004) assert in their turn that “CSR is a concept to run organizations profitably yet in a socially and environmentally responsible way, in order to achieve business sustainability and stakeholder satisfaction”.

On the other hand, the focus on large corporations and financial outcomes ignores the consequences of business social responsibility for entrepreneurs (Besser, 2012). While it is assumed that multinational companies (MNC) are capable of assuming responsibility by implementing the CSR, little is known about the CSR in small and medium sized enterprises (SME), despite their contribution to the national output and employment (Baumann-Pauly et al., 2013). The social capital is a concept that has a great deal of resonance in the CSR of SME, beside the personal values of the owner–manager and the role of ethics (Coppa and Sriramesh, 2013). Thus, an important strand of literature addressing the entrepreneurship–CSR relationship is represented by the social entrepreneurship theory. A social entrepreneur uses market-based methods to solve social problems and presents a deep commitment towards the social vision. At the same time, the main purpose of a social entrepreneur is to provide social services while making profit, and its success depends upon its ability to garner resources from public-sector stakeholders (Pache and Chowdhury, 2012). He/she practically contributes to the social wealth creation and has a large involvement into social issues, associated with social responsiveness (Kuratko and Hodgetts, 2004).

Nevertheless, not all the entrepreneurs’ business areas are oriented towards social practices and services. In this context, an important question arises: Can the regular entrepreneurs adopt CSR practices? Early studies on the topic compare the SME with the MNC and note that, in general, CSR practices can also be adopted by small business, because they are socially and economically embedded in the community, even if they are unable to spend comparable amounts of time and money in the CSR implementation (Wilson, 1980; Thompson and Smith, 1991; Castka et al., 2004; Besser, 2012; Moyeen and Courvisanos, 2012; Hsu and Cheng, 2012; Coppa and

Sriramesh, 2013). Even if some attempts were noticed in literature, the issue of CSR in SME has not yet received adequate attention from researchers (Campopiano et al., 2012). Moreover, the empirical documentation of the theoretical assumption is scarce (Thompson and Smith, 1991), while the analysis is mainly theoretical, prescriptive or normative (Lepoutre and Heene, 2006; Fassin, 2008; Gellert and De Graaf, 2012; Moyeen and Courvisanos, 2012). In addition, the orientation of SME towards the CSR practices is not clarified.

Starting from this background, this part examines the entrepreneurial characteristics in the context of the CSR practices in order to reveal possible compatibilities or incompatibilities between the two frameworks, exploring both the CSR and entrepreneurial models. This article is somehow related to that of Ma (2012) which draws on the CSR models in order to compare the MNC and the SME involvement in CSR practices. Nevertheless, opposite to that paper, we want to see if the entrepreneurial characteristics fit the CSR models. We do not make the distinction here between CSR and individual social responsibility. The term “corporate” is considered as a broad concept, associated with different firms, including the start-ups. Thus, the study provides insight into entrepreneurial models of competences cited in the literature, and, on this basis, reveals a set of individual entrepreneurial characteristics that could contribute to the development of social responsible entrepreneurs, and, in the same time, a set of entrepreneurial characteristics that should be at least tempered from the view of social responsibility concept. This part conducts a critical view on entrepreneurial success competences frameworks, from individual entrepreneurial characteristics relative to CSR attributes. We attempt to find answers to the following questions: How broadly or narrowly should entrepreneurial characteristics and success competences be defined? Are the entrepreneurial characteristics/competences compatible with the CSR framework?

While there is a vast academic literature on CSR, the focus on social responsibility concentrates primarily on large businesses. Apparently, the MNC are better positioned to adopt CSR practices, disposing of financial resources and trained personnel (Thornton and Byrd, 2013), having sufficient influence to address social issues, access to information and adequate research methodologies (Thompson and Smith, 1991), clear strategy and enough visibility (Jenkins, 2004). A similar reasoning is advanced by Williamson et al. (2006) who argue that the CSR cannot be

applied to small and medium enterprises as they are heterogeneous in terms of size, resources, management style and personal relationships. Empirically, the size of enterprises has been identified as a barrier for SME to adopt CSR practices (Brammer and Millington, 2006). Meanwhile, many scholars consider that SME can focus on certain social responsibility issues (for a review of the literature, see Hsu and Cheng, 2012). In their opinion, small business' CSR research has been hampered by the assumption that limited opportunities exist for small firms to exercise social responsibility. Thus, in order to sustain the SME implication in CSR practices, Matten and Moon (2008) make the distinction between explicit and implicit CSR, showing that SME can implement CSR activities which are not formally identified as CSR practices. As Lepoutre and Heene (2006) note, the SME "are socially responsible by nature....but they just do not know that they are". Ma (2012) points in his turn the differences between the CSR approaches of SME and MNC. In this line, Baumann-Pauly et al. (2013) draw on Zadek's (2004) organizational learning model with five stages: denial, compliance, managerial, strategic, and civil. They argue that small firms possess several organizational characteristics that are favorable for the internal implementation of CSR-related practices.

There are also researchers that highlight a peculiar orientation to CSR in the SME sector (i.e. Azmat and Samaratunge, 2009). While Fuller and Tian (2006) report that SME act in responsible ways in the context of their relationships with the society, Murillo and Lozano (2006) argue that the CSR practices of SME are both moral and ideological and result from pressures from stakeholders. A strong assumption is advanced by Moyeen and Courvisanos (2012), who consider that SME are perceived to be better positioned and equipped than their larger counterparts to address the needs of the local communities and environment, due to their physical proximity to customers and community. A plethora of factors were put forward to show the need of SME's involvement in the CSR practices. For example, Azmat and Samaratunge (2009) describe the business environment, the corruption issues and the rule of law, the regulatory quality and the socio-economic conditions, the level of awareness and cultural traditions, but also the domestic pressures and civil society. In the same vein, Perrini (2006) found that the motivations among Italian SME for executing CSR strategies are rather based on factors of social capital, such as reputation, trust of stakeholders, company legitimacy, and consensus pressure.

Other studies draw on the benefits provided by the adoption of the CSR practices for SME. Weber (2008) underlines the positive effects on the firm's image and reputation, on the employees' motivation, retention, and recruitment, on cost savings and revenue increases from higher sales and on the risk reduction and management skills. Similar, Gallardo-Vázquez and Sanchez-Hernandez (2014) posit that the adoption of CSR practices by SME leads to an increased success and financial performance.

The above mentioned studies are in general intuitive and theoretical. The empirical literature investigating the entrepreneurs' perception of CSR practices, or the determinants of adopting the CSR by SME, is almost absent with few recent exceptions (Besser, 2012; Gellert, and De Graaf, 2012; Campopiano et al., 2012; Coppa and Sriramesh, 2013; Baumann-Pauly et al., 2013; Gallardo-Vázquez and Sanchez-Hernandez, 2014). In this context, we propose a different approach. Basically, we compare the characteristics of CSR models with the characteristics and the competences of entrepreneurs, revealed by related models. This way, we are able to observe the compatibilities/incompatibilities between CSR and SME. View the existing theory which focuses on SME, we consider that entrepreneurs belong to this category of firms.

#### **CSR and entrepreneurial models: a comparison *CSR models***

We start the presentation of CSR models with Wilson's (1980) model (Figure 1.33). He describes the CSR model for small business having five distinct areas, namely the responsibility to (1) consumer satisfaction, (2) employees, (3) ethics, (4) community, and (5) profits. The author notes that 90 percent of their respondents primarily associate the CSR practices with profitability.



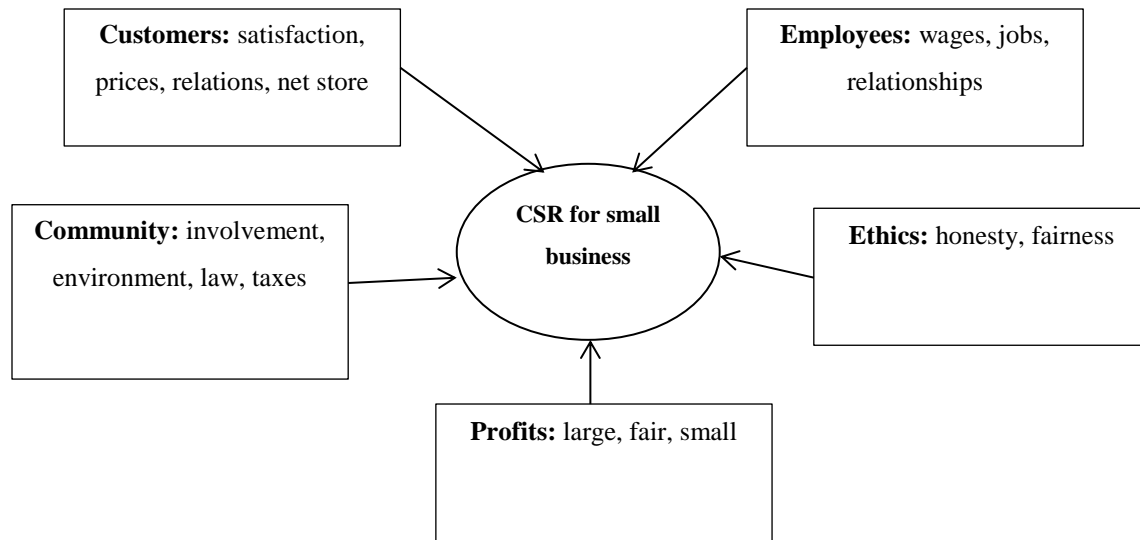


Figure 1.33. Wilson's (1980) CSR model for small business Source: Wilson (1980)

We continue the presentation of CSR models with the well-known Carrol's (1991) pyramid of CSR. We also notice that the economic issues represent the basis of the pyramid, while the philanthropic responsibilities come at the end (Figure 1.34).

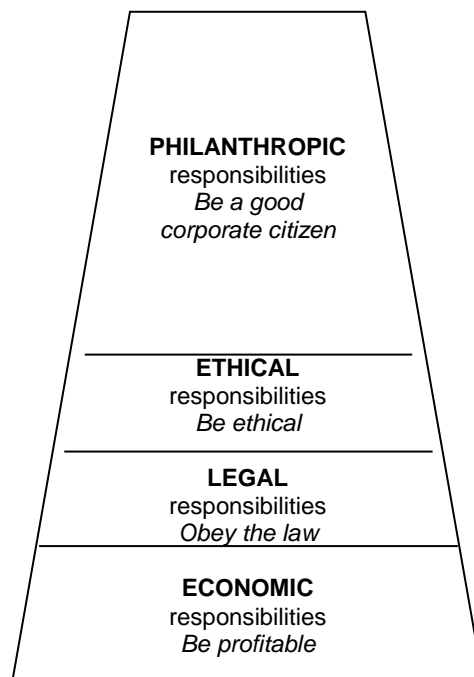


Figure 1.34. The pyramid of CSR Source: Carrol (1991)

The next model that we present is Weber's (2008) model, which underlines the business benefits deriving from CSR (Figure 1.35):

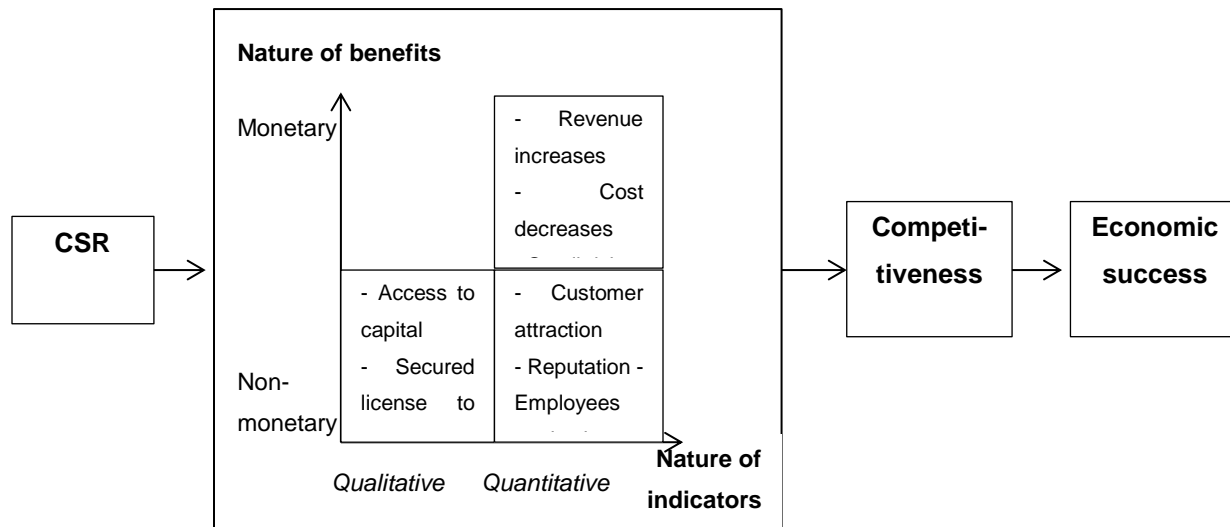


Figure 1.35. CSR impact model (Source: Weber (2008))

Finally, we describe four CSR models presented by Ma (2012). The first model is called the hierarchy model of CSR and it is inspired from Carrol (1991). The discretionary responsibility is associated with optional philanthropic contributions (Figure 1.36).

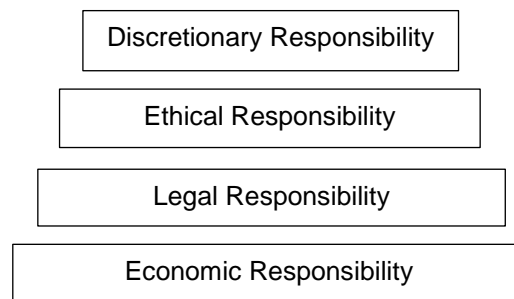


Figure 1.36. Hierarchy Model of CSR (Source: Ma (2012))

Ma's second model (2012) is the side-by-side model, which describes the principles of having a responsible behavior, the social responsiveness and the outcomes of social performance (Figure 1.37).

<b>Principles of CSR</b>	<b>Processes of Social Responsiveness</b>	<b>Outcomes of Corporate Behavior</b>
<i>Institutional:</i> legitimacy	<i>Environmental</i> assessment	<i>Social impact</i>
<i>Organizational:</i> Public responsibility	<i>Stakeholder</i> management	<i>Social program</i>
<i>Individual:</i> Managerial discretion	<i>Issues management</i>	<i>Social policies</i>

Figure 1.37. Side-by-side Model of CSR (Source: Ma (2012))

Another fruitful theoretical approach on the peculiarities of SME in relation to CSR is provided by the star model (Figure 1.38). Beside the traditional shareholders as customers, employees, and suppliers, the model includes new external stakeholders in order to underline the social responsibility of managerial actions.

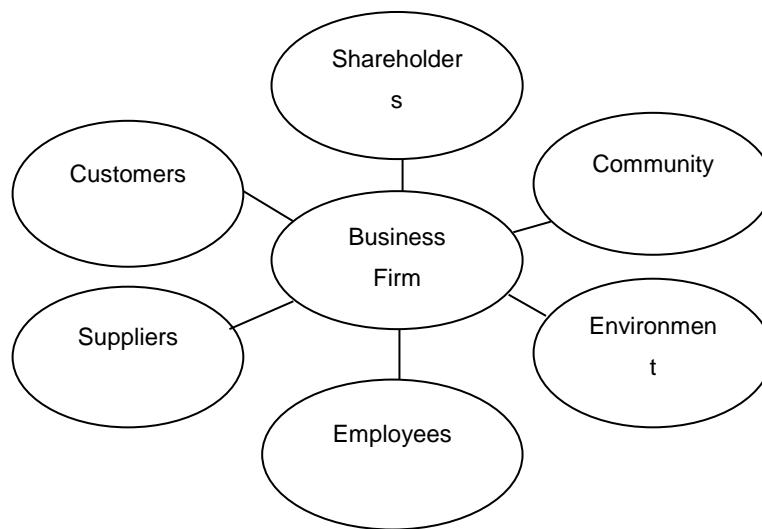


Figure 1.38. Star Model of CSR (Source: Ma (2012))

The last CSR model presented in our paper is the coordinate model, where two distinct dimensions of CSR are identified, namely the motivation basis (strategic versus altruistic) and the locus of responsibility (corporate versus individual). On the one side, the strategic dimension seeks to reconcile the managerial decision with the social responsibility. On the other side, the altruistic motive is philanthropic, without searching for a concrete benefit (Figure 1.39).

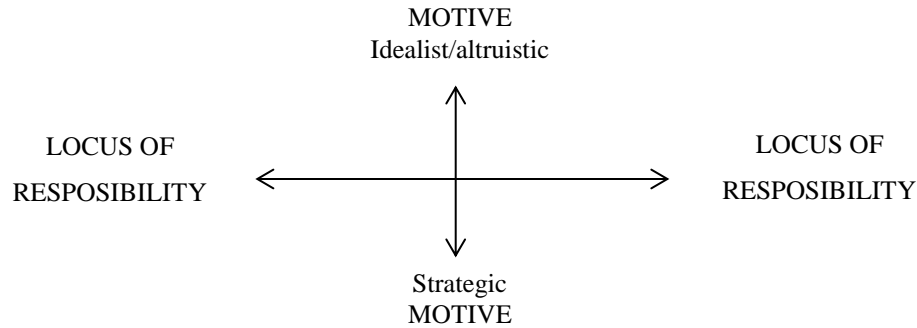


Figure 1.39. Coordinate Model of CSR (Source: Ma (2012))

### *Entrepreneurial models*

A burgeoning literature examined the entrepreneurship determinants. In general, these factors can be grouped in three categories (Miller, 1983): the personal characteristics of the leader, the structure of the organization and the importance of strategy making. However, most of the researchers focus on entrepreneurial competences and behavior, as (Jain, 2011): motivation, innovativeness, risk-taking propensity, internal locus of control, self-efficacy, creativity, personal and family background, environment factors and social intelligence for promoting entrepreneurial behavior. Different competencies are advanced by Mitchelmore and Rowley (2010), who focus on the business skills, as the identification of a viable market niche, the development of products and services, the generation of ideas, the environmental scanning, as well as on taking advantage of opportunities and formulating strategies. All these elements give birth to different entrepreneurial models, sometimes very similar.

The first model that we present describes the attributes of entrepreneurs (Table 1.9). Some characteristics as the initiative, flexibility, ability to influence others, responsibility and profit orientation, can be also found in the CSR models described above.

Table 1.9. Characteristics often attributed to entrepreneurs

1. Confidence	22. Responsibility
2. Perseverance. Determination	23. Foresight
3. Energy, diligence	24. Accuracy, thoroughness
4. Resourcefulness	25. Cooperativeness
5. Ability to take calculated risks	26. Profit orientation
6. Dynamism, leadership	27. Ability to learn from mistakes
7. Optimism	28. Sense of power

8. Need to achieve	29. Pleasant personality
9. Versatility; knowledge of product, market, machinery, technology	30. Egotism
10. Creativity	31. Courage
11. Ability to influence others	32. Imagination
12. Ability to get along well with people	33. Perceptiveness
13. Initiative	34. Tolerance for ambiguity
14. Flexibility	35. Aggressiveness
15. Intelligence	36. Capacity for enjoyment
16. Orientation to clear goals	37. Efficacy
17. Positive response to challenges	38. Commitment
18. Independence	39. Ability to trust workers
19. Responsiveness to suggestions and criticism	40. Sensitivity to others
20. Time competence, efficiency	41. Honesty, integrity
21. Ability to make decisions quickly	42. Maturity, balance

Source: Kuratko and Hodgetts (2004), adapted from John A. Hornaday, "Research about living entrepreneurs", in *Encyclopedia of Entrepreneurship*, ed. Kent/Sexton/Vesper, 1982.

A second model makes the distinction between the man of action and the non-entrepreneurial person, following the Schumpeter's theory (Table 1.10). The main attributes of entrepreneurs are the dynamism, the creativity and the flexibility (Swedberg, 2006).

Table 1.10. The Man of Action and the Non-Entrepreneurial Person, according to the young Schumpeter (Source: Swedberg (2006))

<i>The Man of Action</i>	<i>The Non-Entrepreneurial Person</i>
Dynamic	Static
Breaks out of equilibrium	Seeks equilibrium
Does what is new	Repeats what has already be done
Active, energetic	Passive, low energy
Leader	Follower
Puts together new combinations	Accepts existing ways of doing things
Feels no inner resistance to change	Feels strong inner resistance to change
Battles resistance to his actions	Feels hostility to new actions of others
Makes an intuitive choice among a multitude of new alternatives	Makes a rational choice among existing multitude of new alternatives
Motivated by power and joy in creation	Motivated exclusively by needs and stops when these are satisfied
Commands no resources but borrows from a bank	Commands no resources and has no use to new resources

Another different model is presented by Huarng (2013). It is called a two-tier business model for entrepreneurship, combining a conceptual model with a financial model (Figure 1.40). This model is useful for presenting the idea of a new business.

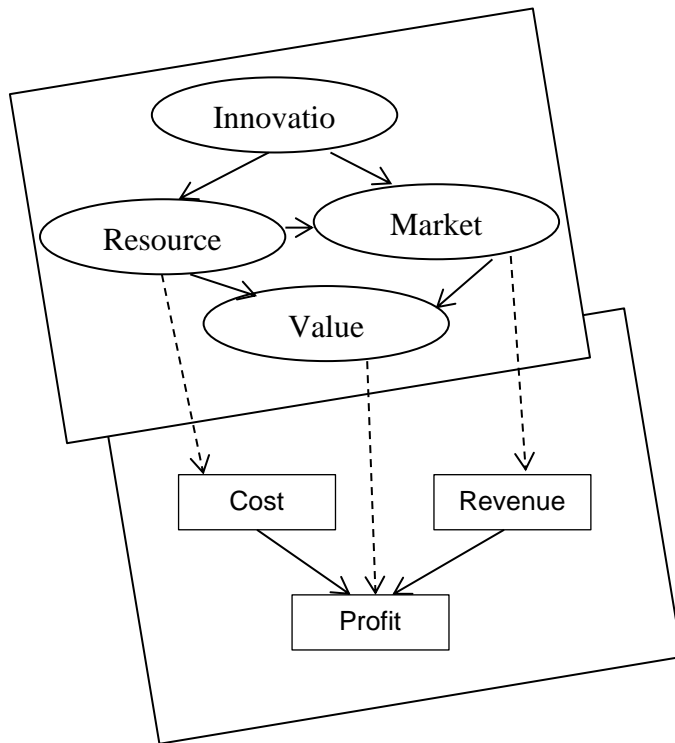


Figure 1.40. The two-tier business model (Source: Huarng (2013))

A more complex model based on a meta-research review is proposed by Jain (2011). This model presents on the one side the motives and the characteristics of entrepreneurs, and, on the other side, the intentions, performance and the environment factors which influence the business (Figure 1.41).

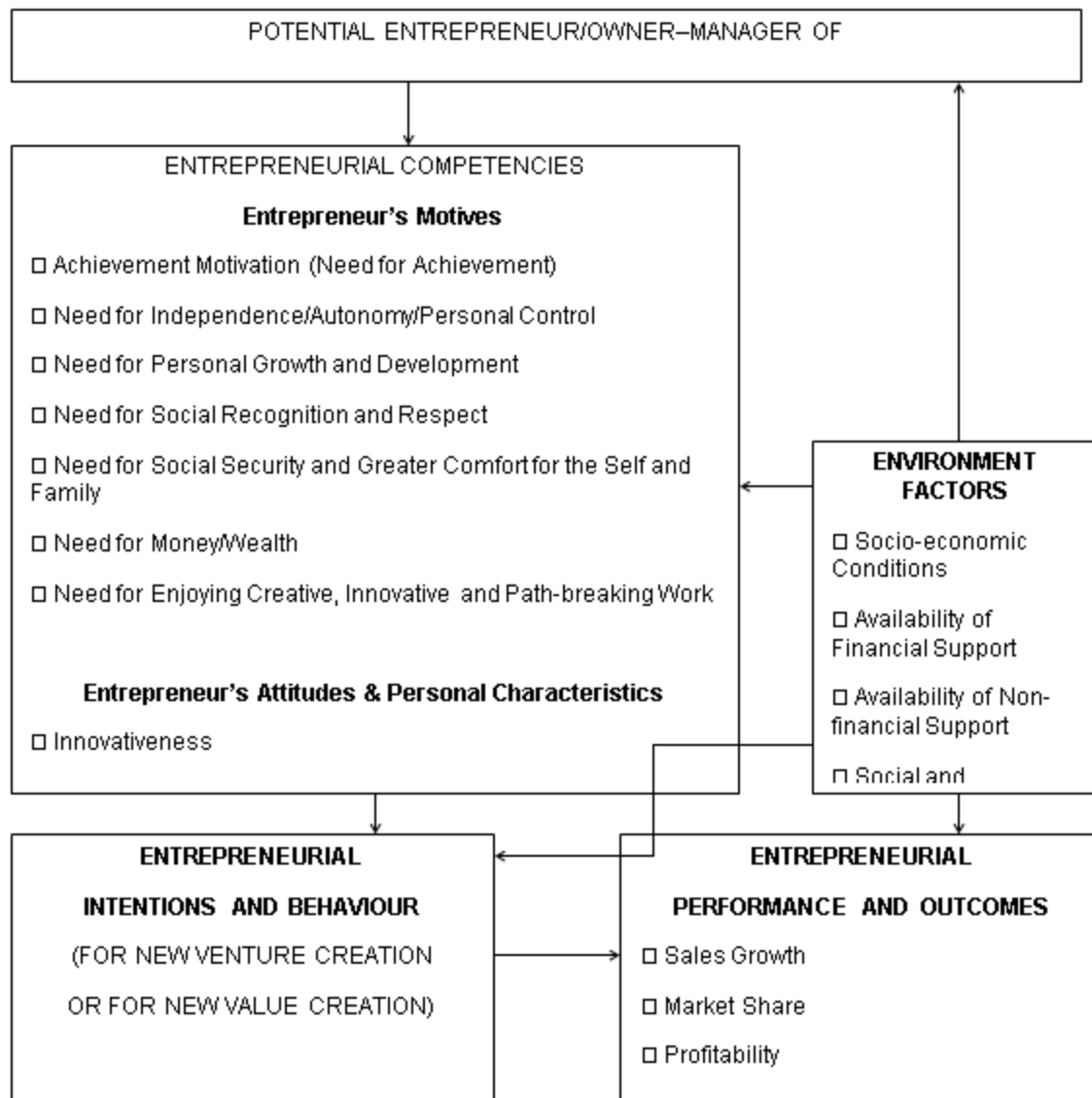


Figure 1.41. A Simple of Entrepreneurship and Entrepreneurial Competencies (Source: Jain (2011))

The next model draws on the theoretical foundations of entrepreneurial leadership (Figure 1.42). Bagheri and Pihie (2011) state that this model presents the interaction between the entrepreneurial leadership and different forms of entrepreneurial learning, including experience, observation, social interaction and reflection.

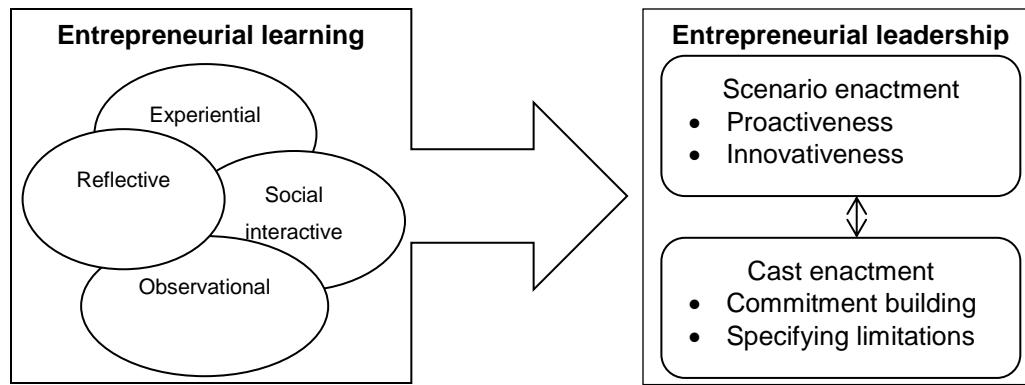


Figure 1.42. An integrated model for entrepreneurial leadership (Source: Bagheri and Pihie (2011))

Because the motivation for entrepreneurship can influence the decision to adopt CSR practices, we also present a model of entrepreneurial motivation (Figure 1.43). The model described by Kuratko and Hodgetts (2004) indicates as a key element for entrepreneurial motivation the rewards and expectations of possible entrepreneurs.

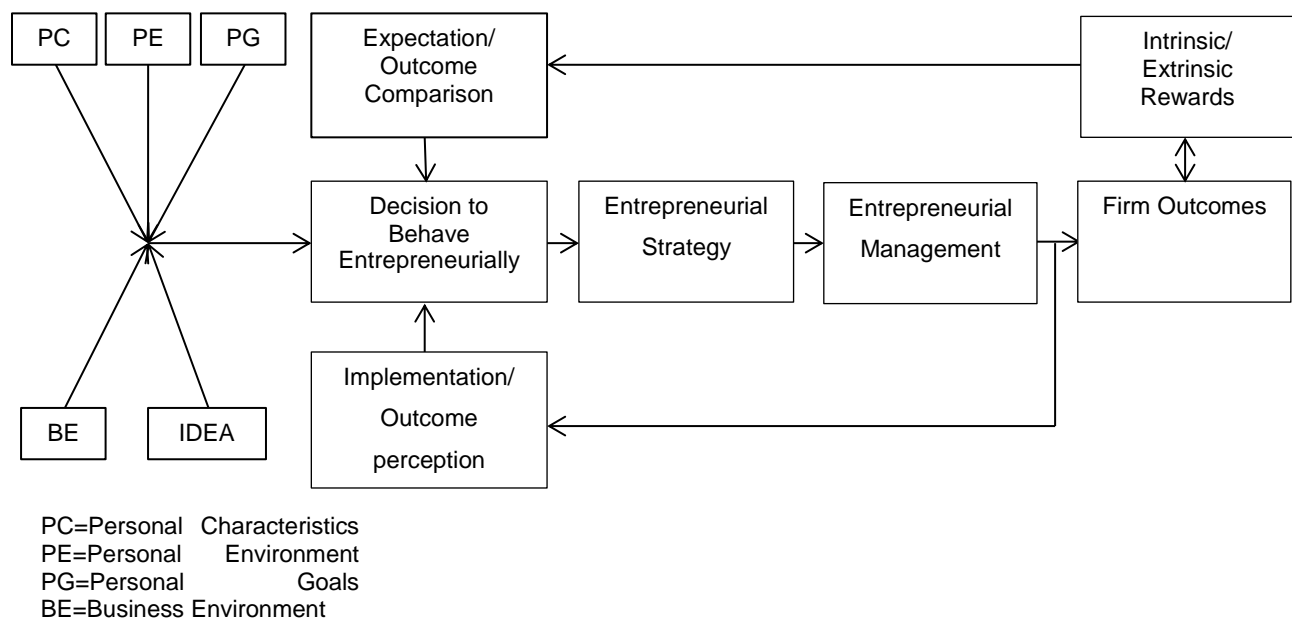


Figure 1.43. A model of entrepreneurial motivation

Source: Kuratko and Hodgetts (2004), extracted from Naffziger, D.W., Hornsby, J.S. and Kuratko, D.F. (1994) A proposed research model of entrepreneurial motivation, pag.33



The last entrepreneurial model described in this part is related to the ethical behavior of entrepreneurs (Figure 1.44). This model is representative for the social responsibility behavior and puts forwards the dilemmas which the entrepreneurs are confronted with (Vyakarnam et al., 1997).

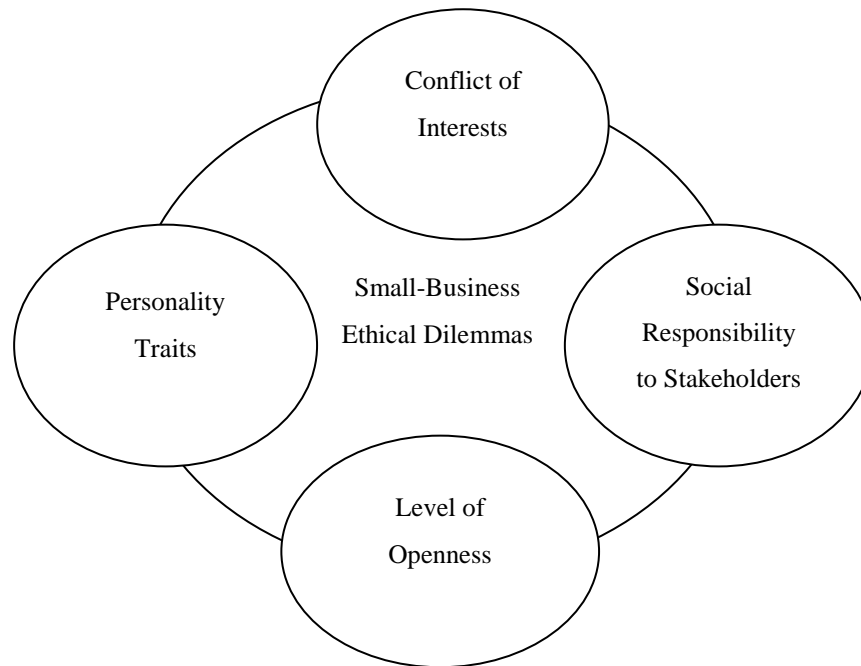


Figure 1.44. Four main themes of ethical dilemmas for entrepreneurs (*Source: Vyakarnam et al. (1997)*)

The efficiency of the entrepreneurial activity is now more than vital in a competitive global market, so the profit of a new business is the rule of surviving or extinction. The problem is how the profit has been obtained. Can a successful entrepreneur afford the luxury to be interested in social, cultural and environmental issues, or this is impossible, or totally or partially against the entrepreneurial nature? The characteristics of the CSR models show that the profitability is the main part, sometimes even the basis of these models. It is considered as an economic responsibility for the business (Wilson, 1980; Carrol, 1991; Ma, 2012). Making profit is one of the key issues in entrepreneurial models also (Kuratko and Hodgetts, 2004; Jain, 2011; Huarng, 2013). Consequently, this element allows avoiding the gap between normative CSR proposals and the actual operation of CSR by SME, noticed by Moyeen and Courvisanos (2012). Weber's (2008)

model clearly states that the implementation of CSR models by SME presents economic benefits and a burgeoning literature agrees on this conclusion.

Analyzing Carrol's (1991) CSR model, or Ma's (2012) hierarchy model of CSR, we see that economic responsibilities came first while the philanthropic responsibility comes in the last stage of the CSR maturity. For an entrepreneur it is hard to think first to others' problems because, in the first stages of the business, the struggle for survival is very hard. However, if philanthropic actions increase the visibility of the business and improve the networking capacity of entrepreneurs, it is recommended to act accordingly. In addition, philanthropic activities contribute to psychological rewards of personal recognition, personal satisfaction, implication in the community's future, and to the pleasure gained from socializing and interacting with others (Besser, 2012).

Another core element of the CSR models is the ethical behavior. Kuratko and Hodgetts (2004) show that honesty and integrity are amongst the characteristics of entrepreneurs. However, Vyakarnam et al. (1997) underline the ethical dilemmas of an entrepreneur. In order to overcome possible barriers to an ethical behavior, he/she must prove responsibility towards stakeholders, with primary importance assigned to customers, employees and local authorities.

Finally, the social and legal responsibility revealed by the CSR models is in agreement with several attributes of entrepreneurs, like the dynamism, the flexibility and the ability to get along well with people. The respect of the environment, even if it requires additional financial resources, brings in the long-run more benefits to the business.

Entrepreneurial intention is defined very pragmatic in the literature (Katz and Gartner, 1988), as being the search for information that may be used to create new business. In the same context, Choo and Wong and other authors argues that personal commitment to become an entrepreneur, to find a business, is actually the critical/key dimension of this search with significant impact on shaping entrepreneurial intention.

Intention is otherwise considered to be the only and the best predictor of behavior (Ajzen, 1991), individuals with plans to start new business finding their place much better in the entrepreneurial phenomenon in comparison with the persons who lack initiative. Therefore

entrepreneurial intention may be considered essential in the case of studying and understanding entrepreneurial dynamics, because intention is the one which determines initial key characteristics for the new organizations ((Katz and Gartner, 1988; Choo and Wong, 2006).

In the last period there have been many advances regarding the study of entrepreneurial intention, vast majority of those being based on cognitive psychology principles, emphasizing the importance of cognition in the development process of the entrepreneurial intention. This way have been highlighted, on the one hand, the role and the importance of cognitive variables in the entrepreneurial process (Galio, 2004) and on the other hand, it had reached the conclusion that studying cognitive processes involved in developing entrepreneurial intentions could be made on the basis of some models (Mitchell and Chesteen, 1995; Mitchell et al., 2002). These models offer the possibility for studying correlations between variables like the perceived feasibility, entrepreneurial experience, perceived utility, entrepreneurial intention etc (Krueger, 1993; Shapero and Sokol, 1982). One of the findings which are important to our research, obtained as a result of empirical testing of cognitive entrepreneurial models, is that entrepreneurial education is an important factor of influence in the process of cognition of feasibility and associated utility with the capacity to become an entrepreneur (Peterman and Kennedy, 2003).

Even if there have been made important progresses, as regards studying entrepreneurial phenomenon, there are still many “unsolved mysteries” , one of the study suggesting as possible emergent axes of future researches, the following three questions (Mitchell et al., 2007):

- Why some people choose to become entrepreneurs and others do not?
- Why only certain people recognize opportunities for new products and services that can be profitable and others do not?
- Why some entrepreneurs have so much success in comparison to others?

We believe that the answers to these questions can be found by focusing our research on two major axes of entrepreneurial phenomenon:

- Influence factors (individuals, socials and environmental)
- Entrepreneurial characteristics, considered as a group of variables, identifying and testing correlations between them.

Therefore, in the first instance, the entrepreneurial intention, according to the social factors model, is conditioned by influence factors such as:

- Social individual, such as: personal preparation, career stage, family experience (Robinson et al., 1991), gained life experience, as well as the growth medium (Gibb, 1993);
- Contextual, environmental, such as: taxes level, career opportunities synchronization, social environment changes, market conditions impact (Alstete, 2002), economic and social culture support (Green et al., 1996).

As regards the second axis, entrepreneurial characteristics model or of entrepreneurship necessary characteristics, the literature reveals several attempts that have focused on entrepreneurs personality characteristics. It went on from the general idea that entrepreneurs certainly must have unique characteristics, skills and values that distinguish them from others (Kohn, 1996), various studies highlighting and analyzing characteristics declared as imperious necessary for an entrepreneur. For example, the individual entrepreneurial orientation has been conceptualized based on three dimensions by (Covin and Slevin, 1989): innovativeness, proactiveness and risks taking, to which (Lumpkin and Dess, 1996) added two: competitive aggressiveness and autonomy, other research undertaken affirm that (Entriaglo et al., 2000): self-control, need of fulfilment/accomplishment and tolerance towards uncertainty are determinants of entrepreneurial tendency. On the other hand, another study shows that (Stewart et al., 1998): need of fulfilment/accomplishment, predisposition in taking risks, are differentiators of entrepreneurs to other people, even to corporate managers or owners of small and medium-sized companies.

Given that premises, is more than clear that entrepreneurial intention as predictor and subsequently entrepreneurial behaviour as concrete result of the latter, are influenced by the intensity with which them manifest, but also by the relations, correlations that exist or may be discerned under certain conditions between factors of individual and contextual nature. Moreover, it becomes absolutely necessary to identify possible ways to act on these levers, in order to influence the attitude at the individual level with further implications upon intention to have an entrepreneurial behaviour. In this respect, one of the models dedicated to study entrepreneurial intention is Shapero and Sokol model (Shapero and Sokol, 1982) (see Figure 1.45), which was

subsequently tested by Krueger in 1993 (Krueger and Carstrud, 1993). This model is based on a socio-cognitive approach, starting from the following assumptions:

- Exposure to previous entrepreneurial experiences will directly influence the perceived feasibility and desire
- Perceived feasibility and desire will directly influence perceived entrepreneurial intention.

The two authors, creators of the model, argued that exposure to entrepreneurial experiences will have a positive, direct influence upon the perceived feasibility of entrepreneurship and also upon the perceived desire to become an entrepreneur.

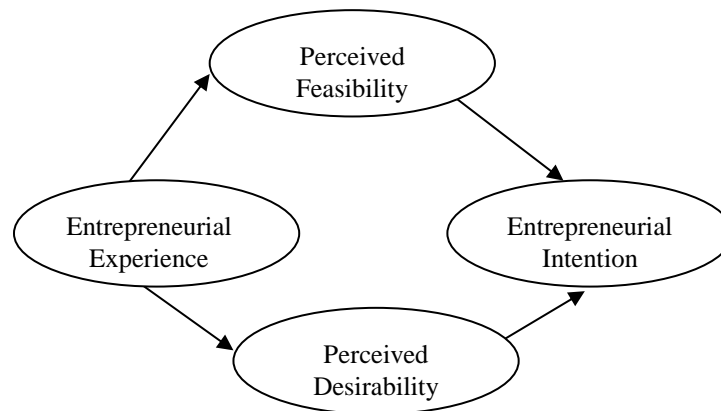


Figure 1.45. Model of entrepreneurial intentions (Shapero and Sokol, 1982)

Their work has been confirmed ten years later by Krueger (1993), which was demonstrating that entrepreneurial experiences are significantly influencing the perceived feasibility and in the same time the positive entrepreneurial experiences directly influences the perceived desire. Almost 20 years later, starting from the same model, it has been proposed to study entrepreneurial intention from the following assumptions (see Figure 1.46):

- Exposure to previous entrepreneurial experiences will directly influence the perceived feasibility
- Perceived feasibility will directly influence the perceived desire
- Perceived desire will directly influence the entrepreneurial intention

Results of the study have confirmed once again that the exposure to entrepreneurial experiences has a major impact upon intention to become an entrepreneur, not directly but through personal awareness upon desire and feasibility, reiterating at the same time the hypothesis that these

personal convictions represents the mechanism by which externally induced factors, such as entrepreneurial experience, could influence entrepreneurial intention (Krueger, 2010)

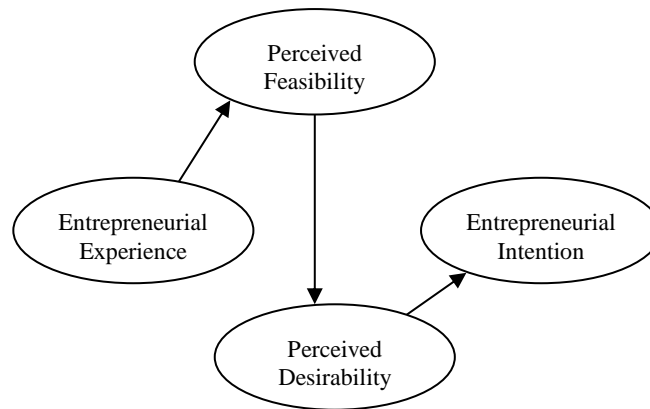


Figure 1.46. Model of entrepreneurial intentions (Devonish et al., 2010)

In the context in which entrepreneurial behaviour is considered in the literature, almost unanimously, a type of planned behaviour, is reasonably reiterating the idea that it can be learned, educated. From these premises, a group of Austrian researchers suggested also a highly interesting model that constitutes both an individual and a contextual of entrepreneurial phenomenon, from four perspectives: the person, the educational context, the educational process and environment (Frank et al., 2005) (see Figure 1.47).

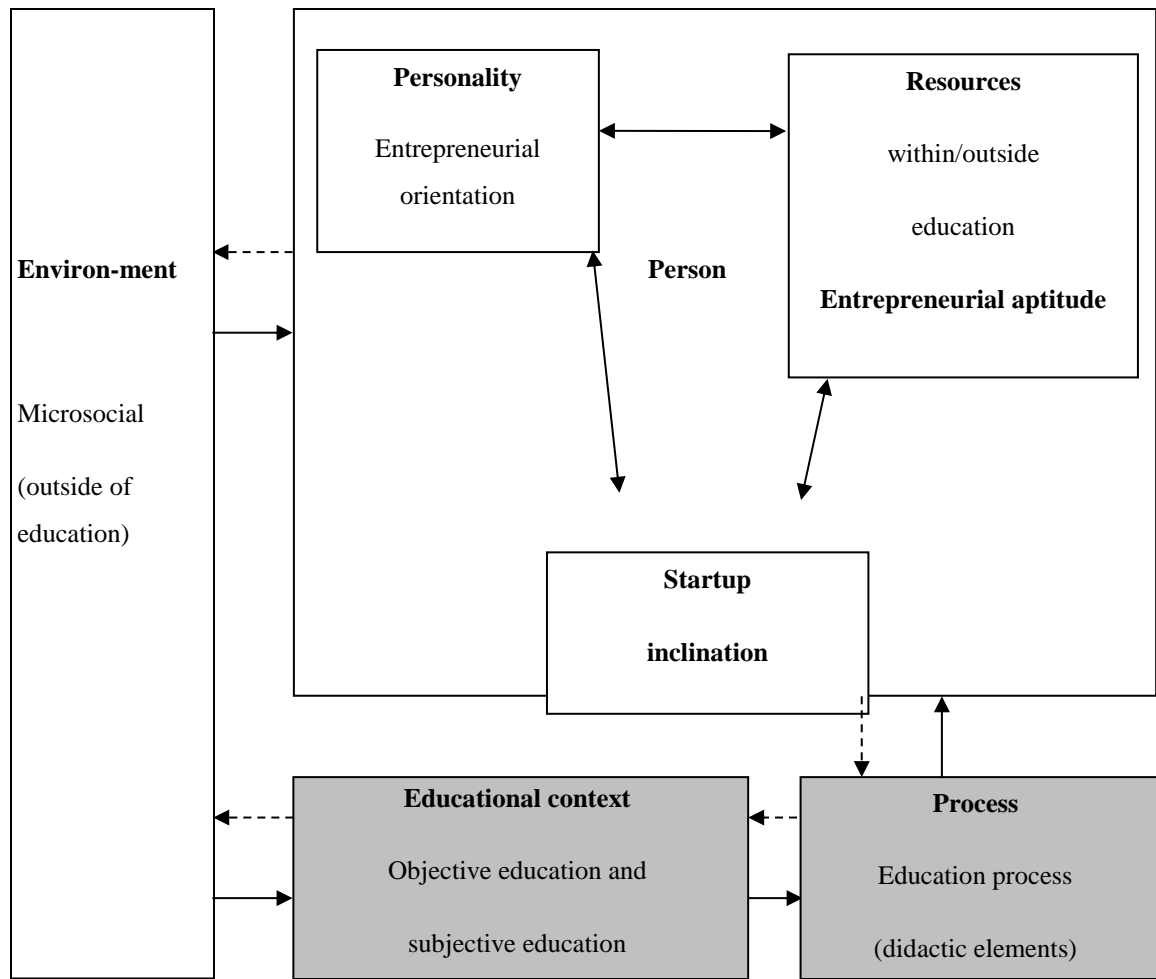


Figure 1.47. Model of entrepreneurial intentions (Frank et al., 2005)

This model promotes the idea according to which there is a correlation between personal configuration limits, on the one hand, and those of environment and educational context, on the other hand. The empirical test results of the model have confirmed that, of course in a certain context, that entrepreneurial orientation could be considerably influenced if acting in good time and well focused: at the personality level, in the educational process and at the environment level. It also has been found that entrepreneurial orientation development possibilities are real for any normal person. Based on previous approaches it can be observed the pointing out of education, of course we make reference to education of individuals, as influence factor within entrepreneurial process. From this perspective, is remarkable that, beyond the vertically approach on cycles, specific to national, classical education systems, is the bivalent approach in the horizontal plane of

education from entrepreneurial perspective, namely: “enterprise education” (a minimum set of skills that any student should possess) as prerequisite for entrepreneurial education (intercorrelation between graduation of a Higher Education Institution and predisposition to an entrepreneurial behaviour which requires: attitude, creativity, motivation, relationship, organization. Literature on the subject in the entrepreneurship field suggests that that possible "targets" for entrepreneurial education must be derived from entrepreneurial process purposes, which in the most comprehensive meaning, refer to: 1- increasing the level of entrepreneurial knowledge; 2- developing entrepreneurial skills of individuals and 3- opening of new businesses (Hytti et al., 2010). Thus, on the basis of these premises, were checked the following assumptions: the fact that individual motivation and team behaviour influences the results of entrepreneurial learning and on the other hand, motivation impact upon learning results is moderated by team behaviour. Therefore it is more than clear that individual motivation has an important role for: entrepreneurial education, entrepreneurial intention, and entrepreneurial behaviour and could be the subject for a new research. By approaching motivation from learning theory perspective, it has been highlighted that it is influenced by both internal and external factors (Helm-Stevens, O. Griego, 2009). Accordingly, we are dealing with two types of motivation: intrinsic motivation related to meet high rank needs and extrinsic motivation, related to meet low rank needs.

### **1.3.2. Research models: structure, results and analysis**

In the next part are presentend the implicion of *Entrepreneurial attitude as knowledge asset: its impact on the entrepreneurial activity in Europe*.

In order to increase the European Union (EU) competitiveness on international level, the European authorities have set up at the beginning of the 21st century the “Lisbon strategy”. The Lisbon declaration on 24th March 2000 stated that “the Union has today set itself a new strategic goal for the next decade: to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion”. Today, we can see that the results of this strategy, which has shifted the accent on the role of knowledge in promoting economic growth, were not the expected ones. Wyplosz (2010) states that “the Lisbon strategy for making the EU the world’s most competitive economy is a



failure”. The causes of this failure relate to the lack of structural reforms, needed in each member country (for more explanations, see Tabellini and Wyplosz, 2006).

### **The implication of the entrepreneurial attitude**

Indeed, structural reforms were necessary but, in our opinion the main reason causing the failure of the strategy was the incapacity to stimulate the entrepreneurial activities. The entrepreneurial attitude was not enforced and therefore, the impact on economic growth was relatively poor. In this context, the purpose of this part is not to show the impact of knowledge and entrepreneurship activity on growth, but to demonstrate that encouraging the entrepreneurial attitude and strengthening the entrepreneurial perception is benefic for the entrepreneurial activity. In other words, little was done by the authorities in associating the entrepreneurial attitude with a knowledge asset, even if the Green Paper on “Entrepreneurship in Europe” focused on the role of education in supporting the improvement of the skills necessary to develop an entrepreneurial mindset. There have been many attempts to define what can be included in the concept of a knowledge based economy (Westeren, 2008). The term “knowledge-based economy” results from a full recognition of the role of knowledge in economic growth (Kim, 2002). In the macroeconomic theory, Romer (1990) was the first who introduced the knowledge concept in the endogenous growth theory. In this line, in a knowledge-based economy, the exploitation of knowledge plays an important role in the creation of wealth. In the same time, the knowledge-based economy is characterized by change and by a turbulent business environment, where the role of the entrepreneurial activity cannot be neglected (Liang, 2002).

However, even if the academic literature associates knowledge with entrepreneurship, it fails in showing how the entrepreneurial attitude and perception can be considered as knowledge asset. Knowledge represents the total process of creation, storing, learning and sharing of knowledge which is embedded in organization and individuals, while the entrepreneurship is the process by which individuals pursue opportunities without regard to resources they currently control (Bin Mansour, 2002). The European Commission has defined entrepreneurship as a general view that is applicable in any kinds of business activities and routine lifetime control (Fuchs et al, 2008; Draghici et al., 2012). But how do we define the entrepreneurial attitude and how can we assess it?

The following scholars consider different factors influencing the entrepreneurial attitude (for a detailed description, see Kazemi and Madandar, 2012). These factors are related to the need for achievement, personal control and self-confidence (Robinson et al., 1991), to the attitude toward self-efficacy, creativity, leadership and intuition (Athayde, 2009), to the attitude focused on earning money (Robinson et al., 1991), to entrepreneurship motivation (Schwarz et al., 2009) or to the risk taking capacity (Olson and Bosserman, 1984). These factors are assessed by the Global Entrepreneurship Monitor (GEM), which associate the entrepreneurial attitude and perception with the perceived opportunities, capabilities and entrepreneurial intentions, but also with a reduced fear of failure and with the high status of entrepreneurs. All these elements represent in our opinion knowledge assets.

The association of entrepreneurial attitude with a knowledge asset is good for strengthening the entrepreneurial activity at EU level. Based on GEM data for the period 2007-2011 and using both a linear and a dynamic panel data approach, we have discovered that the entrepreneurial attitude positively influences the entrepreneurial activity in 15 European countries. The entrepreneurial attitude, as well as the entrepreneurial activity, is assessed using GEM statistics and aggregate index methodology (see the next section).

### **Entrepreneurial attitude and entrepreneurial activity in Europe**

The GEM is the annual report of the Global Entrepreneurship Research Association (GERA), dedicated to the assessment of the entrepreneurial activity, attitude and perception around the globe. In 2011, the Global Entrepreneurship Monitor conducted its 13th annual survey (GEM, 2011). GEM interviewed over 140,000 adults (18-64 years of age) in 54 economies, spanning diverse geographic areas and different economic development levels. These economies are considered “factor-driven economies”, “efficiency-driven economies” or “innovation-driven economies”, depending on their development level. In the EU, 22 countries were assessed out of which we have retained only 15 in our analysis (Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Netherlands, Romania, Spain, Slovenia and the United Kingdom). The seven countries which were excluded because of the lack of data are: Austria, the Czech Republic, Lithuania, Poland, Portugal, the Slovak Republic and Sweden. Portugal and Sweden were excluded in order to avoid the break panel problem.

The GEM reports present the entrepreneurial perception worldwide before 2000, but the setup of several well identified indicators describing the entrepreneurial activity and attitude is associated with the year 2007. That is why we have decided to retain in our analysis the timeframe covering 2007-2011. Even after 2007 some improvements of the reports were observed but, starting with 2007 we can have consistent statistical data. Moreover, before 2007 only few European countries were retained into the GEM surveillance. This makes the empirical study impossible for that period. The description of the individual indicators is represented in Table 1.11.

Table 1.11. Indicators describing the entrepreneurial activity and the entrepreneurial attitude

Entrepreneurial perception and attitude	
Indicators	Description
1. Perceived opportunities	Reflect the percentage of individuals who believe there are opportunities to start a business in the area they live in.
2. Perceived capabilities	Reflect the percentages of individuals who believe they have the required skills, knowledge and experience to start a new business.
3. Fear of failure	Associated to starting a business.
4. Entrepreneurial intentions	Represent the percentage of individuals who expect to start a business within the next three years.
5. Entrepreneurship as a good career choice	Is the degree to which entrepreneurship is accepted as a good career choice.
High status to successful entrepreneurs	Stands for the appreciation of entrepreneurship as a good career choice in general
Media attention for entrepreneurship	Is assessed by asking the individuals whether they believe that there are plenty of items on new and growing firms in the news and other media.
Entrepreneurial Activity	
Indicators	Description
6. Nascent entrepreneurship rate	The stage in advance of the start of a new firm.
7. New business ownership rate	The stage directly after the start of a new firm.
8. Early-stage entrepreneurial activity (TEA)	Combines nascent entrepreneurs and owner-manager of a new firm (less than 3.5 years old).
9. Established business ownership rate	Provide stable employment and exploit the knowledge and social capital accumulated in past experiences.
10. Discontinuation of businesses rate	Percentage of who have, in the past 12 months, discontinued a business, either by selling, shutting down or otherwise discontinuing an owner/management relationship with the business. This is not a measure of business failure rates.
Necessity-driven (% of TEA)	Percentage of those involved in total early-stage entrepreneurial activity (as defined above) who are involved in entrepreneurship because they had no other option for work.
Improvement-driven opportunity (% of TEA)	Percentage of those involved in TEA who: (i) claim to be driven by opportunity, as opposed to finding no other option for work; and (ii) indicate the main driver for being involved in this opportunity is being increasing their income, rather than just maintaining their income.

*Note: \* We have retained only the first five indicators from each category. The other indicators appear in the GEM survey starting with 2008. \*\* For the “fear of failure” indicator we have retained in the analysis its opposite (100%-fear of failure) as it is associated with a lack of knowledge and also with a negative influence on the entrepreneurial attitude.*

Source: GEM (2011)

In order to obtain an aggregate index for the entrepreneurial attitude and an aggregate index for the entrepreneurial activity, the values of each indicator were normalized and afterwards they were aggregated for each country, using a the arithmetic mean of the individual indicators. The Eq. (1.3.1.) presents the normalization procedure.

$$I_{ijc}^n = (I_{ijc} - I_i^{min}) / (I_i^{max} - I_i^{min}) \quad (1.3.1.)$$

where:  $I_{ijc}$  represents the indicator  $i$  for the period  $j$  for the country  $c$ ,  $I_i^{min}$  and  $I_i^{max}$  stand for the values corresponding to the weakest, respectively to the strongest manifestation of entrepreneurial attitude or activity, recorded by the indicator  $i$  over the analysed period in all the countries.  $I_{ijc}^n$  is the normalized value of the individual indicator. This normalization procedure allows obtaining the indicators defined over the interval  $[0;1]$ .

The normalized values of each indicator are aggregated in an entrepreneurial attitude index ( $I_{att}$ ) and in an entrepreneurial activity index ( $I_{act}$ ) according to Table 1, Eq. (1.3.2) and Eq. (1.3.3).

$$I_{att} = \sum_{i=1}^5 I_{ijc}^n / 5 \quad (1.3.2)$$

$$I_{act} = \sum_{i=6}^{10} I_{ijc}^n / 5 \quad (1.3.3)$$

### Econometric analysis

Using a panel data analysis, I assess the impact of entrepreneurial attitude on the entrepreneurial activity, which were evaluated based on the aggregate indexes described above. In the first step, I have estimated a simple OLS panel model, including dummy variables for each country, in order to observe the differences between countries. For the dummy variables, we have assigned the value 1 for the “innovation-driven economies” and the value 0 for the “efficiency-driven economies” (Hungary, Romania and Latvia in our sample). Because these dummy variables are not significant and because we consider that other variables beside the attitude influence the entrepreneurship activity, we do not report these results. However, due to the fact that the sample heterogeneity is important, we have constructed in the second phase a fixed effects panel model. However, having in mind the fact that the structure of our sample shows a  $N < T$  situation (number of countries is higher than the number of periods), we have estimated in the same time a random effects model. A Hausman test was performed in order to select the most appropriate model of the two mentioned above. The general equation is:

$$I_{actij} = \beta_0 + \beta_1 I_{attij} + \alpha_i + \varepsilon_{ij} \quad (1.3.4.)$$

where: the  $i$  subscript refers to different countries and  $j$  refers to different measurements within countries – i.e., the same variable measured at different points in time;  $\beta_1 I_{attij}$  is described as a fixed/random effect because the  $I_{attij}$  terms are all measured values and  $\beta_1$  is a fixed parameter;  $\alpha_i$

represents all stable characteristics of countries;  $\varepsilon_{ij}$  is a random variable with a probability distribution.

The results are reported in Table 1.12.

Table 1.12. Fixed and random effects models

<b>Iact<sub>ij</sub></b>	<b>Fixed effects</b>	<b>Random effects</b>
$\beta_0$	0.162***	0.152***
Iatt <sub>ij</sub>	0.296**	0.313***
R <sup>2</sup>	0.07	0.07
F test	7.37	
Huassman test	Prob>chi2 = 0.4794 (i.e. insignificant)	
<i>Note: *, ** and ***, mean statistic relationship significant at 10%, 5%, respectively 1%.</i>		

Both models show that the entrepreneurial attitude ( $I_{att}$ ) positively influences the entrepreneurial activity ( $I_{act}$ ). However, the Hausman test which tests the null-hypothesis that there is no difference between the estimated coefficients of a fixed effects and a random effects estimator, indicates the random effects model as performing better.

Nevertheless, these linear (static) models do not allow us to observe the potential dynamism which exists in the entrepreneurial activity for each country. Therefore, we use dynamic panel data estimation techniques to deal with the issue of endogeneity. Moreover, a reverse-causality effect can manifest between the entrepreneurial activity and the entrepreneurial attitude. That is why we employ a GMM system dynamic estimator, an approach proposed by Blundell and Bond (1998). This estimator is designed for datasets with many panels and few periods. This method assumes that there is no autocorrelation in the idiosyncratic errors and requires the initial condition that the panel-level effects be uncorrelated with the first difference of the first observation of the dependent variable. The following equation was tested (we have suppressed the constant as proving not significant):

$$I_{act_{ij,t}} = \beta_1 I_{att_{ij,t}} + \beta_2 I_{act_{ij,t-1}} + \varepsilon_{ij} \quad (1.3.5.)$$

The results are presented in Table 1.13. To test the validity of the restrictions of the model, a Sargan test was performed. The results show the evidence of the validity of the instruments employed.

Table 1.13. Results of dynamic panel data analysis

<b>Iact<sub>ij</sub></b>	<b>GMM system</b>
Iatt <sub>ij,t</sub>	0.482***
Iact <sub>ij,t-1</sub>	0.362**
Number of instruments	10
Countries included	15
Total observations	58
<i>Note: *, ** and ***, mean statistic relationship significant at 10%, 5%, respectively 1%.</i>	

The results are the same as in the previous static models, showing that the entrepreneurial attitude and the efforts to encourage this attitude toward culture and education are determinant factors for enhancing the entrepreneurial activity in the EU countries. This study is an attempt to show the link between the entrepreneurial attitude and entrepreneurial activity at EU level. Starting from the general context of the Lisbon strategy semi-failure, we have shown that one of the main reasons of this failure is related to a reduced effort directed to the enforcement of the entrepreneurial attitude. The European authorities have not considered the entrepreneurial attitude and perception as a knowledge asset able to dynamize the entrepreneurial activity in the EU member countries. Based on the GEM statistics, we have built aggregate indexes in order to capture the entrepreneurial attitude and activity in 15 European countries. We have employed both a static and a dynamic panel data approach for testing the effect of the attitude on the entrepreneurial activity. Our results have shown in both cases that the attitude and entrepreneurial perception have a positive impact upon the entrepreneurial activity. Therefore, the policy implications of our findings are important. Encouraging the entrepreneurial education and promoting the entrepreneurial culture (which result in ameliorating the entrepreneurial attitude) will represent the pillars of the economic growth in the EU countries.

Therefore, on the basis of the motivational model in the entrepreneurial context (personal characteristics, personal environment, personal goals, business environment, idea), we believe that it is appropriate to focus with propensity on intrinsic nature influences, being supporters of the idea that the "rewards" of intrinsic nature could be long-standing and can act as a motivational factor regarding entrepreneurial behaviour. In this context, the proposed model intend to study if individual perception on education, in general, and entrepreneurial education, in particular, has

influence on intrinsic motivation and therefore if the perception mediates the entrepreneurial education influence upon individual entrepreneurial intention (see Figure 1.48).

The proposed model distinguishes by the fact that it focuses attention on potential correlation between perception, as a higher level of processing and integration of information about external world but also about our own person, and education, respectively educational context as discrete contextual determinant proposing the following hypothesis:

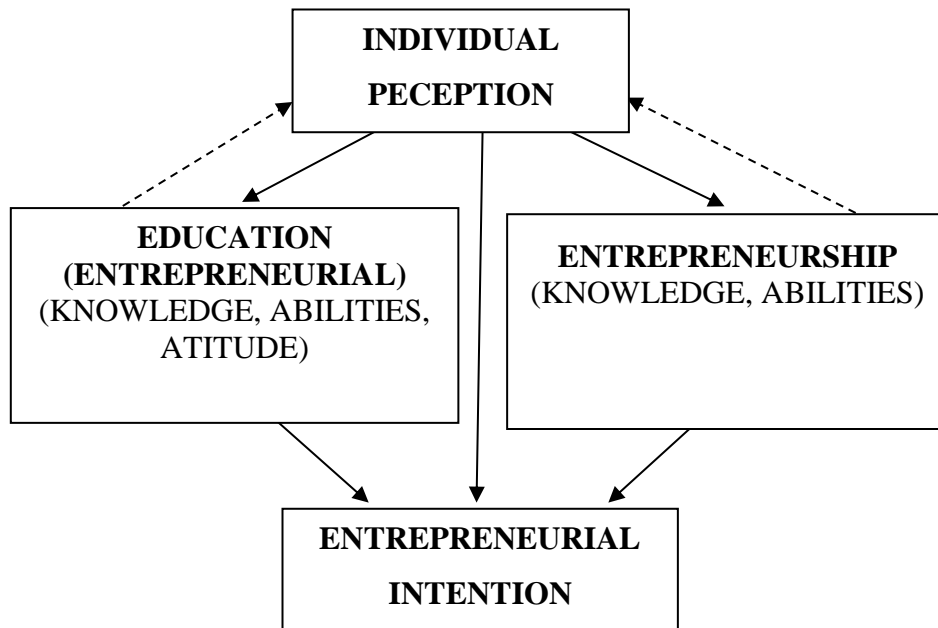


Figure 1.48. Research conceptual model

H1 – Education (as support for entrepreneurial activity) influences the intention to become an entrepreneur.

H2 – Knowledge about entrepreneurship (necessary knowledge and skills, possible results etc) influences the intention to become an entrepreneur.

Certainly, the next step must be the model testing in a certain educational context to see if the level of individual determination to become an entrepreneur is linked to the level of training in this domain; if perception of entrepreneurship (necessary knowledge/skills, possible results etc) is linked with the first two; perceived educational benefits system which sustains entrepreneurial intention etc. The methodology of this part consists of collecting the necessary data based on

investigation, using questionnaire as instrument. The research has been directed on two routes: for license students and for master students.

Both utilized questionnaires imply 5 separate modules [Pavlov and Tamasila, 2011] (Pugna et al., 2012), which totals 34 questions, both opened and closed:

Module 1 - The purpose of this group of questions is to determine whether the respondents would like to start their own business and to what extent he / she are willing and interested to do so. Also it is desired to clarify if young people are involved in entrepreneurial activities. This group of questions analyzes the primary eagerness of students to start their own business.

Module 2 - The purpose of this group of questions is to identify subjects' perception of the entrepreneurial phenomenon, to what extent they are aware of what imply an entrepreneurial career. Although most of the questions are closed, some of them allow students to provide additional explanations to justify their answers. This group of questions is focused toward determining subjects' motivation but also the degree of their preparation to start their own business.

Module 3 - consists of several detailed questions for respondents' self-evaluation. Through them, it should be determined to what extent they possess the necessary qualities to become entrepreneurs. After students have indicated willingness to choose between to be an employee or "their own employee" (Module 1), and have become aware of what day-to-day life of an entrepreneur presumes (Module 2), it came the time to be aware about the personal characteristics they do need in order to become entrepreneurs. The purpose of this group of questions is to identify what is missing to become more committed to begin a career as entrepreneurs.

Module 4 - gathers information about respondents perception with respect to knowledge and competences that they have acquired in the educational process and which might be of help in initiating their own business. Therefore, this group of questions identifies educational system benefits, regarding supporting students' entrepreneurial intentions. On the other hand, this module helps to identify the students' knowledge level they have already received in a variety of domains. At the same time, this module helps to identify the academia curriculum usefulness. This



awareness is helping them to formulate improvement suggestions of educational system, in order to foster an entrepreneurial career.

Module 5 - includes a set of questions which aims at respondents' opinions identification regarding educational system "flaws", which are considered the "gaps" which determined them to perceive, from a perspective of a potential entrepreneurial career, the educational system as pointlessness. Respondents can freely express their own ideas and position, as well as provide suggestions that can help identify problems and find interesting correlations.

The case study were performed at a Romanian Higher Education Institution (Faculty of Management in Production and Transportation, part of University „Politehnica” from Timisoara). The sample size was  $n_1 = 186$  students for licence studies and  $n_2 = 49$  students for master studies.

### **Statistical analysis – Pearson's correlation coefficient**

At this stage we will identify the main intercorrelations between possible control variables in each of the two case studies: case study 1 – for license students; case study 2 – for master students. This is in fact the preceding step for testing underlying assumptions of our conceptual research, by using the hierarchical regression analysis. Specific intercorrelations for case study 1 (including mean and standard deviation) are presented in Table 1.14. To be noted a number of significant correlations between the potential control variables. Thus, in this case, intention to become an entrepreneur is strongly correlated with: the level of knowledge regarding aspects linked to the entrepreneur's life ( $r = 0.354, p < 0.01$ ), the tendency to assume, to accept risk ( $r = 0.301, p < 0.01$ ) respectively the potential to take initiative ( $r = 0.268, p < 0.01$ ).

At the same time is correlated to the ability to impose your own ideas ( $r = 0.161, p < 0.05$ ) or simply a preference for a particular activity scheme ( $r = 0.171, p < 0.05$ ). It is also noted that, a preference for a particular activity scheme is strongly correlated with the level of knowledge regarding aspects linked to the entrepreneur's life ( $r = 0.252, p < 0.01$ ) and the potential to take the initiative ( $r = 0.214, p < 0.01$ ). In the same context, the knowledge level regarding aspects of entrepreneurship is significantly correlated to risk taking frequency ( $r = 0.338, p < 0.01$ ) or to correct decision taking frequency ( $r = 0.236, p < 0.01$ ) respectively to initiative taking potential ( $r = 0.197, p < 0.01$ ). Regarding education impact, in this particular case, one can see strong

correlations only with: initiative taking potential ( $r = 0.276$ ,  $p < 0.01$ ) respectively the capacity of imposing own ideas ( $r = 0.246$ ,  $p < 0.01$ ) and also two significant correlations regarding capacity of mobilizing other individuals to support your own ideas ( $r = 0.176$ ,  $p < 0.05$ ) and potential to be a self-disciplined person ( $r = 0.155$ ,  $p < 0.05$ ) (see Table 1.14.)

Table 1.14. Intercorrelations between variables, mean and standard deviation for Study 1 (License)

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1	3.45	0.882	-										
2	1.43	0.568	0.171*	-									
3	2.87	0.784	0.354**	0.252**	-								
4	3.27	0.670	0.301**	0.157*	0.338**	-							
5	4.10	0.670	0.068	-0.017	0.016	0.154*	-						
6	3.78	0.569	0.167*	0.195**	0.236**	0.273**	0.229**	-					
7	3.94	0.998	-0.019	0.074	0.011	0.065	0.122	0.082	-				
8	3.70	1.022	-0.076	0.103	-0.031	-0.124	0.100	0.015	-0.065	-			
9	4.01	0.984	0.116	0.112	0.036	0.096	0.130	0.176*	0.000	0.125	-		
10	4.10	0.854	0.161*	0.121	0.134	0.177*	0.095	0.058	-0.056	0.153*	0.604**	-	
11	3.65	0.773	0.268**	0.214**	0.197**	0.283**	0.185*	0.263**	-0.006	0.145*	0.401**	0.464**	-
12	1.44	0.696	-0.040	-0.011	-0.031	-0.118	0.089	0.107	-0.041	0.102	-0.264**	-0.048	0.178*
13	1.27	0.668	-0.051	0.050	-0.065	-0.069	-0.038	0.029	0.000	0.048	-0.307**	-0.105	0.091
14	1.13	0.639	-0.041	0.048	-0.028	0.040	-0.045	0.037	0.072	0.071	-0.293**	-0.085	0.184*
15	1.28	0.727	-0.075	0.068	-0.056	0.005	-0.082	-0.069	0.038	0.152*	-0.319**	-0.091	0.104
16	1.42	0.718	0.049	-0.007	-0.063	-0.106	0.000	-0.064	0.035	-0.048	-0.218**	-0.061	0.094
17	1.20	0.631	-0.026	0.077	0.043	0.037	-0.036	0.002	0.036	0.085	-0.211**	0.002	0.168*
18	3.11	0.872	0.116	0.109	0.054	-0.016	-0.075	0.007	0.008	-0.034	0.176*	0.246**	0.276*

Table 1.14. (continuation)

12	13	14	15	16	17
-					
0.572**	-				
0.645**	0.763**	-			
0.565**	0.687**	0.812**	-		
0.487**	0.587**	0.666**	0.536**	-	
0.515**	0.603**	0.697**	0.677**	0.483**	-
0.070	0.087	0.128	0.060	0.105	0.155*

To be also noted a few normal interdependences, like the fact that the most powerful correlation is recorded between ability to organize your own time and the ability to finalize a started activity,

Specific intercorrelations for case study 2 (including mean and standard deviation) are presented in Table 1.15.

Table 1.15. Intercorrelations between variables, mean and standard deviation for Study 2  
(Master)

	M	SD	1	2	3	4	5	6	7	8	9	10	11
1	3.39	0.953	-										
2	1.45	0.503	0.325*	-									
3	3.04	1.207	0.439**	0.141	-								
4	3.45	0.792	0.178	0.006	0.024	-							
5	4.29	0.645	0.189	0.174	0.359*	0.151	-						
6	4.10	0.586	0.226	0.124	0.141	0.034	0.307*	-					
7	4.27	0.811	0.107	-0.196	0.095	-0.189	-0.068	-0.190	-				
8	4.10	0.928	-0.286*	-0.195	-0.176	-0.005	-0.051	-0.215	-0.042	-			
9	1.96	0.957	-0.005	0.212	-0.053	-0.030	-0.082	-0.178	-0.093	0.170	-		
10	3.45	0.765	0.242	0.007	0.025	0.829**	0.114	0.035	-0.196	0.024	0.026	-	
11	4.24	0.662	0.275	0.101	0.300*	0.183	0.856**	0.0310*	-0.085	0.026	-0.214	0.148	-
12	3.82	1.014	0.075	-0.162	-0.045	-0.077	0.114	0.628**	-0.092	-0.158	-0.609**	-0.053	0.317*
13	3.88	1.348	-0.027	-0.348*	-0.074	-0.221	-0.079	-0.063	0.621**	-0.076	-0.569**	-0.228	0.058
14	4.00	1.258	-0.104	-0.264	-0.192	-0.042	0.000	0.056	0.143	-0.129	-0.537**	-0.043	0.150
15	4.24	1.300	-0.196	-0.331*	-0.153	-0.089	-0.035	-0.061	0.095	-0.042	-0.578**	-0.113	0.074
16	3.80	1.190	-0.076	-0.227	-0.284*	-0.011	-0.004	0.060	-0.007	-0.001	-0.666**	-0.080	0.118
17	3.41	1.153	-0.128	-0.251	-0.222	0.046	0.008	-0.032	0.060	-0.061	-0.532**	0.048	0.139
18	3.53	0.819	0.024	0.067	-0.043	0.235	0.141	0.232	-0.122	-0.100	-0.185	0.243	0.101

Table 1.15(continuation)

12	13	14	15	16	17
-					
0.578**	-				
0.718**	0.786**	-			
0.636**	0.755**	0.841**	-		
0.624**	0.607**	0.710**	0.801**	-	
0.582**	0.649**	0.804**	0.752**	0.715**	-
0.145	-0.053	-0.020	-0.046	0.028	0.009

To be noted a number of significant correlations between the potential control variables, but to be mentioned that there are also recorded (as compared to the first case study) a series of mutations,

from the correspondence point of view (of variables pairs), respectively of interdependences manifestation intensity. Thus, intention to become an entrepreneur, in this case, is more strongly correlated, but only to the knowledge level of aspects regarding entrepreneurial career ( $r = 0.439$ ,  $p < 0.01$ ), respectively directly correlated to preference for a particular activity scheme ( $r = 0.325$ ,  $p < 0.05$ ) and inversely correlated with the necessary time horizon, estimated to become an entrepreneur ( $r = -0.286$ ,  $p < 0.05$ ). Therefore, intercorrelations with the potential of initiative taking, the capacity of imposing own ideas, does not appear any longer etc. To be also noted that, the preference for a particular activity scheme, is no longer strongly correlated with any of the other variables, being negatively correlated with: the ability to coordinate heterogeneous people, from characteristics perspective ( $r = -0.384$ ,  $p < 0.05$ ) respectively the ability to organize your own time ( $r = -0.331$ ,  $p < 0.05$ ). In the same context, the knowledge level regarding entrepreneurial aspects is no longer strongly correlated with risk taking frequency or correct decision frequency, but is still significantly correlated with ability to assume the decisions taken ( $r = 0.359$ ,  $p < 0.05$ ) or initiative taking potential ( $r = 0.300$ ,  $p < 0.05$ ) respectively negative correlated with the need to prove yourself that you can achieve something ( $r = -0.284$ ,  $p < 0.05$ ). Regarding the education impact, we point out the nonexistence of significant correlations, in other words both disappearance of registered correlations in previous case study (with: initiative taking potential, ability of imposing own ideas, mobilizing other individuals to support your own ideas, ability to mobilize others to support your ideas, potential to be a self-disciplined person etc) as well as lack of new intercorrelations. In this context, the most powerful correlation is recorded between: ability to assume the decisions taken and the potential to take the initiative ( $r = 0.856$ ,  $p < 0.01$ ), tendency to assume, to accept a risk and the ability to impose own ideas ( $r = 0.829$ ,  $p < 0.01$ ) respectively between ability to organize own time and the ability to finalize whatever is already started ( $r = 0.841$ ,  $p < 0.01$ ).

From these intercorrelations, highlighted through Pearson's coefficient, in order to verify the two enunciated hypothesis, we will use hierarchical regression analysis to determine, for each of the analyzed case studies, dependencies or independencies orientation and intensity between control variables. In this respect, variables whose correlation based on Pearson's coefficient have been explained beforehand, will be ranked according to the degree of correlation with the variable that will be considered as dependent. Thus, we have used three models, considering as dependent

variables: intention to become an entrepreneur (1), knowledge of aspects regarding entrepreneurship (3) and also perceived utility of educational process (18) (see Table 1.16).

As can be seen, in the case of license studies students, the determination to choose a career of entrepreneur is significantly related to the degree of knowledge of aspects regarding entrepreneurship ( $\beta = 0.253$ ,  $p < 0.01$ ), desire to prove yourself that you can do it ( $\beta = 0.707$ ,  $p < 0.01$ ) respectively your ability of risks taking ( $\beta = 0.159$ ,  $p < 0.05$ ) and is related negatively to the ability to complete usually commenced activities ( $\beta = -0.154$ ,  $p < 0.05$ ). Regarding the extent of knowledge of aspects tied to an entrepreneur career are recorded powerful relationships with intention to become an entrepreneur ( $\beta = 0.236$ ,  $p < 0.01$ ), capacity of risks taking ( $\beta = 0.195$ ,  $p < 0.05$ ) respectively preference for a certain type of activity ( $\beta = 0.153$ ,  $p < 0.05$ ) and a negative relationship regarding capacity to mobilize others ( $\beta = -0.153$ ,  $p < 0.05$ ) (see Table 1.16).

Table 1.16. Hierarchical regression – License studies

<b>Model 1(1)</b>		<b>Model 2(3)</b>		<b>Model 3(18)</b>	
2	0.045	1	0.236	9	0.063
3	0.253	2	0.153	10	0.150
4	0.159	4	0.195	11	0.200
6	0.015	6	0.132	17	0.129
10	0.023	11	0.043	R <sup>2</sup>	0.111
11	0.149	R <sup>2</sup>	0.223	R <sup>2</sup> Adj.	0.091
R <sup>2</sup>	0.191	R <sup>2</sup> Adj.	0.201	F	5.638
R <sup>2</sup> Adj.	0.164	F	10.333	1	0.070
F	7.049	5	-0.064	2	0.056
5	-0.001	7	-0.003	3	-0.001
7	-0.034	8	0.005	4	-0.138
8	-0.052	9	-0.153	5	-0.095
9	-0.019	10	0.093	6	-0.040
12	-0.009	12	0.017	7	0.019
13	0.007	13	-0.072	8	-0.102
14	-0.154	14	-0.037	12	-0.031
15	-0.033	15	-0.088	13	-0.002
16	0.707	16	-0.028	14	0.163
17	-0.046	17	0.123	15	-0.118
R <sup>2</sup>	0.227	R <sup>2</sup>	0.251	16	-0.008
R <sup>2</sup> Adj.	0.154	R <sup>2</sup> Adj.	0.180	R <sup>2</sup>	0.161
$\Delta R^2$	0.036	$\Delta R^2$	0.028	R <sup>2</sup> Adj.	0.076
F	3.106	F	3.535	$\Delta R^2$	0.050

18	0.064	18	-0.001	F	1.895
R <sup>2</sup>	0.231	R <sup>2</sup>	0.251		
R <sup>2</sup> Adj.	0.153	R <sup>2</sup> Adj.	0.175		
$\Delta R^2$	0.004	$\Delta R^2$	0.000		
F	2.963	F	3.507		

In the same context, education utility is significantly related to the ability of initiative taking ( $\beta = 0.200$ ,  $p < 0.01$ ), or complete commenced activities ( $\beta = 0.163$ ,  $p < 0.05$ ) respectively the ability to persuade others ( $\beta = 0.150$ ,  $p < 0.05$ ) or to be disciplined ( $\beta = 0.129$ ,  $p < 0.05$ ). As significant relationship, to this date, we can consider only the one regarding the ability of risks taking ( $\beta = -0.138$ ,  $p < 0.05$ ).

Hypothesis 1, which argues that perception on education influences intention to become an entrepreneur, we've tested by using models 1 and 3, and as dependent variables: intention to become an entrepreneur and perceived education utility become an entrepreneur. The results obtained in this case reveals a relationship far from significant between intention to become an entrepreneur and perceived utility of educational process, in this meaning ( $\beta = 0.064$ ,  $p < 0.05$ ), therefore one can say, that in given circumstances, this hypothesis is not, even partially, confirmed.

Hypothesis 2, assumes that the degree of knowledge aspects regarding entrepreneurial career a influences intention to become an entrepreneur and has been tested using models 1 and 2 which have as dependent variables: between intention to become an entrepreneur and knowledge degree regarding entrepreneurial career. The obtained results confirms the hypothesis because there has been a significant relationship between the two variables ( $\beta = 0.253$ ,  $p < 0.01$ ).

In the case of master students (see Table 1.17), determination to choose an entrepreneurial career is significantly related to frequency of correct decisions taking ( $\beta = 0.956$ ,  $p < 0.01$ ) or capacity of initiative taking ( $\beta = 0.867$ ,  $p < 0.01$ ) respectively the ability to coordinate heterogeneous people, from the point of view of characteristics and interests ( $\beta = 0.873$ ,  $p < 0.01$ ) or a desire to prove yourself something ( $\beta = 0.582$ ,  $p < 0.01$ ).

Table 1.17. Hierarchical regression – Master studies

<b>Model 1(1)</b>		<b>Model 2(3)</b>		<b>Model 3(18)</b>	
2	0.221	1	0.450	1	0.204
3	0.442	5	0.331	2	0.315
8	-0.272	11	-0.138	3	0.158
R <sup>2</sup>	0.289	16	-0.814	4	0.523
R <sup>2</sup>	0.241	R <sup>2</sup>	0.339	5	0.641
Adj.					
F	5.962	R <sup>2</sup>	0.278	6	0.401
		Adj.			
4	-.0227	F	5.525	7	0.050
5	-0.806	2	-0.065	8	0.173
6	0.956	4	0.386	9	0.234
7	-0.817	6	-0.060	10	0.588
9	0.290	7	0.713	11	0.635
10	0.525	8	0.058	12	0.402
11	0.867	9	-0.440	13	0.071
12	0.537	10	-0.439	14	0.300
13	0.873	12	0.711	15	0.288
14	-0.158	13	-0.039	16	0.259
15	-0.473	14	-0.391	17	0.211
16	0.582	15	0.342	R <sup>2</sup>	0.248
17	-0.123	17	-0.020	R <sup>2</sup>	0.178
				Adj.d	
R <sup>2</sup>	0.556	R <sup>2</sup>	0.536	F	0.582
R <sup>2</sup>	0.327	R <sup>2</sup>	0.297		
Adj.		Adj.			
$\Delta R^2$	0.086	$\Delta R^2$	0.197		
F	2.427	F	2.239		
18	-0.041	18	-0.131		
R <sup>2</sup>	0.557	R <sup>2</sup>	0.549		
R <sup>2</sup>	0.306	R <sup>2</sup>	0.294		
Adj.		Adj.			
$\Delta R^2$	0.001	$\Delta R^2$	0.013		
F	0.222	F	2.152		

At the same time, is negatively related to decisions responsibility taking ( $\beta = -0.806$ ,  $p < 0.01$ ) or support expected from the family, friends ( $\beta = -0.817$ ,  $p < 0.01$ ) respectively ability to organize own time budget ( $\beta = -0.473$ ,  $p < 0.01$ ). Regarding the knowledge of entrepreneurial career aspects,

are recorded strong relationships with capacity to mobilize others ( $\beta = 0.711$ ,  $p < 0.01$ ) or the ability to coordinate heterogeneous people, from the point of view of characteristics and interests ( $\beta = 0.873$ ,  $p < 0.01$ ), respectively frequency of correct decisions taking ( $\beta = 0.386$ ,  $p < 0.01$ ) but also with the intention of becoming an entrepreneur ( $\beta = 0.450$ ,  $p < 0.01$ ). The most significant negative relationships are recorded with desire to prove yourself something ( $\beta = -0.814$ ,  $p < 0.01$ ), capacity to mobilize others ( $\beta = -0.440$ ,  $p < 0.01$ ) respectively correct self-evaluation capacity ( $\beta = -0.439$ ,  $p < 0.01$ ). In the same context, education utility is significantly related decisions responsibility taking ( $\beta = 0.641$ ,  $p < 0.01$ ) or the ability to initiative taking ( $\beta = 0.635$ ,  $p < 0.01$ ) respectively the capability to persuade others ( $\beta = 0.588$ ,  $p < 0.01$ ), no negative relationships appearing.

Hypothesis 1, which argues that education perception influences intention to become an entrepreneur, we've tested again with the models 1 and 3, using as dependent variables: intention to become an entrepreneur and education perceived utility to become an entrepreneur. The results obtained in this case, reveals also not only a far from significant relationship between intention to become an entrepreneur and perceived utility of educational process, but in addition, is a negative one ( $\beta = -0.041$ ,  $p < 0.05$ ), and therefore this hypothesis we can say that, in given circumstances, is ruled out once again.

Hypothesis 2, argues that the knowledge degree regarding entrepreneurial career aspects influences the intention to become an entrepreneur and has been tested using models 1 and 2 which have as dependent variables: intention to become an entrepreneur and the degree regarding entrepreneurial career aspects.

The obtained results not only reconfirms the hypothesis, but is strengthen it, because an even stronger relationship has been ascertain among the two variables ( $\beta = 0.442$ ,  $p < 0.01$ ). It should be noted that two important aspects, in antithesis with previous case study, the degree regarding entrepreneurial career aspects is negative significantly related to education perceived utility ( $\beta = -0.131$ ,  $p < 0.05$ ) and, on the other hand, perception over educational process utility is also significantly related with the intention of becoming an entrepreneur ( $\beta = 0.204$ ,  $p < 0.01$ ).



Studying entrepreneurial phenomenon from different angles, constituted and of course remains a perpetual concern, alike to scientists but also to practitioners. As far as we're concerned, both context and dynamic but especially desire and curiosity of identification respectively testing certain ideas or hypotheses took over driving forces which updates always the challenge.

The place and the role of educational process in the equation that entrepreneurial phenomenon occurs, activity, in the context in which educational performance is in a manifestly impasse, actually representing the neuralgic spot in the necessary procedure to understand present, but also absolutely necessary for identifying future solutions.

Therefore, the question to which we've searched answer for, can be expressed in the most systematic way possible as: Intention to become an entrepreneur, to initiate a business it is, or not, influenced a priori by educational process?

Beyond more than obvious certain similarities or differences among respondents' replies at some questions for the two samples, one can say that the attitude towards entrepreneurial career, initiating own business is positive, but step-by-step doubled by an insecurity, hesitation state, derived as a result of gaps perception from educational process journey perspective or from ignorance regarding more concrete aspects of entrepreneurial phenomenon.

Crystallization of some opinion vectors, respectively of possible differences or similarities between the two samples from this perspective, constituted the premise for the next step: identifying context-sensitive correlations, able to highlight some dependencies or interdependencies on which basis it can be determined if the entrepreneurial phenomenon can be "shaped", or not, with the assistance of educational levers, or other kind, in a given context.

In this respect, to capture any shade that could be useful to our initiative, the analysis has been made to a different level of detail, at two levels, license and master studies.

Having in view the pursued objective, hypothesis (that forms the basis of the proposed conceptual research model) confirmation or rejection, we have focused attention on axes generated by possible control variables, obviously correlated with it, thus:

A. Intention to become an entrepreneur is strongly correlated with the knowledge level regarding entrepreneurial career aspects both for license studies students and master studies students. In the same context, significant correlations are recorded with: risks taking (for master students), ability to initiative taking (for students), ability to mobilize others to support your own ideas (for license students), preference for a certain activity regime (both for license and master students). The most significant negative correlation is recorded with estimated time horizon to become an entrepreneur (for master students' case).

B. Preference for a particular activity scheme is significantly intercorrelated with: ability to initiative taking or knowledge regarding entrepreneurial aspects (for license students) respectively the ability to organize your own time, or to coordinate heterogeneous persons from the point of view of interests and characteristics (negative correlated for master students).

C. Knowledge degree regarding entrepreneurial career aspects is strongly correlated with: risks taking or accepting and frequency of correct decisions taking (for license students), assuming decisions taken responsibility (for master students), respectively the capacity of initiative taking (both for license and master students).

D. As to the impact of perceived education received, has found powerful intercorrelations with: initiative taking potential, ability to impose own ideas or to mobilize others and to be self-disciplined (for license students), respectively no significant correlation in master students' case.

There are many points of view (correlations) identical/common but equally even more characteristic only to certain groups of respondents, the most obvious being due to the lack of any significant correlations in the case of perceived education impact for master students.

Beginning with correlations highlighted from Pearson's coefficient based analysis, in order to verify actually the two hypothesis which the research model proposes, was performed a hierarchical regression analysis, with the assistance of three models that have successively considered as dependent variables: intention to become an entrepreneur (1), knowledge regarding entrepreneurial aspects (3) and also perceived education impact (18). The results obtained, technically speaking, adds up to the following directions:

A. Regarding individual perception of entrepreneurial education utility/impact on entrepreneurial intention (hypothesis 1) we have the following situation: the relationship coefficient is recording very low values, in other words, a insignificant relationship between dependent variable (entrepreneurial intention) and the independent one (educational process). At least for license students, one can say that educational process does not have a direct impact on their intention to choose an entrepreneur career, maybe only indirectly, since there are some education significant relationships with: ability to initiative taking, ability to persuade others or to finish what you've already started, respectively to be disciplined, specific characteristics to entrepreneurial profile. For master students the relationship intensity between the two variables is noticeably equal, giving the impression that we can have a similar contextual interpretation, only that the coefficient sign is negative, an consequently a negative relationship.

B. As regards the relationship between perception of knowledge degree regarding entrepreneurial career aspects and intention to become an entrepreneur, one can observe a situation that can be characterized even homogeneous, in both case studies, between the two variables is putting forth significant positive relationships of relatively equal intensity, with a "plus" in the case of master students.

Therefore, one can say that only one of the two hypotheses is fully confirmed in both case studies, and that is hypothesis 2, the hypothesis 1 being confirmed only partially, explicitly speaking, it is observed that following situation: perception is that "educational journey", therefore education which they benefit or have benefited from, is not significantly influencing their intention to become entrepreneurs, but minus sign beside the regression coefficient in the regression table suggests even a possible negative influence, in master students case.

This result is a direct consequence of: low level of "learning by doing" concept promotion and deployment, entrepreneurs and companies more theoretical rather than practical involvement in the planning and carrying out/implementation of the programs and educational activities designed to cultivate and develop entrepreneurial spirit, the teachers motivation low level (financial, but not only), lack of correlation and coordination efforts of entrepreneurial education promoters. As an additional direction for entrepreneurship, the *implications of leadership* are presented. The leadership style represents the behavioral model which characterizes generally speaking a human

been and particular a leader. In the same time the entrepreneurial behavior it is a kind of planning behavior, so it is possible to be learned but also has need some contextual demands. At the beginning of the twenty-first century we are experiencing a rapidly changing environment in various domains of human activity as: technological, scientific and economic, etc. Unfortunately these few very rapid mutations giving rise to complexity and uncertainty in the modern world. Therefore all these societal changes have inevitably transformed including the school environment into a more dynamic and complex one than in the past (Crow (2006)).

In this context, where many and various challenges and pressures are identified, there is an increasing recognition of the importance of school leadership in supporting change and providing for educational quality (Brauckman and Psahiardis (2011)). All of these are necessary because the major demands of new era for all of us it is the capacity to have an entrepreneurial behavior that supposes: innovativeness, proactivity and risk taking (Covin and Slevin (1996)) where have added two: competitive aggressiveness and autonomy (Lumpkin and Dess (1996)). But in the same time it is knew the fact that leader hypostasis suppose to deal with the interpersonal aspects of a manager's job, with change, inspiration, motivation and influence. Of course another way to gain an understanding of leadership is to examine the various roles carried out by the leaders.

In this context we use the following questionnaires in order to identify the readiness of students for the leadership role (DuBrin (1995)) and what type of leadership they are prefer, what kind of leader is possible to become as a first step, and then starting from these premises how much predisposed are students to change, to have an entrepreneurial behavior.

In order to *evaluate the student's involvement level*, a study was performed based on *questionnaires (two of them had use the five points Likert scale and the third is based on a dihotomic questions) addressed to students from technical universities, regarding leadership potential and leadership style and finally regarding the entrepreneurial predisposition.*

To understand the leadership, it is important to grasp and to assume the difference between the leader roles by comparison with the manager role. The leadership behavior could be classified in terms of how much involvement leaders have with people-related versus work-related issues. So, in order to provide useful suggestions for being an effective leader (to inspire people, to be

innovative and to initiate positive changes or new ventures) we consider that is necessary to attain insight into your own leadership style or potential style.

The autocratic leaders retain for them the most part of the authority. They take decisions confidently and assume that the group members will obey. The autocratic leaders are not concerned with group member's attitude about their decisions. The autocratic leaders are considered as being task-oriented and their typical attitude includes telling employees what and when to do. The conditions in which this style can be applied are when the leader has all necessary information, is under time pressure and the employees are well motivated. The authoritarian style must be utilized normally very rarely and only when in general there is a deadline limit pressure.

The participative leaders share decisions with group members. The participative leadership contains so many behaviors and attitudes that it can be divided in three types; consultative, consensual and democratic.

The consensual leader discusses with group members before making a decision, but they retain the final authority before making the final decision. The consensual leaders are named this way because they fight for consensus realizing. They encourage the group discussions about an issue, and then they make the final decision which reflects the general consensus. A decision is not considered as final until all parts involved agreed upon the decision

The democratic leaders confer the final authority to the group. They function as collectors of group's opinions and take a vote before a decision making.

There are some issues regarding participative leadership. Sometimes it may take too long time to make a decision and sometimes the group members are asked for trivial issues. Another problem is that some managers consider that sharing decisions reduces their power. The participative style is usually utilized when the leaders has a part of the information and the employee the other one. It is obvious that is not expected that the leader knows everything and therefore is necessary that the group members are peoples with high professional and humane qualities. Using this style ensures a mutual benefit, meaning that the peoples work together in a team and the leader can take the best decisions.

The delegative leaders (free-rein) transfer virtually all authority and control toward the group (team). The leadership is offered to the group indirectly rather than directly. The group members have the entire liberty as far as they don't disobey the procedures. The delegative style is sometime efficient if the employees are well motivated and are experienced. The issue which appear regarding the delegative leadership is that the group members perceive it as noninvolvement or indifferent. The delegative style is not the one to be utilized to blame other people, but rather is used when there is complete confidence among employees.

An efficient leader uses all three styles depending on forces involved between leader, group members (employees) and situation.

The use of the three styles: letting an employee know that a procedure is not efficient and a new one must be implemented (authoritarian style). Another popular framework for thinking about a leader's "task versus person" orientation was developed by Robert Blake and Jane Mouton in the early 1960s. Called the Managerial Grid, or Leadership Grid, it plots the degree of task-centeredness versus person-centeredness and identifies five combinations as distinct leadership styles.

The two behavioral dimensions can be described as follows:

- *Concern for People* - this is the degree to which a leader considers the needs of team members, their interests, and areas of personal development when deciding how best to accomplish a task
- *Concern for Production* - this is the degree to which a leader emphasizes concrete objectives, organizational efficiency and high productivity when deciding how best to accomplish a task.

Using the axis to plot leadership "concerns for production" versus "concerns for people", Blake and Mouton defined the following five leadership styles:

- ✓ *Country Club Leadership* - High People/Low Production – this style of leader is most concerned about the needs and feelings of members of his/her team. These people operate under the assumption that as long as team members are happy and secure then they will

work hard. What tends to result is a work environment that is very relaxed and fun but where production suffers due to lack of direction and control.

- ✓ Produce or Perish Leadership - High Production/Low People - Also known as Authoritarian or Compliance Leaders, people in this category believe that employees are simply a means to an end. Employee needs are always secondary to the need for efficient and productive workplaces. This type of leader is very autocratic, has strict work rules, policies, and procedures, and views punishment as the most effective means to motivate employees.
- ✓ Impoverished Leadership - Low Production/ Low People - this leader is mostly ineffective. He/she has neither a high regard for creating systems for getting the job done, nor for creating a work environment that is satisfying and motivating. The result is a place of disorganization, dissatisfaction and disharmony.
- ✓ Middle-of-the-Road Leadership - Medium Production/Medium People - this style seems to be a balance of the two competing concerns. It may at first appear to be an ideal compromise. Therein lays the problem, though: when you compromise, you necessarily give away a bit of each concern so that neither production nor people needs are fully met. Leaders who use this style settle for average performance and often believe that this is the most anyone can expect.
- ✓ Team Leadership - High Production/High People - According to the Blake Mouton model, this is the pinnacle of managerial style. These leaders stress production needs and the needs of the people equally highly. The premise here is that employees are involved in understanding organizational purpose and determining production needs. When employees are committed to, and have a stake in the organization's success, their needs and production needs coincide. This creates a team environment based on trust and respect, which leads to high satisfaction and motivation and, as a result, high production.

The survey is an investigation done in order to find out the opinions of a given population, by interrogating a limited number of its members (a sample). We follow the main stages of making a qualitative study by survey, which are: making up the sample; determining the sample size; drawing up the questionnaire; administering the questionnaire; processing and analyzing the data; drawing up the synthesis report. For determining the sample size, formula (1.3.6.) was utilized:

$$n = t^2 \cdot p \cdot (1 - p) \cdot \frac{100}{\Delta\omega^2} \quad (1.3.6.)$$

where: n – sample size; t – statistic coefficient; p – probability with which the results are guaranteed, to be more than 96%; 1 - p – accepted error not to be more than  $\pm 3\%$ ;  $\Delta\omega$  – admissible error.

Thus, for  $t = 2.1$ ;  $p = 0.946$  and  $\Delta\omega = 1.236$ , by applying relation (1) a representative sample is necessary formed of  $n = 26.9\%$  individuals. From the total number of employees of 120 individuals (students), there are needed a representative sample of 32 students.

We use in our survey 3 questionnaires. The first was used to find leadership potential of the students and the results are shown in Figure 1.49, Figure 1.50, Figure 1.51.

In figure 1 are shown the overall result for leadership potential. As we can see the majority of employed and unemployed have moderate readiness to become a leader.

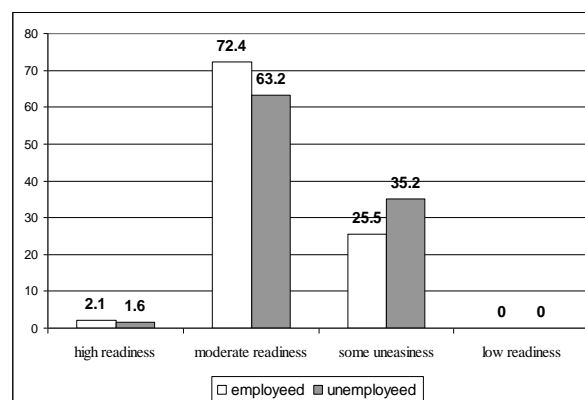


Figure 1.49. Leadership potential

When we look at some characteristics of leadership, we see some differences between employed and unemployed students, shown in Figure 1.49 and Figure 1.50.



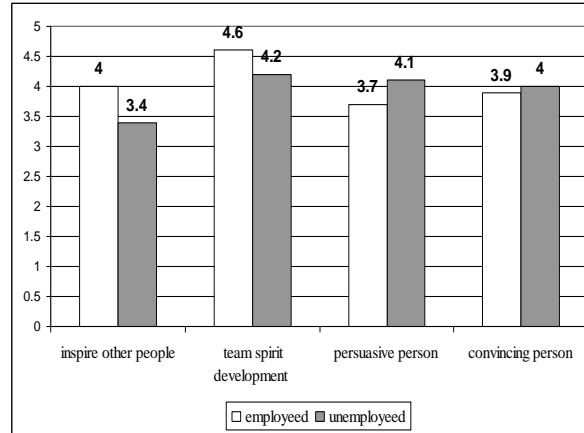


Figure 1.50. Leadership potential. Details 1

The major differences are in the case of: “inspire other people”, “persuasive”, “team comes first” and “team spirit development”.

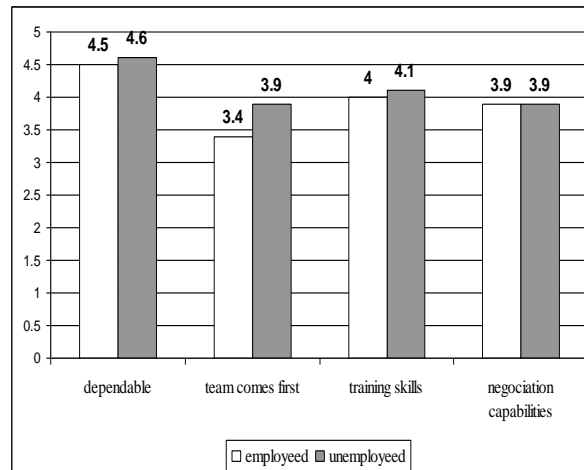


Figure 1.51. Leadership potential. Details 2

The second questionnaire tries to identify the leadership styles of students. The results are presented in Figure 1.52, Figure 1.53, Figure 1.54, and Figure 1.55.

In Figure 1.52 presents the overall result for leadership styles. Here, both categories (employed and unemployed) have the tendency to be “participative”.

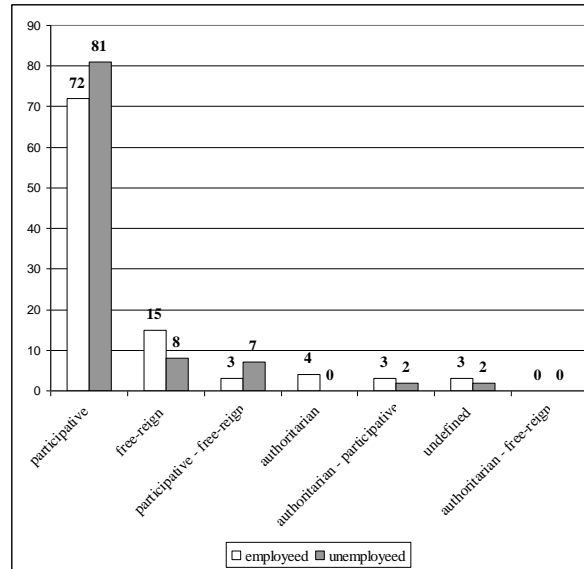


Figure 1.52. Leadership style preference

Starting from this result, we present in the following a detailed analysis of the student responses regarding the participative style.

As it can be seen in Figure 1.53, regarding decision justification, all employed students and 88% of unemployed consider that is necessary to explain a decision before it's taken.

In Figure 1.54 are presented the results regarding democratic versus imposed decision. We can see that more unemployed than employed students consider that democrat style is more appropriate.

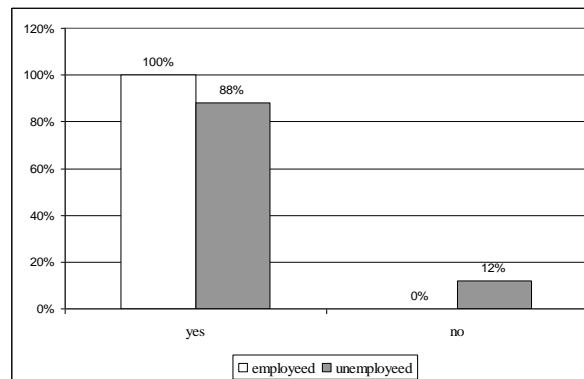


Figure 1.53. Leadership style preference. Decision justification

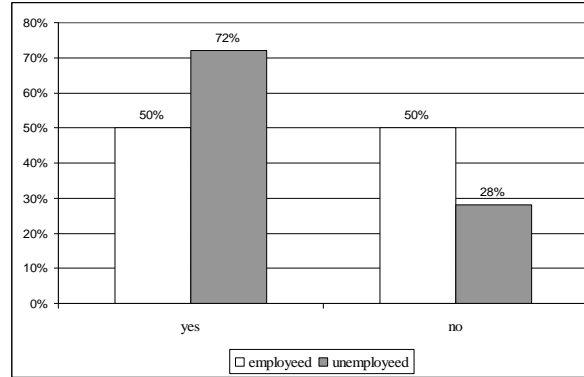


Figure 1.54. Leadership style preference. Democratic vs. imposed decision

As a consequence of the tendency to participative style, the team is favoured over the individual (62% employed and 68% of unemployed, see Figure 1.55).

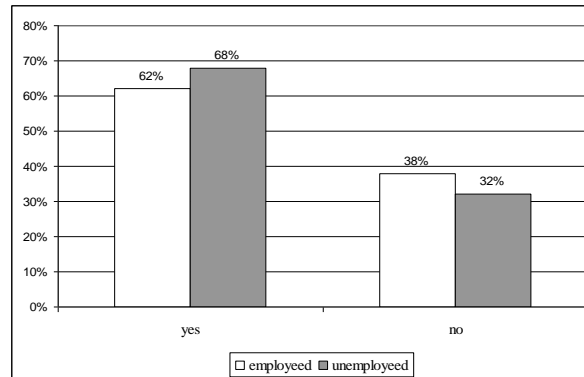


Figure 1.55. Leadership style preference. Team vs. individual

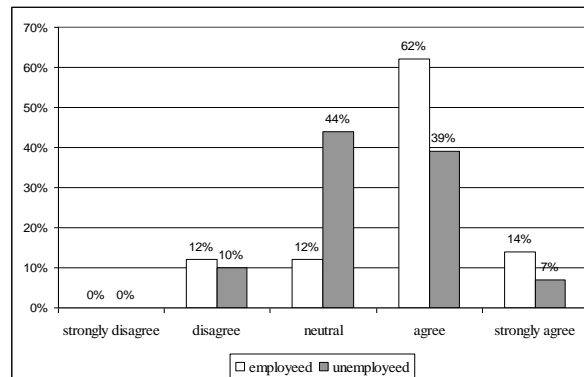


Figure 1.56. Entrepreneurial intention

It can be seen in Figure 1.55 that the employed have a higher percentage of intention to become entrepreneurs than unemployed (62% over 39% of “agree” and 14% over 7% of “strongly agree”). Regarding neutral position, the unemployed are almost four times higher than employed.

The results highlight in one hand the leader potential of students and what type of leadership they are prefer, what kind of leader is possible to become, and in the other hand starting from these premises how much the students are predisposed to change, to entrepreneurship. The research findings are of interest to academics and policy makers. The study suggests that the entrepreneurial attitude among students can be influence by leader potential. Therefore in response to the change of graduate labor market, the higher educational institutions have to change of skills, abilities and mindset about leadership in their general academic education in order to nurture university student's entrepreneurial intentions. The research provides comprehensive empirical evidence about the influence of leadership predispose on entrepreneurial intentions of university students.

#### **1.4. Micro and macroeconomic influences**

While in the previous part I have analyzed the entrepreneurial attitude and intentions, in what follows the focus is on the micro- and macro-levels determinants of the entrepreneurial activity. A special emphasis is awarded to the role of institutional quality, assessed based on the level of corruption and tax evasion, with a negative influence on the entrepreneurial activity. The analysis is conducted at the EU level.

The entrepreneurship is considered one of the main ingredients of economic growth, fostering the productivity level, enhancing the employment and leading to other potential efficiency gains through the tax system (Cullen and Gordon, 2007). Therefore, the impact of taxation on the entrepreneurial activity is heavily investigated. However, less attention is paid to the long-run impact of tax evasion and corruption level on the entrepreneurial activity. Several scholars indicate that corruption has a significant negative impact on the levels of tax revenues collected in a country (Nawaz, 2010), and that it is inter-linked with the tax evasion, but, as far as we know, there is no research investigating their joint impact on entrepreneurship.

This parts fills in this gap and analyzes the complexity of the relationship between corruption, tax evasion and the entrepreneurial activity. The fact that countries with higher levels of corruption also tend to have larger shadow economies, which generate tax evasion is commonly accepted. At the same time, the presence of tax evasion nourishes the corruption environment, especially in the case of tax administrators. Both phenomena have a negative impact on entrepreneurship and

economic growth, discouraging the initiative of the private sector and enhancing the uncertainty on the market.

Although a large body of works have addressed how different institutional weaknesses influence the entrepreneurial activity, less attention was paid to tax evasion and corruption, with few exceptions. For example, Estrin & Mickiewicz (2012) consider that in countries with larger shadow economies individuals are more or less likely to initiate entrepreneurial activities. Similarly, Parker (2003) shows that tax evasion influences the occupational choice and the entrepreneurial activity. Anokhin & Schulze (2009) posit in their turn that better control of corruption might be associated with rising levels of entrepreneurship.

However, neither of these papers considers the endogeneity problems and the fact that entrepreneurs can also influence the level of tax evasion and corruption. On the one hand, entrepreneurs can obtain advantages from illegal trading, generating then tax evasion (Fadahunsi & Rosa, 2002). So, several papers show that entrepreneurs pay taxes only when tax morale is high, when the tax evasion is costly, and when the risks of being caught and the severity of punishment are also high (Allingham & Sandmo, 1972; Lisi & Pugno, 2011; Mickiewicz, Rebmann & Sauka, 2012). But this conclusion is too simplistic, because the mechanism of entrepreneurs generating tax evasion is complex. On the other hand, if we assume that entrepreneurs can play a role in tax evasion, they also might be engaged in small corruption. Therefore, the current study attempts to fill in the void existing in the literature by exploiting the long-run interdependencies which exists between these phenomena.

The study brings forward three contributions to the canon of work on the subject. First, the study here analyzes the long-term relationship between institutional weaknesses, associated with tax evasion and corruption, and the entrepreneurial activity in 15 European countries, for the time-span 2002-2010, using Global Entrepreneurship Monitor (GEM) data for entrepreneurship, Transparency International data for corruption and the statistics proposed by Schneider & Buehn (2012) for measuring tax evasion. Second, it addresses the long-run relationship within a cointegration framework and takes into account the potential endogeneity of the involved variables by using adequate models as the fully modified OLS estimator (FMOLS) and the dynamic OLS (DOLS) estimator. In particular, we use the cointegration analysis for heterogeneous panels, as

proposed by Pedroni (1999, 2001), and we compare the results with the cointegration techniques conceived for homogenous panels by Kao (1999). However, because the probability to have homogenous panels is reduced, given the structure of our sample the results' interpretation is made based on the Pedroni's technique. The long-term regression is carried out using the FMOLS and DOLS estimators. Another important consideration is the distinction between different types of entrepreneurs. The GEM statistics allows to differentiate between necessity-driven entrepreneurs (NDE) and innovation-driven entrepreneurs (IDE). Consequently, because the NDE are forced to engage themselves in entrepreneurial activities having no other source of revenues, the impact of corruption and tax evasion on NDE is expected to be smaller than the impact on the total entrepreneurial activity (TEA).

To anticipate the primary results, I find that entrepreneurship, tax evasion and corruption are cointegrated. Furthermore, we discover that the level of corruption and tax evasion negatively impact the total entrepreneurial activity in Europe, in the long-run. In addition, tax evasion has no impact on NDE while the corruption level negatively affects the activity of this category of entrepreneurs.

Several studies show that corruption affects tax administration and has a negative impact on the levels of tax revenues collected in a country (Nawaz, 2010). The corruption can manifest under divers forms as bribery, revenue fraud, embezzlement, extortion, patronage/nepotism, regulatory capture, collusion between tax officers and tax payers, political interference, revolving doors (for details see Martini, 2014), and it is seen by some scholars as a tool to mitigate the burdens of excessive taxation on the economy through enabling better allocation of resources and enabling investment. However, the dominant view clearly states that both phenomena are negative for the economy in general, and for the entrepreneurial activity in particular. Even if the link between tax evasion and entrepreneurship is rarely addressed in the literature, the impact of taxes on the entrepreneurial activity is heavily investigated. Taxation can affect the entrepreneurial entry in different ways, trough the level of investment, risk taking, and trough the occupational choice (Bruce & Gurley, 2004; Asoni & Sanandaji, 2014). Stenkula (2012) identifies three channels linking taxation and entrepreneurship, underlined by the theoretical literature, namely the incentive effect affecting the effort of self-employed people, the evasion effect affecting the willingness to

become self-employed and to take advantage of the opportunities to decrease the tax burden, and the insurance effect associated with risk taking. Therefore, considerable empirical work has been done to analyze the relationship between taxes and entrepreneurship (for a review of the literature, see Bruce & Schuetze, 2004). In this line, a series of papers examines the impact of income and payroll taxes on the decision to become entrepreneurs (Bruce, 2000; Keuschnigg & Nielsen, 2002; Cullen & Gordon, 2007; Henrekson, Johansson & Stenkula, 2010), while other papers investigate the role of tax progressivity (Robson & Wren, 1999; Folster, 2002). For example, Da Rin, Di Giacomo & Sembenelli (2011) investigate how tax policy fosters the creation of new companies, using a country-industry level panel database for 17 European countries between 1997 and 2004. They find a significant negative effect of corporate income taxation on entry rates. Ferede (2013) emphasizes the fact that the adverse impact of income tax on entrepreneurial risk-taking outweighs the tax evasion opportunities for the self-employed. In their treatment of the relationship between tax structure and entrepreneurship, Balamoune-Lutz & Garello (2014) use GEM data on nascent entrepreneurship and Organization for Economic Co-operation and Development (OECD) Tax Database. Their panel data analysis shows that tax progressivity at higher-than-average incomes has a robust negative effect on nascent entrepreneurship.

Another strand of literature investigates the entrepreneurs' attitudes towards tax evasion (for a review of the literature see Mickiewicz, Rebmann & Sauka, 2012). The key word here is "tax morale", seen as a moral obligation or an intrinsic motivation to pay taxes, and most of the papers (i.e. Yitzhaki, 1974) highlight the role of the risks of being caught and the severity of punishment for the entrepreneurs' behavior regarding tax avoidance.

Unlike tax evasion, tax morale does not measure individual behavior, but rather individual attitude (Lisi & Pugno, 2011). Therefore, more recent, the entrepreneurship cognition literature emphasizes the role of owner-manager attitudes and intentions in shaping their behavior and business strategies, but also the social norms agreed by entrepreneurs (Wikilund, Davidsson & Delmar, 2003; Mickiewicz, Rebmann & Sauka, 2012). Thus, the effect of entrepreneurship on the level of tax evasion is noteworthy and shall be considered in this category of analyses.

The link between corruption and entrepreneurship is also investigated by the literature. Anokhin & Schulze (2009) suggest that corruption and the institutions' quality play an important role in

accounting for disparities in rates of entrepreneurship and innovation across nations. If corruption is present, decisions for entrepreneurs became risky. If the opposite applies, corruption seems to disappear from the entrepreneur's calculations, communication channels are efficient, and the market mechanism reduces the costs (Rose-Ackerman, 2001). In a far more recent paper, Dove (2015) shows that the judicial independence, associated with the fight against corruption, is important for the entrepreneurial activity.

At the same time, entrepreneurs are not totally unfamiliar with corruption practices. In this light, Fadahunsi & Rosa (2002) underline the entrepreneurial advantages of trading in illegal goods in Nigeria. They state that, although there has been some research into illegal business activity, the literature focused on large organizations. However, in their opinion, an entrepreneur is a “person sailing close to the wind, constantly testing the boundaries of what is permissible, bending the rules, and exploiting any ambiguity in the law”. Therefore, the link between entrepreneurship and corruption is not unidirectional.

In this regard, we consider that tax evasion and corruption range between the elements with a negative influence on the entrepreneurial activity. At the same time, some reverse causality issues appear, the entrepreneurs having in their turn an influence on the level of tax evasion and corruption. We posit then that there is a long-run relationship between these variables. Consequently:

*H1: Entrepreneurship, tax evasion and corruption are cointegrated*

However, the contribution of entrepreneurs to tax evasion and corruption is intuitive and can hardly be demonstrated. Thus, our interest variable is the total entrepreneurial activity, while tax evasion and corruption are regarded as explanatory variables. So, we emphasize that there is a negative influence of tax evasion and corruption on entrepreneurship.

*H2: Tax evasion and corruption negatively impact the entrepreneurial activity in the long-run*

Another important consideration revolves around the distinction between NDE and IDE, allowed by the GEM statistics. While IDE notice investment opportunities in the market and have a deeper knowledge of the economic environment, NDE are forced to orient themselves toward entrepreneurship because they have no other source for living. Consequently, even if the corruption



level and tax evasion negatively affect their performances also, we expect a smaller impact in this case as compared to TEA. Therefore:

*H3: Tax evasion and corruption negatively affect NDE, but the effect is smaller compared with TEA*

As a methodology, this part use panel Cointegration Tests. Pedroni (1999, 2001) proposes several cointegration tests for heterogenous panels, and shows that these tests are less restrictive compared to those employed for homogenous panels. The group tests for heterogenous panels are based on the between-dimension approach which includes three statistics: group rho-Statistic, group PP-Statistic and group ADF-Statistic. The tests for homogenous panels are based on the within-dimension approach (panel statistics) which includes four statistics: panel v-Statistic, panel rho-Statistic, panel PP-Statistic, and panel ADF-Statistic. These four statistics pool the autoregressive coefficients across different countries for the unit root tests on the estimated residual.

Kao (1999) further studies the special case in which cointegrating vectors are assumed to be homogeneous. In this case, the asymptotic equivalency result is violated because of the endogeneity of regressors. In addition, for macro-panels, it is hard to consider the homogeneity hypothesis. Therefore, different from the Kao's test constructed for strictly homogenous panels, the Pedroni's tests allow for cross-section interdependence with different individual effects and relax the homogeneity assumption.

For both tests, we have:

$$y_{i,t} = y_{i,t-1} + \vartheta_{i,t}$$

$$x_{i,t} = x_{i,t-1} + \varepsilon_{i,t}$$

Consider the regression:

$$y_{i,t} = \alpha_{i,t} + \beta_{i,t}x_{i,t} + u_{i,t} \tag{1.3.6.}$$

where:  $i = 1, \dots, N$  are the countries in the panel;  $t = 1, \dots, T$  refers to the analyzed period;  $\alpha_{i,t}$  are individual constant terms;  $\beta_{i,t}$  is the slope parameter (which is considered homogenous in the

case of Kao, 1999);  $\vartheta_{i,t}$ ,  $\varepsilon_{i,t}$  are stationary disturbance terms and therefore,  $y_{i,t}$  and  $x_{i,t}$  are integrated process of order 1 for all  $i$ .

The null hypothesis of no cointegration ( $\rho_i = 1$ ) is tested applying a unit root test on the residuals, as follows:

$$u_{i,t} = \rho_i u_{i,t-1} + w_{it} \quad (1.3.7.)$$

For the estimation of the cointegration relationship in our study, we propose a modified version of the Pedroni's cointegration model (which allows for the cointegration of more than two variables), as follows:

$$TEA_{i,t} = \alpha_{i,t} + \beta_{1,i} TEV + \beta_{2,i} COR + u_{i,t} \quad (1.3.8.)$$

and

$$NDE_{i,t} = \alpha_{i,t} + \beta_{1,i} TEV + \beta_{2,i} COR + u_{i,t} \quad (1.3.9.)$$

where:  $TEA$  is the total entrepreneurial activity;  $NDE$  are the necessity-driven entrepreneurs;  $TEV$  is the tax evasion level;  $COR$  is the corruption level and  $u_{i,t}$  is the error term.

#### *Long-run relationship based on FMOLS and DOLS*

Various estimation methods for panel cointegration models are proposed in the literature. Although the OLS estimator is consistent under panel cointegration, it has a second order asymptotic bias. Therefore, the FMOLS and the DOLS estimation techniques were designed. After multiple Monte Carlo experiments to compare small sample properties of particular forms of panel FMOLS and DOLS estimators, Pedroni (2001) proposes the FMOLS, while Kao and Chiang (2000) recommend the dynamic DOLS. For specific versions of within-dimension panel estimators, Monte Carlo results illustrate that DOLS has superior small sample properties. However, Pedroni (2001) points out that the within-dimension panel FMOLS and DOLS estimators proposed by Kao and Chiang (2000) suffer from serious small sample size distortions and their results are difficult to be interpreted from an economically point of view when the cointegrating vectors are heterogeneous. Pedroni (2000) shows thus that the group mean panel

estimator pools the data along the between-dimension and exhibits relatively minor size distortions in small samples. So, building up on Kao and Chiang (2000), Pedroni also proposes a between-dimension, group means panel DOLS estimator that incorporates corrections for endogeneity and serial correlation parametrically. In this study we present both categories of estimations for robustness purpose.

Consequently, after the documentation of the cointegration relationship, we first estimate the non-parametric FMOLS for heterogeneous cointegrated panels, following Pedroni (2000). The model is:

$$TEA_{i,t} = \alpha_{i,t} + \beta_{1,i}TEV + \gamma_{2,i}COR + u_{i,t} \quad (1.3.10)$$

$$NDE_{i,t} = \alpha_{i,t} + \beta_{1,i}TEV + \gamma_{2,i}COR + u_{i,t} \quad (1.3.11)$$

Alternatively, the group mean panel DOLS estimator is:

$$TEA_{i,t} = \alpha_{i,t} + \beta_{1,i}TEV_{i,t} + \sum_{k=-k_i}^{k_i} \gamma_{1ik} \Delta TEV_{it} + \beta_{2,i}COR_{i,t} + \sum_{k=-k_i}^{k_i} \gamma_{2ik} \Delta COR_{it} + u_{i,t} \quad (1.3.12)$$

$$NDE_{i,t} = \alpha_{i,t} + \beta_{1,i}TEV_{i,t} + \sum_{k=-k_i}^{k_i} \gamma_{1ik} \Delta TEV_{it} + \beta_{2,i}COR_{i,t} + \sum_{k=-k_i}^{k_i} \gamma_{2ik} \Delta COR_{it} + u_{i,t} \quad (1.3.13)$$

For the 15 European countries (Belgium, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Netherlands, Norway, Slovenia, Spain, Sweden, Switzerland, United Kingdom), the annual data regarding the entrepreneurial activity are collected from GEM database and cover the period 2002-2010. Because the tax evasion series provided by Schneider & Buehn (2012) stop in 2010, we are forced to perform the analysis on the indicated time-span. The corruption perception index is extracted from the Transparency International database and represents one possibility of studying corruption (usually employed in the literature), beside the World Bank's control of corruption index. Notice that a high level of the index is equivalent with a small level of corruption. Consequently, the waited sign is positive in the case of *COR*, which proves a negative influence.

Before performing the cointegration analysis, we must be sure that our variables are I(1). Thus, a series of panel unit root tests are performed (Table 1.18). Except for the test proposed by Levin,

Lin & Chu (2002), all the other tests document the presence of unit roots in level, and show that variables are  $I(1)$ . However, the asymptotic properties of all these tests require large  $N$  and  $T$ . Moreover, all tests are based on the strong assumption of independent cross-section units, which proves their limits in the case of macro-panels. However, Im, Pesaran & Shin (2003) prove that their test can be used even if  $N$  and  $T$  do not converge toward infinity. Given the above considerations, we look at the results of this test which clearly state that the variables are  $I(1)$  and we can use the cointegration.

Table 1.18. Panel unit root tests

Variables		Levin, Lin and Chu $t^*$	Im, Pesaran and Shin W-stat	ADF-Fisher Chi-square	PP-Fisher Chi-square
Level	TEA	-3.537***	-0.817	39.45	68.20***
	NDE	-1.754**	-0.593	35.61	59.00***
	TEV	-4.603***	-0.006	24.31	9.228
	COR	-5.442***	-1.182	47.58**	37.0
First difference	$\Delta$ TEA	-7.035***	-2.679***	59.64***	128.6***
	$\Delta$ NDE	-7.033***	-2.308**	55.00***	104.9***
	$\Delta$ TEV	-6.210***	-2.065**	46.96**	42.94**
	$\Delta$ COR	-6.155***	-1.629*	47.52**	76.14***

Notes: (1) \*, \*\* and \*\*\* indicates the rejection of the null hypothesis at 1%, 5% and 10% significance level; (2) Levin, Lin & Chu  $t^*$  assumes common unit root process; (3) Im, Pesaran and Shin W-stat, ADF-Fisher Chi-square and PP-Fisher Chi-square assume individual unit root process; (4)  $\Delta$  denotes the first difference.

This part of research presents two categories of results, one for TEA and one for NDE. The result presentation starts with the cointegration results and afterwards we test the long-run relationship employing the FMOLS and DOLS estimators.

Table 1.19 presents the cointegration results. As it can be seen, if we consider the particular case of homogenous panels, two out of the four tests proposed by Pedroni (1999, 2001) indicate a cointegration relationship, both for TEA and NDE. The Kao's (1999) test also documents the existence of a cointegration relationship. However, the hypothesis of heterogeneous panels is more plausible. In this case, the results also support the existence of cointegration (two out of the three tests). Therefore, we admit the long-run relationship between entrepreneurship, tax evasion and corruption.

Table 1.19. Panel cointegration tests

Within-dimension (homogenous)				Between-dimension (heterogeneous)	
TEA	Tests	Statistic	Weighted Statistic	Tests	Statistic
Pedroni (1999, 2001)	Panel $v$ -Statistic	-0.120	-1.545	Group $\rho$ -Statistic	2.183
	Panel $\rho$ -Statistic	0.715	0.670	Group PP-Statistic	-12.37***
	Panel PP-Statistic	-8.681***	-9.508***	Group ADF-Statistic	-6.776***
	Panel ADF-Statistic	-5.702***	-5.967***		
Kao (1999)	ADF $t$ -Statistic	-2.266**			

$\Delta u_{it}$ -Statistic		-9.503***			
NDE	Tests	Statistic	Weighted Statistic	Tests	Statistic
Pedroni (1999, 2001)	Panel $v$ -Statistic	1.444	-1.195	Group $\rho$ -Statistic	2.878
	Panel $\rho$ -Statistic	0.431	1.012	Group PP-Statistic	-6.449***
	Panel PP-Statistic	-3.817***	-5.599***	Group ADF-Statistic	-3.634***
	Panel ADF-Statistic	-3.719***	-4.300***		
Kao (1999)	ADF $t$ -Statistic	-2.781***			
	$\Delta u_{it}$ -Statistic	-7.485***			
Notes: (1) *, ** and *** mean statistic relationship significant at 10%, 5%, 1%, respectively; (2) 135 observations; (3) Schwarz information criterion for lags selection is used.					

The next steps consist in estimating this long-run relationship based on FMOLS and DOLS estimators (Table 1.20).

Table 1.20. Panel FMOLS and DOLS

variables	TEA		NDE	
	FMOLS	DOLS	FMOLS	DOLS
TEV	-0.747**	-0.662	4.231	8.169***
COR	0.520***	0.514***	0.796***	0.666**
Notes: (1) *, ** and *** mean statistic relationship significant at 10%, 5%, 1%, respectively; (2) group mean panel estimator for heterogeneous panels is used; (3) Schwarz information criterion for lag and lead selection in the case of DOLS is employed.				

The results presented in Table 1.20 are intriguing. First, in the case of TEA, we notice that tax evasion has a negative influence. The same applies for the corruption (remember, a high level of corruption means a small value of the corruption index). However, if we compare the FMOLS and DOLS estimators, the results are not robust regarding the impact of tax evasion on entrepreneurship. Second, if we look to NDE, we notice that corruption negatively influences their activity, both under FMOLS and DOLS estimations. Nevertheless, in the case of tax evasion the results are not robust, and the significance of the coefficient is documented only for DOLS. Moreover, we notice a positive influence of tax evasion on NDE. This mechanism might occur as increased tax evasion encourages people without occupation to start a business, though their risk perception decreases.

All in all, our findings confirm our first research hypothesis, namely the cointegration relationship. In addition, if we analyze only the FMOLS estimator view its superiority given the structure of our data sample, the second hypothesis is confirmed for TEA and partially confirmed for NDE. However, our results are not in line with our third research hypothesis. On the one hand, the corruption level has a stronger influence on NDE as compared to ODE. On the other hand, the tax evasion has no clear influence on their activity.

This part of research improves upon earlier studies in that it tries to investigate the joint long-run impact of tax evasion and corruption on the entrepreneurial activity. Using a panel cointegration framework which takes into consideration the existing endogeneity between the variables, we show that there is a long-run relationship between entrepreneurship, tax evasion and corruption. Furthermore, we document the negative influence of corruption, both on TEA and NDE. However, the results are mixed regarding the influence of tax evasion on entrepreneurship. As such, we show, using the FMOLS estimator, that tax evasion negatively affects TEA, while having no impact on NDE, though the latter result is somewhat less robust.

Given the role of the entrepreneurial activity in fostering economic growth, our findings have several policy implications. On the one hand, when trying to reduce tax evasion, authorities shall also fight against corruption. On the other hand, in order to promote entrepreneurship, both phenomena shall be eradicated. It appears that corruption has a higher negative impact on entrepreneurship than tax evasion. This result is not surprising given the fact that entrepreneurs are persons who assume risks and, if they perceive that their competitors obtain advantages from non-paying taxes, they behave accordingly. Nevertheless, in the case of corruption the situation is somehow different, as it appears that entrepreneurs either do not have financial resources to bribe and to obtain this way advantages from a corrupt administration, or because they have an adverse perception on corruption, associating it with bureaucracy or with uncertainty on the market.

Another important approach is presented below. The impact of FDI on entrepreneurship in the European Countries is presented in the next part.

As the entrepreneurial activity is considered the main engine of economic growth, the entrepreneurship literature historically focused on the identification of entrepreneurship determinants, including the economic context, government policies, entrepreneurial culture and the operating environment. Only recently researchers have started to assess the effects of the foreign direct investments (FDI) on the new firm setup (Ayyagari & Kosová, 2010). This effect is expected to be two-fold (Doythch & Epperson, 2012). On the one hand, domestic firms are expected to benefit from the know-how that multinational enterprises transfer, but also from the demand creation (positive spillovers). On the other hand, the domestic entrepreneurs are expected to suffer from negative externalities because of increased competition and of technological barriers

to entry (negative spillovers). Both the demand creation effect and the entry barrier effect were documented in the empirical literature.

Nevertheless, to the best of our knowledge, none of the studies approaching the impact of the FDI on the entrepreneurship makes the distinction between necessity driven entrepreneurs (*nde*) and opportunity driven entrepreneurs (*ode*). This particular emphasis is theoretically attractive because the expected impact of the FDI may be different, depending on the motivation for entrepreneurship. Therefore, the first contribution of this part is represented by the assessment of FDI impact on both necessity and opportunity-driven entrepreneurs. Most of the scholars have focused on the host country effect, analyzing the impact of the inwards FDI on the new firm creation. However, the role of the outwards FDI is also important in terms of entrepreneurial activity as they may act as a driver for necessity entrepreneurs. This category of entrepreneurs is represented by persons who lose their job or do not find any job on the market. They are trying to ensure their revenues by starting a business. The fact that a part of the domestic capital leaves the country or the region in order to find investment opportunities abroad (outwards FDI), can then stimulate the necessity entrepreneurial activity. Thus, the second contribution of this part consists in the analysis of the impact of both inwards and outwards FDI on the entrepreneurial activity.

The extensive literature studying incentives and impediments to firm entry and exit associates the entrepreneurial activity with the setup of new firms (Kim & Li, 2012). Indeed, the regular way to assess the entrepreneurial activity regards the persons operating new businesses. However, this measure does not take into account the persons involved in the process of starting businesses (nascent activity). The GEM statistics cover early-stage entrepreneurial activity (*tea*) which combines nascent and new entrepreneurial activities. Consequently, the third contribution of this part is represented by the use of *tea* for assessing the entrepreneurial activity. The last contribution is associated with the empirical methodology. While most papers conduct single-country analysis, the present work relies on a panel data approach for 16 European countries, for the period 2005-2011 (strongly-balanced panel). We employ several macroeconomic control variables as the growth rate and the GDP per capita, but also a series of control variables which represent the entrepreneurial attitude, as the fear of failure, and the entrepreneurial intentions. In order to test for the robustness of our results, we extend in the first step the original panel for the

period 2001-2011. In the second step, we extend both the time dimension (2001-2011) and the panel dimension, including in the analysis four European countries for which data are available starting with 2007. This research on entrepreneurship and FDI relationship expands the new research front regarding the determinants of entrepreneurship literature. On the one side, as Kim & Li (2012) show, the FDI – entrepreneurship relationship has been for the first time explored in the context of the spillover effects produced by inward FDI in host economies. Starting with McDougall (1960), the researchers have been interested in the relationship between foreign direct investment and a variety of economic development outcomes in the destination country, including the activity of local firms. The surveys have shown that FDI improve labor productivity (Liu et al., 2000) and increase the production capabilities of local firms (Hejazi & Safarian, 1999).

On the other side, as Ayyagari & Kosová (2010) states, a huge body of literature has focused on the determinants of entrepreneurial activity. Theoretical papers are oriented towards the entrepreneurial culture and gradual learning or to the role of technological innovation in supporting the entrepreneurial intentions (Jovanovic, 1982; Jovanovic & MacDonald, 1994; Ericson & Pakes, 1995). Empirical works consider in particular the role of the economic context and institutional framework in promoting the entrepreneurship. The effects of the FDI on the entrepreneurship were assessed in particular in the last three decades, due to the internationalization of large and small firms (De Maeseneire & Claeys, 2012). Most of the studies focus on the role of inward FDI on the host country entrepreneurial activity. The theoretical arguments are complementary but sometimes opposed and show that FDI can have both positive and negative spillover effects on new firms (Meyer & Sinani, 2009).

Positive spillover effects on host country firms are illustrated in terms of the diffusion of new technologies, management practices brought by the foreign-owned firms, creation of new markets, sub-contracting activities, access to critical resources or even financial support. Foreign investment brings new products and services into the host economy, generating demand for these products. There are several implications of this positive spillover (Javorcik, 2004). First, the new products lead to the creation of new markets and entrepreneurial opportunities (horizontal effects). New domestic firms can offer comparable products by imitating their foreign competitors). Second, new firms may seek to exploit niche opportunities within sectors neglected by foreign-



owned firms. Third, the new firms can learn from the failed attempts of foreign-owned firms to satisfy customers through the introduction of more appealing alternatives, being aware of the cultural features of their customers – demonstration effect (Caves, 1996; Pitelis & Teece, 2010).

Next, FDI provides managerial skills for the host country firms. The diffusion can occur directly through mobility of managers and workers when they are hired into the foreign-owned firms and subsequently move on to other local firms (Fu, 2012). Additionally, FDI provide support for trade flows, boosts export competitiveness and stimulates import-competing production (Christiansen & Ogutcu, 2002). They bring technical and informational externalities (Rodriguez-Clare, 1996; Meyer, 2004). Moreover, FDI permit access to financial resources (Urata & Kawai, 2000; De Maeseneire & Claeys, 2012). Finally, the FDI can help new firm extend their activities by sub-contracting activities or by developing collaborations for different activities (vertical effects).

Negative spillover effects can occur when foreign-owned firms compete for the same customers and “crowd out” domestic firms (De Backer & Sleuwaegen, 2003). Presence of foreign firms in an industry can have a negative impact on the entry of domestic firms by raising the technological barriers to entry (Ayyagari & Kosová, 2010). The entry barrier effect arises because foreign firms are often more technologically advanced than domestic firms, especially in emerging markets, and because they can better exploit economies of scale. The presence of foreign investment may also spur additional upstream and downstream demand along the supply chain, what we call backward and forward linkages (Kim & Li, 2012). Backward linkages signify situations when foreign-owned firms integrate with locally owned suppliers to source raw materials needed for their products, whereas forward linkages occur when local firms purchase the goods and services produced by the foreign-owned firms.

Prior studies have reported both positive and negative spillover effects of FDI on entrepreneurial activity. Most of the previous works are based on single-country settings. Negative spillover effects or no effects were usually reported for the transition economies (Djankov & Hoekman, 2000; Konings, 2001; Sabirianova et al., 2005). Similar results were reported by De Backer & Sleuwaegen (2003), in their study of firm entry and exit across Belgian manufacturing industries. Contrary, Görg & Strobl (2002) find a positive effect of the FDI on the entry of new domestic firms in Ireland.

More recent studies test the effects of FDI on entrepreneurship using a panel data approach. While Doytch & Epperson (2012) has found that FDI positively affect entrepreneurship only in the middle income country group, Kim & Li (2012) state that the main positive impact of FDI on business creation is most salient in regions with weak institutional support. Their findings obtained from 104 countries panel analysis are consistent with the predictions that foreign direct investment positively relates to business creation, especially in the less developed countries, characterized by lack of institutional support, political stability and good quality of human capital.

Nevertheless, the contradictory results found in the literature can also be associated with the lack of distinction between opportunity and necessity driven entrepreneurs. In terms of inwards FDI, we expect positive effects for the overall entrepreneurial activity. In addition, new firms entrances increase once the entrepreneurs observe new opportunities in the market. Contrary, as the multinational firms create jobs, the impact of the FDI on the necessity entrepreneurs is a negative one. These hypotheses enable the reconciliation of the contradictory findings in the literature. In addition, we also look for the impact of outwards FDI. They should have an opposite effect on the new firm creation. When the domestic investors live the country to find new opportunities abroad (increased outwards FDI), the opportunity driven entrepreneurial activity decreases, while the necessity one increases, as many persons do not find jobs and look for alternative revenues.

Stylized facts regarding the entrepreneurial activity in Europe is presented below. For the present study we use the GEM data for 16 selected European economies (Belgium, Croatia, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Netherlands, Norway, Slovenia, Spain, Sweden, Switzerland and United Kingdom). For the robustness analysis we extend in the first step the analyzed period from 2005-2011 to 2001-2011 and in a second step we extend both the analyzed period (2001-2011) and the number of panel (Latvia, Romania, Russia and Turkey). The country choice was based on data availability in the GEM database.

The GEM survey includes at present more than 198,000 people from 69 economies, out of which 29 are located in Europe. The central measure of GEM is the total entrepreneurial activity rate (*tea*), which consists of the percentage of individuals aged between 18–64 years in an economy who are in the process of starting or are already running new businesses. The entrepreneurs may have different motivations for starting a business, being pushed or pulled into entrepreneurship.

The first category is represented by the necessity driven entrepreneurs (*nde*) and covers persons who do not have other work options and need a source of income. The second category includes individuals who became entrepreneurs because they find an opportunity or because they may desire greater independence in their work or seek to maintain or improve their income (*ode*). Notice that, even if the two aforementioned categories are calculated as percentage of the total entrepreneurial activity rate, their sum is not 100% as there are questioned individuals who consider that they are not belonging to one of the said categories.

Usually, the entrepreneurial activity is more intensive in the innovation driven economies, which are more developed (see Figure 1.57). We obtained further information above the economic development – entrepreneurship relationship by analyzing the necessity and opportunity entrepreneurs. The number of opportunity entrepreneurs increases with the economic development (assessed based on the GDP per capita), while the number of the necessity entrepreneurs decreases.

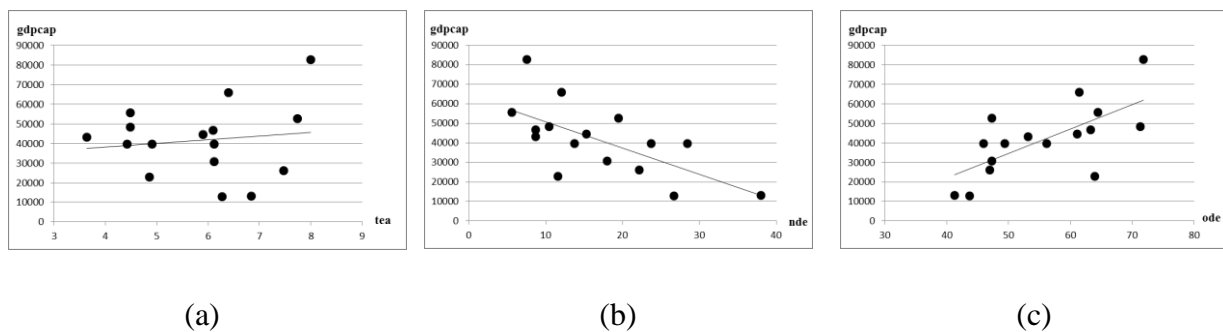


Figure 1.57. Scatter plot on the economic development – entrepreneurial activity correlation: (a) *tea*; (b) *nde* (c) *ode*

It is also interesting to observe how the economic context influences the entrepreneurial activity in the European countries. Normally, growth period are favorable for investments and thus for the opportunity-driven entrepreneurs, while crisis periods, associated with the job lost, determine peoples to find alternative sources of revenues, becoming then necessity entrepreneurs. However, there is no clear evidence regarding the economic context and the crisis' impact on these categories of entrepreneurs.

All in all, the level of the development (*gdpcap*) and the economic growth rate (*gdpg*) represent our control variables. Beside, in order to check for the robustness of our results, we have included

in the analysis two other control variables, which characterize the entrepreneurial intentions. The fear of failure (*fof*) is very important for the opportunity entrepreneurs and negatively influences their choice to start-up a business, while the entrepreneurial intentions (*ei*) are positively correlated with the entrepreneurial activity in all cases (a positive sign is then expected). The next section describes the data included in the analysis.

The research constructs a 16 countries panel for the period 2005-2011 (112 observations). Data related to the entrepreneurial activity are extracted from the GEM database, while the macroeconomic variables (including the FDI) are obtained from the UNCTAD database. The descriptive statistics of the variables, including their description and the expected sign for the explanatory ones, are presented in Table 1.21 below.

Table 1.21. Descriptive statistics

	Statistics	Mean	Max.	Min.	S.D.	Exp. sign	Definition and description	Sources
(1)	<i>tea</i>	5.86	9.9	1.9	1.64		<i>Total early-stage entrepreneurial activity</i> , which consists of the percentage of individuals aged between 18–64 years who are in the process of starting or are already running new businesses.	GEM
(2)	<i>nde</i>	16.88	50	3	10.17		<i>Necessity-driven entrepreneurs</i> , represent the percentage of those involved in total early-stage entrepreneurial activity because they had no other option for work.	GEM
(3)	<i>ode</i>	55.54	82	29	12.19		<i>Opportunity-driven entrepreneurs</i> , represent the percentage of entrepreneurs who are pulled into entrepreneurship because they recognize an opportunity that can improve or maintain their income or increase their independence.	GEM
(4)	<i>infdi</i>	12.2	14.04	8.89	1.33	+/-	<i>Inwards FDI</i> represent the stock volume (billions of US dollars), expressed in natural log. They will have a positive impact on the overall entrepreneurial activity and on the opportunity entrepreneurs, while the impact on the necessity entrepreneurs will be a negative one.	UNCTAD
(5)	<i>outfdi</i>	12.11	14.42	7.62	1.9	+/-	<i>Outwards FDI</i> represent the stock volume (billions of US dollars), expressed in natural log.	UNCTAD
(6)	<i>gdpgr</i>	1.24	6.96	-8.54	3.24	+/-	<i>GDP growth rate</i> . The influence is positive on the overall entrepreneurial activity and on the opportunity entrepreneurs, while the impact on the necessity entrepreneurs will be a negative one.	UNCTAD
(7)	<i>gdpcap</i>	10.51	11.5	9.22	0.51	+/-	<i>GDP per capita</i> , expressed in natural log. A positive sign is expected for the opportunity-driven entrepreneurs and a negative one for the necessity-driven entrepreneurs.	UNCTAD
(8)	<i>fof</i>	33.94	54	15	7.38	-	<i>Fear of failure</i> assessed for those seeing opportunities may prevent them from actually starting a business. A negative sign is expected in all cases.	GEM
(9)	<i>ei</i>	7.86	19.5	1.5	3.44	+	<i>Entrepreneurial intentions</i> represent the percentage of the 18–64 age group (individuals involved in any stage of entrepreneurial activity excluded) who intend to start a business within three years. Even when individuals have favorable perceptions of entrepreneurship, they may nonetheless have few intentions to start businesses. A positive sign is expected in all cases.	GEM

The correlation matrix is presented in Table 1.22.

Table 1.22. Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1) <i>tea</i>	1.000								
(2) <i>nde</i>	0.093	1.000							
(3) <i>ode</i>	-0.012	-0.722	1.000						
(4) <i>infdi</i>	-0.219	-0.177	-0.008	1.000					
(5) <i>outfdi</i>	-0.221	-0.307	0.112	0.946	1.000				
(6) <i>gdpgr</i>	-0.485	-0.096	0.203	-0.010	-0.031	1.000			
(7) <i>gdpcap</i>	0.011	-0.627	0.516	0.497	0.683	0.008	1.000		
(8) <i>fof</i>	-0.023	0.194	-0.268	0.123	0.120	-0.084	-0.123	1.000	
(9) <i>ei</i>	0.191	0.233	-0.090	-0.193	-0.245	-0.052	-0.290	0.337	1.000

There is no important correlation between the dependent and explanatory variables (inwards FDI, outwards FDI and the GDP per capita are expressed in natural log). However, the correlation coefficient of the inwards and outwards FDI is very high. In general the small businesses do not have enough financial resources to invest abroad. Consequently, we do not suspect a reverse causality problem regarding our interest variable and we do not use the lag of the independent variable in the regression as Kim & Li (2012) deed. However, an endogeneity problem can arise when we look to the economic growth rate and we accept it as a limit of our approach. The analysis looking for the panel data stationarity. The results of the four stationarity tests are presented in Table 1.23. As it can see, the tests performed show in general that our data are stationary.

Table 1.23. Stationarity tests

Tests	<i>tea</i>	<i>nde</i>	<i>ode</i>	<i>infdi</i>	<i>outfdi</i>	<i>gdpgr</i>	<i>gdpcap</i>	<i>fof</i>	<i>ei</i>
Levin–Lin–Chu (2002) – Adjusted t*	-4.40***	-5.05***	-2.97***	-26.13***	-14.34***	-4.56***	-17.16***	-9.92***	-1.86**
Harris–Tzavalis (1999) – rho (statistics)	0.11***	0.32***	0.29***	0.44**	0.60	0.24***	0.47*	0.12***	0.36***
Breitung (2000) – lambda (statistics)	-1.88**	-1.57*	-1.36*	0.99	2.64	-3.63***	0.51	-3.82***	-2.15**
Im–Pasarán–Shin (1997) – tilde (statistics)	-1.60*	-2.63***	-1.34*	-3.50***	-3.48***	-1.78**	-1.03	-1.95**	-2.59***

\*, \*\*, \*\*\*, mean stationarity significant at 10 %, 5 % et 1 %. Notes: (i) For all tests, the null hypothesis is that all the panels contain a unit root; (ii) For the Im–Pasarán–Shin (1997) test, we have marked the time trend and subtracted cross-sectional means. In case of *ode* variable, the Levin–Lin–Chu (2002) test shows the stationarity in the presence of a time trend, while for the Breitung (2000) test, we have subtracted the cross-sectional means and suppress the panel-specific means.

The fixed effect panel model is usually used for assessing the entrepreneurship determinants. Fixed effects underline disparities between countries. A new development of this classical model is the

panel negative-binomial model, which accounts for violations in the assumption of homoscedasticity and, in the same time, provides the flexibility to address unobserved heterogeneity (Hausman et al., 1984). Nevertheless, as Allison & Waterman (2002) show, this method does not, in fact, control for all stable covariates. We then test a simple fixed effect model, but also a random model, having in mind the fact that the structure of our sample shows a  $N < T$  situation (the number of countries is higher than the number of periods). In addition, for the robustness check we do not have strongly balanced panels (lack of data for the beginning of the period) and the random-effects models address these aspects. In order to avoid the broken panel problem, when entrepreneurship data were missing (Germany - 2007; Ireland - 2009; Sweden - 2008, 2009 and Switzerland - 2006, 2008), we have used the linear interpolation. A Hausman test was performed in order to select the most appropriate model between the fixed and random effects. The general tested equations for fixed and respectively for random effects are:

$$Y_{i,t} = \beta_0 + \beta_1 X_{i,t} + \alpha_i + e_{i,t} \quad (1.3.14)$$

where:  $Y_{i,t}$  is the dependent variable (*tea*, *nde*, *ode*);  $\beta_0$  is the intercept;  $\alpha_i$  represents all the stable characteristics of the countries;  $X_{i,t}$  represents the vector of independent variables;  $\beta_1$  are the coefficients;  $e_{i,t}$  is the error term.

$$Y_{i,t} = \beta_0 + \beta X_{i,t} + \alpha_i + \mu_{i,t} + \varepsilon_{i,t} \quad (1.3.15)$$

where:  $\mu$  represents between-entity errors;  $\varepsilon_{i,t}$  is the within-entity error.

The research has conducted, as mentioned above, three sets of analyses. The first set is represented by the 16 countries panel, for the period 2005-2011 (Panel A). The second set of analysis contains the same number of panel, but extends the period to 2001-2011 (Panel B). The third set includes 20 countries for the period 2001-2011 (Panel C). For each category of analyses we have tested the fixed and the random effects (the Hausman test was performed in order to choose the best model), having in mind the determinants of the total entrepreneurial activity (*tea*), of the necessity-driven entrepreneurs (*nde*) and of the opportunity-driven entrepreneurs (*ode*).

Table 1.24 presents the results for the Panel A, which represents the reference panel of our analysis. As we can see, inwards and outwards FDI do not influence the overall entrepreneurial activity (the coefficients are not significant). However, *tea* is positively correlated with the GDP per capita and with the entrepreneurial intentions. When we refer to *nde* and *ode*, the situation is different. Inwards FDI do not have an impact on the necessity-driven entrepreneurs (the coefficient is not significant), but the sign is the expected one. In the same time, the increase of the outwards FDI positively influences the necessity entrepreneurship. The fact that the capital leaves the country negatively affects job creation. Therefore, people who do not find a job became necessity entrepreneurs.

In case of opportunity-driven entrepreneurs, both the inwards and outwards FDI produce their effects. The entrance of multinational firms on the market stimulates the entrepreneurial activity (the demand creation effect). In the same time, the exit of big companies or of the capital is associated with the loss of interest for entrepreneurial activities. These results are in line with the theoretical background described in Section 2.

Table 1.24. Panel A

Model	<i>tea</i>		<i>nde</i>		<i>ode</i>	
	Fixed	Random	Fixed	Random	Fixed	Random
<i>constant</i>	-12.33	-8.55	183.4***	203.5***	-72.35	-152.2***
<i>infdi</i>	-0.23	0.26	-2.44	-2.59	11.81**	5.01
<i>outfdi</i>	-0.64	-0.60	12.07***	4.87***	-20.05***	-7.41**
<i>gdpgr</i>	-0.01	-0.01	0.08	-0.17	0.06	0.50**
<i>gdpcap</i>	2.67**	1.68**	-26.28***	-19.85***	21.05**	22.36***
<i>fof</i>	-0.02	-0.01	-0.10	-0.11	0.14	0.04
<i>ei</i>	0.20***	0.18***	-0.38	-0.13	0.04	-0.11
R <sup>2</sup>	0.12	0.13	0.01	0.35	0.01	0.37
F test (p-values)	9.01 (0.000)		11.83 (0.000)		6.06 (0.000)	
Hausman test (indicated model)	Prob>chi2 = 0.82 (Random)		Prob>chi2 = 0.06 (Fixed)		Prob>chi2 = 0.00 (Fixed)	

#### Robustness check

In order to check for the robustness of the previous results, we extend in the first step the data sample. In case of *tea*, we have the same sign for the interest variables (FDI), but this time the relationship became significant. The inwards FDI slightly influence the firm creation, at 90% interval of confidence. Contrary, the outwards FDI have an opposite and very significant effect.

The same situation can be seen in case of opportunity-driven entrepreneurs. As in the Panel A, the test performed on Panel B (Table 1.25) shows a positive influence from the *infdi* and a negative one related to *outfdi*. Nevertheless, in case of *nde*, the situation is totally different as compared to the previous results, fact which proves the lack of robustness for this particular category of results.

Table 1.25. Panel B

Model	<i>tea</i>		<i>nde</i>		<i>ode</i>	
	Fixed	Random	Fixed	Random	Fixed	Random
<i>constant</i>	-12.64**	-10.27***	65.24**	65.93***	-72.35	-152.2***
<i>infdi</i>	0.36	0.62*	5.41*	4.14**	11.81**	5.01
<i>outfdi</i>	-1.27***	-0.89***	2.37	-2.13	-20.05***	-7.41**
<i>gdpgr</i>	-0.04	-0.02	-0.06	-0.25	0.06	0.50**
<i>gdpcap</i>	2.77***	1.74***	-13.66**	-7.33***	21.05**	22.36***
<i>fof</i>	-0.04**	-0.03**	0.00	0.05	0.14	0.04
<i>ei</i>	0.23***	0.21***	0.01	0.18	0.04	-0.11
R <sup>2</sup>	0.13	0.16	0.01	0.37	0.01	0.37
F test (p-values)	13 (0.000)		8.33 (0.000)		6.06 (0.000)	
Hausman test (indicated model)	Prob>chi2 = 0.33 (Random)		Prob>chi2 = 0.09 (Random)		Prob>chi2 = 0.00 (Fixed)	

\*, \*\* and \*\*\*, mean statistic relationship significant at 10%, 5%, respectively 1%.

Finally, the last category of tests (Panel C) confirms our results for the opportunity-driven entrepreneurs (Table 1.26). As in case of Panel B, the fear of failure and the entrepreneurial intention are significant and have the expected sign only for the total entrepreneurial activity.

Table 1.26. Panel C

Model	<i>tea</i>		<i>nde</i>		<i>ode</i>	
	Fixed	Random	Fixed	Random	Fixed	Random
<i>constant</i>	-11.51**	-8.28**	52.27**	65.87***	-73.39	-108.2***
<i>infdi</i>	0.41	0.53	4.22*	3.80**	9.85**	1.14
<i>outfdi</i>	-0.89*	-0.66***	1.04	-1.73	-15.53***	-3.67*
<i>gdpgr</i>	-0.04*	-0.04*	-0.26**	-0.35***	-0.06	0.17
<i>gdpcap</i>	2.22**	1.48***	-9.55**	-7.44***	18.01**	18.60***
<i>fof</i>	-0.05***	-0.03**	0.00	0.04	0.09	-0.02
<i>ei</i>	0.20***	0.19***	0.2	0.30**	-0.10	-0.11
R <sup>2</sup>	0.23	0.24	0.09	0.45	0.01	0.50
F test (p-values)	9.30 (0.000)		7.43 (0.000)		4.71 (0.000)	
Hausman test (indicated model)	Prob>chi2 = 0.85 (Random)		Prob>chi2 = 0.24 (Random)		Prob>chi2 = 0.01 (Fixed)	

\*, \*\* and \*\*\*, mean statistic relationship significant at 10%, 5%, respectively 1%.

To sum up our findings, we can state that inwards FDI positively influence the total entrepreneurial activity, while the outwards FDI have an opposite effect. However, the results are partially robust. In case of the necessity-driven entrepreneurs the results are contradictory from



one panel to another and lack in robustness. Finally, the most important result of our research is related to the opportunity-driven entrepreneurs. Their activity is positively influenced by the FDI entrance and negatively influenced by the FDI exit. These findings are significant and very robust. As the *ode* activity is more prolific in the European developed countries, these countries benefit more in terms of entrepreneurial activity from the inwards FDI. The empirical findings regarding the role of FDI in promoting entrepreneurial activity in host countries are mixed and sometimes contradictory. Beside, theoretical arguments often oscillate between positive and negative spillover of inwards FDI on the entrepreneurial activity. These results can be explained by the fact that different elements motivate a person to become an entrepreneur, triggering thus the distinction between necessity-driven and opportunity-driven entrepreneurs.

The purpose of this part is to see to what extent the FDI influence the entrepreneurial activity, based on this delimitation. Consequently, we test the impact of the inwards FDI on the total entrepreneurial activity (assessed not only in terms of new business creation but also in terms of ongoing process for a firm set up), and on the necessity and opportunity European entrepreneurs, using the GME database for the period 2005-2011. In addition, we also estimate the impact of outwards FDI on these categories of entrepreneurs. The robustness check is made by including in the analysis different control variables and by extending the original data sample.

The results show that the impact of FDI on the overall entrepreneurial activity is relatively poor. However, when we make the separation between necessity and opportunity entrepreneurs, the findings became more conclusive. The outwards FDI positively influence the necessity driven entrepreneurs but these results lack in robustness. In case of opportunity entrepreneurs, the empirical findings are robust and show that inwards FDI positively influence this activity while the outwards FDI have an opposite effect. Indeed, the demand creation effect is very important for this category of entrepreneurs and this is the most important result of the present study. As the correlation between opportunity entrepreneurs and the level of countries' development is positive, inwards FDI enforce the entrepreneurial activity in particular in these European countries.

Our study can be further developed in different directions. First, depending on the availability of data, this effect can be checked at sectorial level. Second, it is important to make also the distinction between vertical and horizontal spillover effects and in the same time between

backward and forward linkages. Yet, the differentiation between necessity and opportunity-driven entrepreneurs contributes to a reconciliation of the entrepreneurship literature regarding the FDI role in enhancing the entrepreneurial activity.

*Shadow economy, tax policies, institutional weakness and financial stability in selected OECD countries* are the directions assessment in the next part.

This part investigates the effect of taxation, corruption and financial stability on the shadow economy in 23 OECD countries. For this purpose, we use a panel framework and a difference-in-difference system-GMM model over the period 2001 to 2013. While the taxation effects are assessed through the corporate income tax and the average tax wedge, the banking sector Z-score computed based on four different models represents our proxy for the financial system stability. Our results show that only the average tax wedge by family has a positive influence on the shadow economy dynamics, whereas the effect of corporate income tax proves insignificant. Further, our findings indicate a negative influence of the financial stability on the shadow economy, but the significant effect depends on how the Z-score is calculated-

Analyses of the shadow economy determinants are scarce in the economic literature. However, it is commonly accepted that countries with higher levels of corruption also tend to have a wider shadow economy. In addition, increased levels of taxation or uncertainty about tax policies might determine economic agents to activate in a parallel economy. On the contrary, the impact of the financial and economic stability on the shadow economy is practically unknown. In this context, the purpose of the present part is to provide a response to the following questions: Is the lack of financial stability a determinant factor of the shadow economy? How does the economic instability influence the size of the shadow economy?

The parts makes three contributions to the literature. First, we investigate the role of financial stability and we associate it with a low risk probability manifested in the banking sector, measured through the Z-score. Second, the macroeconomic stability is associated with a low level of the unemployment rate. Finally, we analyse the situation of the Organisation for Economic Co-operation and Development (OECD) countries and we take into account stationarity and endogeneity issues, using a difference-in-difference system-GMM model (Generalized Method of

Moments) over the period 2001 to 2013. The impact of institutional weaknesses on the shadow economy and tax evasion was already investigated by the early literature. But what do we understand by shadow economy, and how is the corruption measured? The shadow economy, also called underground, informal, or parallel economy, covers according to Lippert and Walker (1997) both illegal activities (monetary and nonmonetary), as well as legal activities which are taxable and which are not reported to tax authorities. In the second case, the shadow economy is associated with tax evasion and tax avoidance. Corruption also takes different forms. As Martini (2014) shows, corruption manifests as bribery, revenue fraud, embezzlement, extortion, nepotism, regulatory capture, collusion between tax officers and tax payers, political interference and revolving doors. The corruption is usually assessed through the corruption level perception, based on different surveys conducted on business people and analysts.

Several studies investigate the interdependence between corruption and shadow economy. For example, Çule and Fulton (2009) develop a theoretical model and highlight the existence of multiple equilibriums between business and tax inspection culture, underlining the role of tax evasion and corruption. Nawaz (2010) shows that corruption affects tax administration and has a negative impact on the levels of tax revenues, favouring thus the underground economy. Biswas et al. (2012) study how the shadow economy affects pollution and which is the role of the corruption levels in public administration. More recently, González-Fernández and González-Velasco (2014) study the relationship between the shadow economy and corruption as determinants of public debt in Spain. A different perspective is proposed by Dell'Anno and Teobaldelli (2015) who evaluate the effects of governmental decentralization on the shadow economy and corruption in 145 states.

The impact of taxation on the shadow economy is however less debated. In general, a high tax burden is considered favourable for the corruption climate, positively impacting the shadow economy. In this line, Awasthi and Bayraktar (2015) investigate the link between tax simplification and corruption in tax administration and find a positive relationship. Timmons and Garfias (2015) show in their turn that new information about corruption obtained from different municipal audit reports in Brazil, affects municipal property tax collection and the structure of fiscal institutions. Nevertheless, the impact of tax policies on the shadow economy can also be assessed through the

well-known Laffer curve, which shows the relationship between the rates of taxation and the resulting levels of government revenue. Increased levels of taxation might generate a decrease in tax revenues. This happens because the shadow economy increases when the tax burden is high, or when tax policies are characterized by uncertainty.

Financial stability can also have an important effect on the shadow economy. On the one hand, a stable financial system ensures the access to finance and favours the investments. On the other hand, the financial instability diminishes the revenues of firms (the access to finance and investments is blocked), and pushes companies to develop illegal activities, or force them to avoid taxes. Usually the financial stability is associated with the solidity of the banking system, due to the central role played by these institutions within the financial sector. If, for example, economic agents seek loans in order to undertake risky investment projects, they have thus disincentives to comply with tax obligations (Blackburn et al., 2012). At the same time, the risks accumulated by the banking sector increase. This also happens because the banks' risk-taking behaviour is influenced by the corruption level (Chen et al., 2015). The time-varying Z-score (advanced by Boyd and Graham, 1986) is a risk measure commonly used to reflect a bank's probability of insolvency, or the risk of the entire banking sector. Consequently, in this part we use different metrics of the Z-score in order to test for the financial stability's impact on the shadow economy.

Finally, the economic stability is associated with acceptable values of macroeconomic indicators, reflected by the price stability, small levels of exchange rate fluctuations or a reduced unemployment rate. Two reasons underlie our choice to retain in the analysis the unemployment rate as a determinant of the shadow economy. First, it is well-known that in economic contraction periods people lose their jobs and become unemployed. During the same periods of time, firms struggle to survive and might decide to move a part of their activities in the shadow economy zone. Second, people who lose their jobs search for alternative revenue sources and might also activate in the underground economy. The level of the shadow economy (as percentage in the GDP) is taken from the Cesifo database, created based on Professor Schneider's research (for a recent update see Schneider et al., 2015).

For measuring the corruption we use the Transparency International' Corruption Perception Index (TICPI), which is scaled from 1 to 10 until 2011 and from 1 to 100 afterwards (for harmonisation

purpose we have divided the index by 10 after 2011). It is constructed as an average index which takes higher values for a reduced corruption environment. Therefore, in order to associated higher index values with more rampant corruption, we follow Chen et al. (2015) and we assess the corruption level (CR) as follows:  $CR = 10 - TICPI$ .

The tax level is measured on the one hand based on the corporate income tax rate, and on the other hand using the average tax wedge (we consider the tax wedge for one-earner married couple with two children, at 100% of average earnings). Both metrics come from the OECD database and are available starting with 2000. The financial stability is assessed through a time-varying Z-score, which can be viewed as the reverse of the probability of banks' insolvency. A higher value denotes thus higher level of the banking sector soundness. Therefore, an increased financial stability (high Z-score) is expected to have a negative influence on the shadow economy level.

The general formula of the Z-score is the following (for a discussion regarding the way of computing Z-scores for panel data analysis, see Lepetit and Strobel, 2013):

$$Z_t = \frac{CAR_t + ROA_t}{\sigma_{ROA,t}} \text{ or } Z_t = \frac{\mu_{CAR,t} + \mu_{ROA,t}}{\sigma_{ROA,t}} \quad (1.3.16)$$

where  $CAR$  represents the capital-to-assets ratio,  $ROA$  is the return on assets,  $\mu$  is the moving mean and  $\sigma$  the standard deviation.

As in Lepetit and Strobel (2013), we use different approaches to compute the Z-score (Z). In all the cases, a rolling window of three years ( $n = 3$ ) is used: (i) Z1 (Boyd et al., 2006) supposes the use of the moving mean and standard deviation  $\mu_{CAR,t}(n)$ ,  $\mu_{ROA,t}(n)$  and  $\sigma_{ROA,t}(n)$ , calculated for each period  $t \in \{1 \dots T\}$ ; (ii) Z2 (Yeyati and Micco, 2007) supposes the use of moving mean  $\mu_{ROA,t}(n)$  and standard deviation estimates  $\sigma_{ROA,t}(n)$  calculated for each period  $t \in \{1 \dots T\}$ , and the combination with the current value of  $CAR_t$ ; (iii) Z3 (Hesse and Čihák, 2007) takes into account the standard deviation  $\sigma_{ROA,t}$  calculated over the full sample  $[1 \dots T]$ , and combines it with the current values of  $CAR_t$  and  $ROA_t$ ; (iv) Z4 (Lepetit and Strobel, 2013) uses the mean  $\mu_{ROA,t}$  and the standard deviation  $\sigma_{ROA,t}$  calculated over the full sample  $[1 \dots T]$ , and combines these with the current values of  $CAR_t$ . Z1 and Z2 are very similar and show a considerable decrease of the Z-

score during crisis episodes. At the same time, Z3 and Z4 represent smoother methods to assess the dynamics of the banking system default probability.

Data on banking stability are available in the OECD database starting with 1999, until 2009. Starting with 2010, the data used for the Z-score calculation (*CAR* and *ROA*) come from the Financial Soundness Indicators – International Monetary Fund (IMF)<sup>1</sup>.

In this part, we use the unemployment rate as a proxy for the economic instability. The data are extracted from the OECD database. Because the Z-score calculation supposes a rolling window of three years, the starting point of our sample is 2001. Because the shadow economy data are provided by CesIfo until 2013, our sample stops in 2013. All in all, we have obtained a balanced panel for 23 OECD countries<sup>2</sup> over the 2001 to 2013 period (299 observations).

The descriptive statistics of our variables are presented in Table 1.27. Two observations should be made. First, in the case of the average tax wedge, a negative value is recorded for the New Zealand from 2009 to 2011, showing that contributors benefited from tax exemptions during the crisis period. Second, compared to Lepetit and Strobel (2013) who calculate the Z-score for individual banks, the standard deviation of the Z-score computed for the entire banking sector is considerably smaller, showing thus that the problems related to the presence of outliers is avoided.

Table 1.27. Summary statistics

	SE	ATV	CIT	CR	Z1	Z2	Z3	Z4	UNR
Mean	15.11	27.37	28.66	7.476	82.82	82.18	19.69	19.66	7.537
SD	5.820	10.90	6.714	1.649	177.8	173.8	10.10	10.06	3.887
Min	6.600	-1.07	12.50	3.400	2.170	2.799	2.379	2.897	1.900
Max	32.40	43.07	40.87	9.900	1710	1631	58.46	58.22	26.10

*Note: SE – shadow economy, ATV – average tax wedge, CIT – corporate income tax, CR – corruption perception index, Z – Z-score, UNR – unemployment rate.*

<sup>1</sup> For Sweden, the *CAR* data are not available in the IMF database starting with 2010. In addition, the data are partially missing for the United Kingdom over the entire time-span. Consequently, we have used the World Bank data (World Economic Indicators) for these countries. In addition, the *ROA* data for the United Kingdom banking sector come from FED St. Louis (FRED database).

<sup>2</sup> Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States.

The research continues the analysis with the panel unit root tests in order to determine the most appropriate econometric model that should be used. However, given the fact that our sample is very heterogeneous and most of panel unit root tests are based on the assumption of independent cross-section units, we apply three cross-sectional dependence tests (Friedman, 1937; Frees, 1995; Pesaran, 2004), which show that for our panel the null of the cross-sectional independence is rejected. Therefore, we check the presence of panel unit roots using a second generation unit root test, namely the Pesaran cross-sectional Augmented Dickey–Fuller (pCADF) test (Pesaran, 2007).

The results of the panel unit root tests for all considered variables are presented in Table 1.28 below. In all the cases, the pCADF test does not reject the null of unit roots presence, except for the corporate income tax. Our series are then nonstationary and we shall use the first difference of these variables to avoid biased estimates. In addition, a reverse causality problem may arise, as the shadow economy represents an environment favourable for corruption. Indeed, the presence of tax evasion nourishes the corruption environment, if we consider the tax administrators. In addition, the shadow economy means less tax revenues collected, which force the authorities to increase the tax burden to achieve the budgetary planning. Further, the shadow economy means fewer jobs

Table 1.28. Cross-sectional dependence and panel unit root tests

Cross-sectional dependence tests								
	Pearson CD Normal		Friedman Chi-square		Frees Normal			
					test	10%	5%	1%
	19.89	(0.00)	99.34	(0.00)	4.444	0.198	0.262	0.390
Pesaran pCADF panel unit root test								
	Without trend				With trend			
	t-bar	10%	5%	1%	t-bar	10%	5%	1%
SE	-0.803	-2.070	-2.170	-2.340	-0.924	-2.590	-2.690	-2.880
ATV	-1.918	-2.070	-2.170	-2.340	-2.064	-2.590	-2.690	-2.880
CIT	-2.224	-2.070	-2.170	-2.340	-3.649	-2.590	-2.690	-2.880
CR	-1.876	-2.070	-2.170	-2.340	-2.642	-2.590	-2.690	-2.880
Z1	-0.823	-2.070	-2.170	-2.340	-1.481	-2.590	-2.690	-2.880
Z2	-0.781	-2.070	-2.170	-2.340	-1.105	-2.590	-2.690	-2.880
Z3	-1.882	-2.070	-2.170	-2.340	-2.839	-2.590	-2.690	-2.880
Z4	-1.741	-2.070	-2.170	-2.340	-3.722	-2.590	-2.690	-2.880
UNR	-0.751	-2.070	-2.170	-2.340	-1.947	-2.590	-2.690	-2.880
Notes: (i) SE – shadow economy, ATV – average tax wedge, CIT – corporate income tax, CR – corruption perception index, Z – Z-score, UNR – unemployment rate; (ii) pCADF test with two lags.								

Therefore, in order to overcome the endogeneity issues, we use a GMM framework. In addition, because we have a  $N > T$  sample, we use the Blundell and Bond (1998) approach, derived from the estimation of a system of two simultaneous equations, one in level and the other in first difference. However, because our series are not stationary, we are forced to apply a difference-in-difference system-GMM framework, where the taxation, corruption and unemployment are considered endogenous variables, while the financial stability is exogenous.

Because the Z-score measuring the financial stability is computed based on four different approaches (Z1, Z2, Z3, Z4), we proceed to the estimation of four models (Table 1.29). In all the situations, the tax wedge by family has a positive influence on the shadow economy, which shows that a higher taxation of individual revenues and higher social contributions lead to parallel economic activities. In addition, the corporate income tax has no significant influence on the shadow economy, although the sign of the coefficient is positive. This can be explained by the fact that the variability of this variable is reduced and it is hard to obtain reliable econometric results for this variable (there are countries which have the same taxation rate over the entire time-span).

As expected, the corruption has a positive influence on the shadow economy, in line with previous results reported in the literature. At the same time, the unemployment rate positively impacts the level of the shadow economy, showing that people who lose their jobs might enter in the underground economy to obtain alternative revenues. However, the financial stability has a negative influence on the shadow economy only in the case of Models 3 and 4. Indeed, the first two measures of the Z-score show considerable drops in crisis periods, which is not the case for the shadow economy. The shadow economy fluctuates in crisis time, without having strong picks. However, the last two models propose a smooth computation of the Z-score, where  $\sigma_{ROA,t}$  is calculated over the full sample. In these cases, the financial stability negatively impacts the shadow economy.

Table 1.29. Difference-in-difference system-GMM results

$\Delta SE$	Model 1	Model 2	Model 3	Model 4
C	-0.339*** (0.023)	-0.339*** (0.023)	-0.338*** (0.022)	-0.338*** (0.022)
L(1)	0.019**	0.019**	0.013*	0.014*



	(0.008)	(0.008)	(0.008)	(0.008)
$\Delta$ ATV	0.035*** (0.013)	0.034*** (0.013)	0.029** (0.013)	0.029** (0.013)
$\Delta$ CIT	0.015 (0.015)	0.016 (0.014)	0.022 (0.014)	0.021 (0.014)
$\Delta$ CR	0.213*** (0.079)	0.213*** (0.079)	0.190** (0.079)	0.198** (0.079)
$\Delta$ Z1	-0.000 (0.000)			
$\Delta$ Z2		-0.000 (0.000)		
$\Delta$ Z3			-0.011*** (0.004)	
$\Delta$ Z4				-0.009** (0.004)
$\Delta$ UNR	0.192*** (0.014)	0.193*** (0.014)	0.191*** (0.014)	0.194*** (0.014)
Observations	275	275	275	275
Groups	23	23	23	23

*Notes: (i) \*, \*\*, \*\*\* mean significance at 10 %, 5 % and 1 %; (ii) Standard errors are reported in brackets; (iii) GMM errors are used; (iv) The maximum number of the dependent variables lags, used as instruments, is established to 1, in order to avoid the instrument proliferation problem associated to the system-GMM; (v) ATV, CIT, CR and UNR are considered as endogenous variables; (vi) LP(1) is the first lag of the dependent variable, namely the first difference of the shadow economy.*

Tax policies and institutional weaknesses are important drivers of the shadow economy all over the world. The financial and economic stability should be added to these categories of determinants because an inappropriate access to finance or poor economic and social conditions favour the shadow economy.

This part uses a panel framework for 23 OECD countries and tests the impact of taxation, corruption, financial and economic stability on the level of the shadow economy. Addressing both the stationarity and endogeneity problems, we show that the average tax wage, the corruption, as well as the unemployment rate have a positive impact on the shadow economy. While the corporate income tax has no significant influence, the financial stability negatively impacts the shadow economy, but this result is influenced by the modality of computing the banking sector Z-score – a proxy for the financial stability.

Another important direction in the field of entrepreneurship is represented by Firm-level investment in the extractive industry from CEE countries: the role of macroeconomic uncertainty and internal conditions. This part adds to the menu of empirical studies investigating the link

between uncertainty and firms' capital investment policies. To provide additional insights on this relationship, we use firm-level data from the extractive industry of Central and Eastern European (CEE) countries, and we test how the macroeconomic uncertainty and the firms' internal conditions affect their investment decisions.

For a long time the volatility of the investment behavior was considered an essential contributor to aggregate fluctuations (Chirinko, 1993). Therefore, understanding the determinants of investment represents a key point for the corporate finance literature, which highlighted both the role of external and internal conditions, in influencing the firms' investment decision (Mendes et al., 2014). Several studies within the first strand of literature underlines the role of tax policy (Hall and Jorgenson, 1967; Fernandez-Villaverde et al., 2015), stock prices (Gilchrist et al., 2005; Wang et al., 2009), quality of institutions and innovation (Goedhuys et al., 2016), as well as the role of monetary policy and business cycles (Gertler and Gilchrist, 1994). Alongside the role of macroeconomic conditions, noteworthy researches underline the fact that the investment decision is influenced by uncertainty.

According to Fuss and Vermeulen (2008), there are two theoretical implications of uncertainty on investment. On the one hand, uncertainty might influence the level of investment. On the other hand, uncertainty affects the timing of investment. Against this background, a large body of literature investigates the impact of macroeconomic uncertainty on investment, and two opposite theories emerged (Binding and Dibiassi, 2017).

The real-option theory underlines the irreversibility characteristic of investment (Bernanke, 1983; Pindyck, 1988; Bertola and Caballero, 1994; Calcagnini and Iacobucci, 1997). In the presence of uncertainty, the investment decision is postponed, and a negative impact of uncertainty is recorded. Practically, when investment is irreversible, some flexibility appears in the timing of investment (McDonald and Siegel, 1986; Dixit and Pindyck, 1994). Panousi and Papanikolaou (2012) and DeMarzo et al. (2012) provide an alternative explanation of the relationship between uncertainty and the timing of investment. According to these authors, risk averse managers are tempted to underinvest when uncertainty increases, especially when managers own larger fractions of the firm. In the same spirit, Glover and Levine (2015) show in their neoclassical model that, depending

on the managers' compensation contracts, uncertainty can determine a manager to either increase or decrease the level of investment.

Most empirical studies provide evidence in the favor of the real-option theory. For example, Fuss and Vermeulen (2008) posit that demand uncertainty and not price uncertainty depresses the realized investment, while Bontempi et al. (2010) show that a reduction in demand uncertainty enhances the investment level for a panel of Italian firms. Kang et al. (2014) state that the interaction between economic policy and firm-level uncertainty depresses firms' investment decisions. Their data sample contains 2,759 American listed firms and the analyzed time-span is from 1985 to 2010. Further, Morikawa (2016) provides evidence that business uncertainty negatively influences the investment, especially for manufacturing and small companies in Japan. More recently, Binding and Dibiasi (2017) discover for a set of Swiss firms using survey data, that exchange rate uncertainty negatively affects investment in fixed assets. At macro level, Asamoah et al. (2016) also report that macroeconomic uncertainty hamper the flow of foreign direct investment in a set of Sub-Saharan African countries.

The growth-option theory, shows on the contrary, that uncertainty fosters the investment decision. There is a mechanism throughout, in the presence of perfectly competitive markets and reversibility of investment, the uncertainty increases the level of investment (Hartman, 1972; and Abel, 1983; Bar-Ilan and Strange, 1996). This mechanism can be explained by the fact that potential losses of investment projects are bounded, while this is not the case for the potential revenues, which are unbounded. Consequently, an increase of uncertainty on the expected price might trigger an increase in the expected profit, and thus an increase in investment. More recent empirical studies showing the positive impact of uncertainty on investment are that of Boyle and Guthrie (2003), who find that the threat of future funding shortfalls accelerates the present investment, and that of Baum et al. (2008), showing that market-based uncertainty has a positive impact on investment for United States (US) firms. Jeon and Nishihara (2014) also sustain that investment tends to be delayed in boom periods. In addition, firm valuation increases with firm-level volatility, but this is true for research and development (R&D) firms, which have enough growth options (Kraft et al., 2013). However, Czarnitzki and Toole (2011) report an opposite result for the same category of R&D firms.

The internal conditions of firms play their role in the investment decisions, and they usually refer to profitability, liquidity, cash flow, leverage and ownership structure (Farla, 2014; Perić and Durkin, 2015; Mavruk and Carlsson, 2015). Early studies underlining the role of internal conditions are those of Kalecki (1937) and Fazzari et al. (1988). Subsequent empirical works demonstrate that weak balance sheets and high debt level impend the access to finance and the investment (Vermeulen, 2002; Maças Nunes et al., 2012). Gilchrist et al. (2014) show in their general equilibrium model, that the firm's leverage influences the effects of uncertainty on its investment decisions.

In the category of empirical studies, Lang et al. (1996) report a negative relation between leverage and the future growth of firms, while Whited (1992) argue that investment is more sensitive to cash flow for high indebted firms. In the same line, Vermoesen et al. (2013) investigate how financing constraints of small and medium-sized enterprises (SMEs) in Belgium influence their investment decisions. Their findings show that during the crisis period, high leveraged firms experienced a significantly larger drop in investment. The role of leverage and access to capital is also revealed by Baum et al. (2010). The authors investigate a panel of US manufacturing firms and, contrary to other studies, show that the influence of leverage on capital investment may be stimulating. A similar result is reported by Bo and Sterken (2002) for a panel of Dutch listed firms in the period of 1984 to 1995. Baum et al. (2008) posit that the interactions between investment and liquidity can also have changing features. In crisis times, a high liquidity ratio may favor the investment. However, if projects can be delayed, a trade-off between immediate and future investment appears and therefore the liquidity might negatively influence the investment.

As compared to the exhaustive literature on the subject, this part brings several primary contributions to the existing literature. First, using firm-level data from the extractive industry of CEE countries, we investigate in a panel framework how both external and internal conditions influence firms' investment decision. More precisely, we focus on the role of macroeconomic uncertainty, assessed through the economic growth uncertainty (the discrepancy between the real GDP growth rate and its forecasted values) and the inflation uncertainty (the difference between the recorded inflation rate and its forecasted values). These measures of uncertainty are inspired from Svensson and Woodford (2003) and Gorodnichenko and Shapiro (2007). Reifschneider and

Tulip (2007) show how uncertainty is associated with forecasting errors.<sup>3</sup> Given our research topic, we state that managers consider the expected values of the macroeconomic variables in their investment decision. However, after the investment decision is made, if managers notice that the economy follows a different trend as compared to the anticipated one (what we call the manifestation of uncertainty), they decide to underinvest or overinvest (see the theoretical explanations provided above).

Second, we focus on a group of ten CEE countries and on the extractive industry, using firm-level data. As far as we know, this is the first paper that analyzes the investment determinants of companies located in CEE countries in the aftermath of the 2008-2009 global crisis, with an interest on the extractive industry. The investment level in CEE countries was severely and negatively affected by the crisis outburst. The lack of confidence in the macroeconomic policies, but also an inappropriate management of financial risks contributed to this situation. Further, given the level of fluctuation of energy and commodities prices, the extractive industry was particularly affected.

Third, different from previous studies, is conducted both static and dynamic analyses of investment's determinants, in order to avoid the endogeneity issues in relation with the internal conditions of firms. Indeed, the leverage and the liquidity might impact the investment, but an increase in investment can also enhance the leverage when bank loans are used, or might negatively impact the liquidity level in the short run, when the own funds sustain the investment. Finally, we test the robustness of our findings using an alternative measure of the growth uncertainty, namely the output gap calculated over the period 2008 to 2014. We also check the robustness of our findings focusing on a particular sub-industry that concentrates almost 80% of the firms included in our sample.

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<sup>3</sup> There are different approaches to assess the macroeconomic uncertainty. For the economic growth uncertainty, a simple way is to rely on the output gap. For the inflation uncertainty, GARCH-type models or unobserved component models can be used (Albulescu et al., 2017). For the monetary uncertainty, Husted et al. (2016) state that both survey-based and market-based approaches (i.e. CBOE Volatility Index - VIX) can be used. While most of the existing studies employ market-based indicators (Giannetti and Laeven, 2016), there are also papers that rely on surveys for computing time-varying business-level uncertainty (i.e. Bachmann et al., 2013). However, a simple and accepted way to measure the uncertainty supposes the comparison between the forecasted and the recorded values of macroeconomic indicators. Deviations from initial predictions induce uncertainty in the market and in the decision making process.

This part use *AMADEUS statistics* (Bureau van Dijk) for the period 2008 to 2014 (annual data). We focus on the extractive industry, which includes five sub-industries, namely mining of coal and lignite (code 05), extraction of crude petroleum and natural gas (code 06), mining of metal ores (code 07), other mining and quarrying (code 08), mining support service activities (code 09). For the selected ten CEE countries (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, Slovenia), 920 firms acting in extractive industry were identified. However, satisfactory data are obtained for 412 companies only (we have obtained a balanced panel). Table 1.30 presents the structure of our sample.

Table 1.30. Number of firms by country and sub-industries

	BU	HR	CZ	ES	HU	LV	LI	PL	SK	SV
05-Mining of coal and lignite	10	0	5	0	1	0	0	9	1	1
06-Extraction of crude petroleum and natural gas	2	2	0	2	2	0	2	3	1	0
07-Mining of metal ores	9	0	1	0	1	0	0	1	2	0
08-Other mining and quarrying	60	50	51	21	21	8	6	58	38	13
09-Mining support service activities	3	2	10	0	5	0	0	9	1	1
Total extractive industry	84	54	67	23	30	8	8	80	43	15
<i>Note: Bulgaria (BU), Croatia (HR), Czech Republic (CZ), Estonia (ES), Hungary (HU), Latvia (LV), Lithuania (LI), Poland (PL), Slovakia (SK), Slovenia (SV).</i>										

Our dependent variable is the investment dynamics (*investment*), computed based on the growth rate of fixed assets (property, plant and equipment). Using fixed assets to measure the investment level is common in the literature (Aivazian et al., 2005; Bruckner, 2010; Omet et al., 2015). Consequently:

$$investment_t = \frac{fixed\ assets_t - fixed\ assets_{t-1}}{fixed\ assets_{t-1}} \times 100 \quad (1.3.17)$$

The explanatory variables are first represented by the macroeconomic uncertainty. The growth uncertainty (*growth-uncertainty I*) and the inflation uncertainty (*inflation-uncertainty*) are computed as the difference between the real values of the GDP growth rate, and respectively inflation rate (extracted from Eurostat), and their forecasted values. For the forecasted values, we have used the European Commission (DG ECFIN) forecasts. We have considered one-year forecasted values for avoiding high levels of uncertainty (the horizon of forecasts is one or two years). In addition, the forecasted values are extracted from the last report of the year, released in

each autumn. For example, the forecasted value of the economic growth and inflation rates for 2009 are taken from the 2008 report released in autumn. We have used absolute values (modulus) to facilitate the results interpretation. We consider that both positive and negative deviations from the real values induce uncertainty in the market. Eq. (2) and Eq. (3) show how the macroeconomic uncertainty is computed:

$$growth - uncertainty1_t = |real\ GDP\ growth\ rate_t - forecasted\ growth\ rate_t| \quad (1.3.18)$$

$$inflation - uncertainty_t = |HCPI\ inflation\ rate_t - forecasted\ inflation\ rate_t| \quad (1.3.19)$$

An alternative measure of the growth uncertainty (*growth-uncertainty 2*) is used for robustness purpose. In this case, the uncertainty is represented by the deviation of the GDP growth rate from its long-run trend (the average growth rate over the interval 2008 to 2014):

$$growth - uncertainty2_t = GDP\ growth\ rate_t - average\ growth\ rate_{2008-2014} \quad (1.3.20)$$

The remaining two explanatory variables are represented by the leverage and the liquidity ratios. The liquidity ratio (*liquidity*) is extracted from the AMADEUS database, while the leverage (*leverage*) is computed as the long term debt to total assets ratio. The descriptive statistics of the sample are presented in Table 1.31:

Table 1.31. Summary statistics

Variables		Total	BU	HR	CZ	ES	HU	LV	LI	PL	SK	SV
investment	MIN	-999.0	-96.90	-100.0	-999.0	-84.79	-99.77	-65.91	-50.25	-75.95	-78.79	-34.58
	MAX	3726	3726	2501	924.8	968.7	267.2	504.9	410.0	444.3	1250	291.5
	SD	118.2	174.6	179.8	99.54	81.76	28.36	75.96	152.6	45.98	87.16	38.68
growth-uncertainty 1	MIN	0.000	0.000	1.000	0.400	0.200	0.600	0.200	0.100	0.400	0.500	0.100
	MAX	14.80	8.100	10.40	8.400	13.50	7.300	11.60	14.80	1.800	10.30	11.80
	SD	2.967	2.583	3.069	2.540	4.980	2.064	4.582	4.718	0.443	3.289	3.664
growth-uncertainty 2	MIN	-15.68	-4.714	-5.814	-5.314	-14.45	-6.771	-13.37	-15.68	-1.729	-7.371	-7.314
	MAX	7.843	4.886	3.686	2.186	7.843	3.829	7.129	5.114	1.871	3.629	3.786
	SD	3.224	2.623	2.699	2.565	6.929	3.181	6.617	6.638	1.216	3.345	3.817
inflation-uncertainty	MIN	0.000	0.100	0.000	0.200	0.200	1.400	0.200	0.200	0.200	0.000	0.800
	MAX	8.100	6.000	6.900	3.000	8.100	5.200	8.100	5.100	2.400	4.000	3.500
	SD	1.729	1.841	2.066	1.044	1.343	1.384	2.256	1.576	0.674	1.337	0.896
leverage	MIN	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	MAX	99.80	93.50	99.80	45.90	93.20	37.30	70.96	66.42	63.73	73.86	45.99
	SD	18.62	14.81	36.57	5.737	22.67	7.819	18.77	16.76	8.571	9.748	12.26
liquidity	MIN	0.004	0.014	0.011	0.085	0.077	0.103	0.004	0.038	0.005	0.026	0.156
	MAX	93.65	85.47	73.36	85.58	47.79	65.26	14.56	8.661	25.61	93.65	6.981
	SD	5.855	6.694	5.746	7.724	6.473	5.078	3.092	1.607	2.375	6.877	1.516

Notes: (i) Bulgaria (BU), Croatia (HR), Czech Republic (CZ), Estonia (ES), Hungary (HU), Latvia (LV), Lithuania (LI), Poland (PL), Slovakia (SK), Slovenia (SV); (ii) 2884 observations for 412 firms.

The fixed effects model addresses the disparities between firms and the unobserved heterogeneity, but does not control for all the stable covariates. Therefore, we also test a random model, which is recommended given the structure of our sample with  $N > T$ . The choice between the fixed (Eq. 5) and the random effects model (Eq. 6) is made by performing the Hausman test:

$$Y_{i,t} = c + \beta_1 X_{i,t} + \alpha_i + \varepsilon_{i,t} \quad (1.3.21)$$

where:  $Y_{it}$  is the dependent variable (*investment*);  $c$  is the intercept;  $\alpha_i$  represents all the stable characteristics of firms;  $X_{it}$  represents the vector of independent variables (*uncertainty*, *leverage*, *liquidity*) and  $\varepsilon_{i,t}$  is the error term.

$$Y_{i,t} = c + \beta_1 X_{i,t} + \alpha_i + \mu_{i,t} + \varepsilon_{i,t} \quad (1.3.22)$$

where:  $\mu_{i,t}$  represents between-entity errors;  $\varepsilon_{i,t}$  is the within-entity error.

As mentioned before, investment might also influence the leverage and liquidity level. Therefore, in order to deal with the potential endogeneity, we perform an instrumental variable (IV) analysis (using a 2SLS estimator). For the 2SLS estimator, the choice of good instruments is critical. These instruments should be correlated with the endogenous regressors on the one hand, and orthogonal to the errors, on the other hand. For the first issue, an examination of the significance of the excluded instruments in the first-stage, IV regressions can be applied (Baum et al., 2003). For the second issue, an overidentified model (i.e. Sargan test) can be used. Because it is hard to find external instruments that satisfy both conditions, we consider as instruments the first lags of the endogenous variables.

The IV model is not, however, consistent in the presence of heteroscedasticity. We check this issue applying a Pagan-Hall general test for heteroscedasticity. As Baum et al. (2003, 2007) show, in the presence of heteroscedasticity, the GMM estimator is more efficient, because it allows for the correction of the arbitrary heteroscedasticity, using robust and not GMM errors. The GMM estimator also accounts for time and space autocorrelations in residuals, if existing. Consequently, we also resort to a system-GMM estimator (Blundell and Bond, 1998). This estimator implies a system of two simultaneous equations, one in level and the other in first difference, and robust



Given the structure of the sample, the research use unit root tests from the first generation, as the LLC test (Levin et al., 2002), the HT test (Harris and Tzavalis, 1999), and the Breitung test (Breitung, 2000). The asymptotic characteristics of these tests recommend them for micro-panels analyses. Moreover, we can assume the existence of the cross-sectional independence. The results of the panel unit root tests are presented in Table 1.32. We can see that all our variables are stationary in level. A small exception is represented by the leverage ratio, under the Breitung test.

Table 1.32. Panel unit root tests

Variable	Tests	Levin–Lin–Chu (2002) – Adjusted t*	Harris–Tzavalis (1999) – rho (statistics)	Breitung (2000) – lambda (statistics)
investment		-200.0***	-0.156***	-10.58***
growth-uncertainty 1		-300.0***	0.034***	-22.96***
growth-uncertainty 2		-170.0***	-0.149***	-21.45***
inflation-uncertainty		-25.23***	-0.081***	-18.34***
leverage		-4400***	0.427***	-0.296***
liquidity		-130.0***	-0.038***	-4.178***

*Notes: (i) \*, \*\*, \*\*\*, means stationarity significant at 10 %, 5 % and 1 %; (ii) For all tests, the null hypothesis is the presence of a unit root in all panels.*

Table 1.33 presents the main results of our analysis. First, the static models show that only the inflation uncertainty and the liquidity ratio have a significant impact on investment. A high level of liquidity and inflation uncertainty positively influences the increase in investment. These findings confirm thus the growth-option theory and are in agreement with Jeon and Nishihara (2014). The Hausman test recommends the random model, at the expense of the fixed effects model.

Table 1.33. Main results

Models	Fixed effects model	Random effects model	2SLS model (IV)	System-GMM
intercept	-9.092 (4.734)	0.398 (4.025)	0.640 (4.587)	-6.431*** (1.438)
lag (1)				-0.116*** (0.001)
growth-uncertainty 1	0.782 (0.792)	0.701 (0.754)	0.899 (0.759)	0.426* (0.238)
inflation-uncertainty	3.528** (1.530)	3.331** (1.309)	3.890*** (1.315)	1.531*** (0.499)
leverage	0.116 (0.212)	0.218* (0.121)	-0.173 (0.168)	0.304*** (0.095)
liquidity	1.246** (0.560)	0.658* (0.381)	1.155 (0.817)	1.959*** (0.311)
Hausman test	chi2=6.18; chi2(p-value)=0.103			

(recommended)		(Random)		
Sargan statistics –			0.000	115.2
over-identification				[0.00]
Pagan-Hall test –			chi2=5.21	
heteroskedasticity			[0.26]	
Observations	2884	2884	2883	2472
Groups	412	412	412	412

*Notes: (i) \*, \*\*, \*\*\* means significance at 10 %, 5 % and 1 %; (ii) Standard errors are reported in brackets; (iii) Sargan statistics represents the overidentification test for all the instruments and equals 0.00 if the equation is exactly identified; (iv) The instruments used for the endogenous variables in the case of the IV analysis (leverage and liquidity) are the first lags of these variables; (v) p-values in square brackets; (vi) The maximum number of lags of the dependent variables used as instruments was established to 1, in order to avoid the instrument proliferation problem associated to the system-GMM (GMM errors are used); (vii) Lag(1) is the first lag of the dependent variable.*

More precisely, from the random model, we notice that an increase of the liquidity ratio with 1% corresponds to an increase of investment with 0.65% (all variables are expressed in percentages). At the same time, an inflation uncertainty of 1% corresponds to an increase in investment with 3.33%, a result in contrast to most previous results presented in the literature (i.e. Fuss and Vermeulen, 2008). Under the same random model, the leverage ratio becomes significant and positively influences the investment (1% increase in the leverage ratio corresponds to an increase of the investment rate with 0.26%). This result shows that the main source of investment in the extractive industry is the bank loan. The economic growth uncertainty has no influence on investment when we apply static estimators. We may think that a part of the variations of inflation uncertainty captures the variations of economic growth uncertainty, generating a multicollinearity situation. However, the Pearson coefficient shows that the level of correlation between variables is equal to 0.18. Therefore, the results are not prone to a multicollinearity bias, and prove that investors pay a special attention to the future level of prices.

Similar findings are reported for the IV analysis, and the Pagan-Hall test shows the absence of heteroscedasticity. Consequently, in the system-GMM estimation we have not used robust errors, but GMM errors. We have considered, however, the leverage and liquidity as endogenous variables, and the uncertainty variables as being strictly exogenous. Different from previous models, this estimator underlines the significant impact of economic growth uncertainty, which is also positive, and provides evidence in the favor of the growth-option theory. In this case, a 1% deviation of the growth rate from its forecasted value corresponds to a 0.42% increase in the investment growth rate.

## Robustness analysis

The robustness results, based on an alternative specification for the growth uncertainty, are presented in Table 1.34.

These findings confirm the main results, showing a similar magnitude of the coefficients, and proving the robustness of our findings. In this case also, the Hausman test recommends the random effects model. The inflation uncertainty, as well as the internal conditions of firms, influence the investment dynamics. However, under the system-GMM estimator, the growth uncertainty remains insignificant, as in the case of the static models. Consequently, the investors are particularly influenced in their decisions by a distortion relative to the future level of prices. Observing a higher increase in the general price level as compared to the initial estimations, they decide to increase their investment to obtain additional profits, behavior which shows that they are not risk adverse (see Panousi and Papanikolaou, 2012).

Table 1.34. Robustness results – growth uncertainty

Models	Fixed effects model	Random effects model	2SLS model (IV)	System-GMM
intercept	0.403 (4.509)	1.514 (3.812)	2.038 (4.418)	-7.669 (1.441)
lag (1)				-0.009 (0.001)
growth-uncertainty 2	0.458 (0.679)	0.480 (0.679)	0.463 (0.684)	-0.216 (0.199)
inflation-uncertainty	3.806** (1.518)	3.589*** (1.291)	4.198*** (1.298)	1.568*** (0.502)
leverage	0.126 (0.212)	0.227* (0.121)	-0.153 (0.167)	0.367*** (0.091)
liquidity	1.220** (0.560)	0.650* (0.381)	1.151 (0.818)	2.262*** (0.302)
Hausman test (recommended)	chi2=2.12; prob>chi2 = 0.714 (Random)			
Sargan statistics – over-identification			0.000	106.6 [0.00]
Pagan-Hall test – heteroskedasticity			chi2=5.13; [0.27]	
Observations	2884	2884	2883	2472
Groups	412	412	412	412

Notes: (i) \*, \*\*, \*\*\* means significance at 10 %, 5 % and 1 %; (ii) Standard errors are reported in brackets; (iii) Sargan statistics represents the overidentification test for all the instruments and equals 0.00 if the equation is exactly identified; (iv) The instruments used for the endogenous variables in the case of the IV analysis (leverage and liquidity) are the first lags of these variables; (v) p-values in square brackets; (vi) The maximum number of lags of the dependent variables used as instruments was established to 1, in order to avoid the instrument proliferation problem associated to the system-GMM (GMM errors are used); (vii) Lag(1) is the first lag of the dependent variable.

Our results might be influenced by the structure of the sample, where a particular sub-industry is predominant (08-other mining and quarrying), and where 326 out of 412 firms retained in our analysis (almost 80%) are acting. As shown in Table 1, there are countries (i.e. Latvia), where all the companies retained from the extractive industry are concentrated within this particular sector. Thereby, we perform additional robustness checks and we focus on this particular sub-industry.

The new findings are presented in Table 1.35 and confirm, in general, the main findings of the paper. Two small differences appear. On the one hand, the Hausman test recommends the same random model, but this time, under the random model, the liquidity effect becomes insignificant. On the other hand, the magnitude of the explanatory variables decreases for the system-GMM estimator. In this case also, the influence of economic growth uncertainty on the investment dynamics is significant. As stated before, this result lacks, however, in robustness.

Table 1.35. Robustness results – sub-industry

Models	Fixed effects model	Random effects model	2SLS model (IV)	System-GMM
intercept	-0.906 (5.722)	-0.041 (4.836)	1.938 (5.606)	-4.805*** (1.590)
lag (1)				-0.013*** (0.001)
growth-uncertainty 1	0.914 (0.930)	0.862 (0.885)	1.036 (0.889)	0.367* (0.220)
inflation-uncertainty	2.949* (1.826)	3.185** (1.563)	3.841** (1.575)	1.315** (0.502)
leverage	0.066 (0.249)	0.204 (0.138)	-0.229 (0.189)	0.293*** (0.101)
liquidity	1.534** (0.635)	0.617 (0.439)	0.579 (0.970)	0.717** (0.348)
Hausman test (recommended)	chi2=4.30; prob>chi2 = 0.367 (Random)			
Sargan statistic – over-identification			0.000	95.30 [0.00]
Pagan-Hall test – heteroskedasticity			chi2=4.30; [0.36]	
Observations	2282	2282	2281	1956
Groups	326	326	326	326

Notes: (i) \*, \*\*, \*\*\* means significance at 10 %, 5 % and 1 %; (ii) Standard errors are reported in brackets; (iii) Sargan statistics represents the overidentification test for all the instruments and equals 0.00 if the equation is exactly identified; (iv) The instruments used for the endogenous variables in the case of the IV analysis (leverage and liquidity) are the first lags of these variables; (v) p-values in square brackets; (vi) The maximum number of lags of the dependent variables used as instruments was established to 1, in order to avoid the instrument proliferation problem associated to the system-GMM (GMM errors are used); (vii) Lag(1) is the first lag of the dependent variable.

Firms' investment considerably dropped in the CEE countries in the aftermath of the recent financial crisis. In this context, this part investigates if both external and internal conditions are responsible for the dynamics of investment. Applying a panel data analysis for 412 companies acting in the extractive industry of ten CEE countries, the results shows that both the macroeconomic uncertainty and internal conditions influence the investment dynamics.

More precisely, the inflation uncertainty has a positive impact on investment, mechanism explained by the growth-option theory. Consequently, if investors expect to have a higher level of inflation as compared to the recorded inflation rate, they associate the increase in general prices with an increase in their profit. This judgment determines them to invest now for the future. In addition, managers establish their present investment strategy considering the forecasted level of inflation. If managers are not risk averse, they associate any increase in prices over the forecasted value with additional profit opportunities and overinvest in the next period. This rezoning shows how an increase in inflation uncertainty positively influences the investment dynamics in the extractive industry from the CEE countries.

The economic uncertainty has not, however, a significant impact. Indeed, a positive impact is noticed when we look to the results of the system-GMM estimator. However, these findings are not robust if we compare them with the results of the static models, or with the IV analysis. For the internal conditions, the findings clearly show that the liquidity ratio positively influences the investment, while the leverage ratio has a limited effect. These results are confirmed by all the static and dynamic estimators used in our analysis.

The findings have some practical implications. First, the investment managers should learn from the importance of liquidity in supporting the investment during economic revival times. They also have to be aware of the general level of prices when they make their investment decisions. Second, authorities might decide the application of pro- or counter-cyclical economic policies to influence firms' investment decisions. More precisely, the accuracy of their macroeconomic forecasts influences the dynamics of investment. However, the influence might differ from one industry to another. In the presence of risk neutral managers, authorities may be interested in providing accurate forecasts if they want to temperate the investment dynamics in economic boom periods.

### **1.5. Education and sustainable development**

Sustainability is a complex concept that is addressed by most companies, and is the direction of their development. Culture and education for sustainable development must start from higher education. At the level of higher education, the presence of sustainability subjects was mainly assessed in the curricula of study and also the understanding of the concept among students. In Romania these studies are not defined in depth. Also a comparative analysis of students' knowledge and understanding of the concept in business (after graduating higher education) was not made. The purpose of this section is to highlight the current level of education for students and the business environment on the sustainability principles.

Traditionally companies have no concerns beyond those strictly related to business activity, all resource allocations being designed to achieve their economic objectives and reflected ultimately in profit. Lately this business behaviour began to change, with the focus on sustainability and aligning with European requirements on environmental, social and economic dimensions. In recent studies (Baleanu et al., 2014; Viegas et al., 2016) it is pointed out that companies are starting to become increasingly involved in the sustainable development and understand the meaning of the concept in its entirety.

An important role in promoting the concept of sustainability is held by institutions of higher education and especially the master cycle (Baleanu et al., 2010; Moraru et al., 2014). In the case when the master students perceive and understand what the concept is, then sustainability reporting in companies where they work or will work has no longer any barrier.

This section aims to identify the current level of involvement in the sustainable development of communities in Romania and assess the level of understanding of the concept for students in higher education. A growing number of organizations seeking to develop sustainable operations and align with international requirements. Moreover, expectations that long-term profitability is directly proportional to social responsibility and environmental protection, are advancing. Involvement in sustainability reporting helps organizations to set goals, to measure performance and manage change in order to achieve sustainable operations. A sustainability report submits information on the impact of an organization, be it positive or negative, on the environment, society and economy

(Mocan et al., 2015). Involvement in sustainability reporting contributes to long-term development of the organization, but also to improving the image in front of the stakeholders. The reporting environment can be chosen by the organization. Electronic or online reports and reports on paper are two appropriate media for reporting. Organizations can choose to use a combination of web and reports on paper or use only one medium. From this perspective, researching the awareness and adoption of this concept is helpful. To investigate the awareness and adoption, the research is based on the degree of learning of the concept of sustainable development among undergraduate and graduate students, and among the companies in Romania.

So, the students represent the human resource that will contribute to business development (Popa et al., 2015; Vassigh et al., 2014). The students do not have the basic elements of education for sustainable development (ESD). A number of studies highlight the fact that students do not have the sustainability knowledge (Viegas et al., 2016; Chaiwichit, 2016). In Barth's and Rieckmann study in 2012, it is noted that students should acquire skills for sustainable living and be able to understand the link between interaction and consequences over a long period of time. In 2013, Boutou confirms that future professionals must be prepared from the perspective of sustainability to be competitive and be hired easily by companies. In the studies Godemann et al. (2014), Amaral et al. (2015), and Haskova et al. (2016) it is shown the important role that sustainable development plays in the curriculum of the students.

Therefore, knowledge on sustainable development is needed among students. With this purpose a questionnaire was developed that was first applied to students in higher education to identify the level of knowledge of the concept. The second survey was carried out for companies in Romania, being applied to identify the involvement of these companies in sustainable development. Therefore, the research is based on two directions:

- The questionnaire survey applied in academia, and
- The questionnaire survey applied to business.

This research aims to answer the questions: "What are the sustainability principles to be followed? What are the future directions in terms of ESD? ", and to highlight the degree to which human resource and companies are interested in these principles and directions of development.

## Sustainability Principles

The involvement in sustainable development is a concern for many companies in Romania, there is little understanding of how it is perceived by companies and by human resource. Among the basic principles of sustainable development set forth in the Rio Declaration on Environment and Development (UNEP, 2016) there are:

- Development of the companies must involve not only concern for the environment, it must involve respect for society and the balance of financial resources.
- Environmental protection must be an integral part of development processes and no individual activities should be taken for its protection. Companies must equitably support poverty eradication and gender equality in the workplace.
- Companies and businesses should meet most people's needs in a balanced way, with no differences between human resources.
- Environmental issues need to be approached by involving all stakeholders.
- There must be international cooperation to promote an open international economic system that will lead to economic growth and sustainable development in all countries, with no differences.
- The involvement of women and youth, courage, creativity and knowledge of people are the dimensions that are supporting the sustainable development.

In order to assess the degree of involvement in the sustainable development of a number of organizations conduct evaluations performed without the use of international reporting standard. There is no legislation to impose sustainability reporting under a standardized form, so due to the complexity of international reporting many organizations choose a simple evaluation of all activities. According to the last version of sustainable development reporting, Global Report Initiative - GRI G4, the main development directions are presented below in Table 1.36:

Table 1.36. Responsibilities and issues related to sustainability reporting

Responsibility	Aspects	Dimensions
Economic		Economic performance, market presence Indirect economic impact, public procurement practices
Social	Labour practices and decent work	Employees, labour / relations management, health and safety at the workplace, training and education, diversity and equal opportunities in the human resources, Complaint resolution mechanisms of working practices



	Human rights	Forced labour, labour practices, evaluating various human rights, Complaint resolution mechanisms for human rights
	Society	The rights of local communities, business behaviour, Complaint resolution mechanisms of society
	Production responsibility	Conformity of production processes, health and safety of customers, marketing, confidentiality
Environment		Materials, energy, water, biodiversity, emissions, waste, Products and Services, Compliance, Transportation, Assembly, suppliers impact on the environment, environmental related complaints mechanisms

Focus groups were conducted in this study to identify the current level of education in terms of sustainability. For the business environment a questionnaire was applied to identify the level of knowledge of this process of sustainable development. To assess the level of education in terms of sustainability in academia a questionnaire survey was used, emphasizing the closed questions due to the complexity of the concept. The questionnaire is structured in three main directions:

- Assessment of subjects in the curriculum - preferences, learning styles and teaching methods.
- Knowledge of sustainability concept - the degree of perception of this complex concept.
- Students adaptability to business requirements, desire for knowledge and involvement in of the students in organizations.

The research directions of this questionnaire are:

- Company identification through various elements - to outline the profile of the organization.
- Risk management in organizations - sustainable development involves risk assessment because it is present in every activity and there is no durability without hazard and threats identification.
- Standardization and globalization - sustainability leads to standardization of processes and the implementation of international standards.
- Sustainability - perception and implementation of sustainability principles and directions.

The entire research can be sketched as shown in Figure 1.58 starting from directions and theoretical principles, evaluating the perception of sustainability in business and among students and directions are obtained to be followed for global sustainable development.

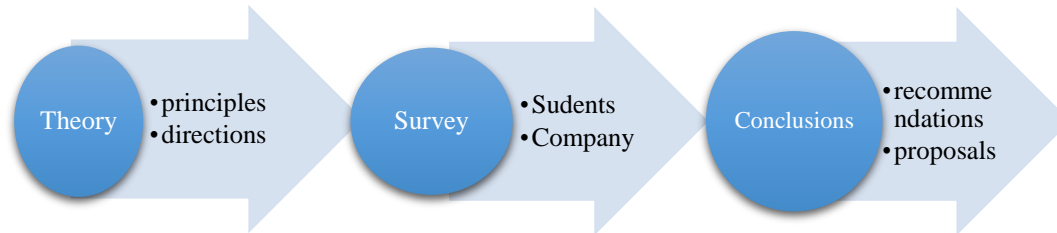


Figure 1.58. Research structure

#### Interpretation of results obtained in academia

From the questionnaire applied to academia some information were obtained that are consistent with the international direction. As underlined by Barth and Rieckmann, students should possess basic information on sustainability because knowledge in this area is minimal. The centralisation of results obtained are presented in Table 1.37.

Table 1.37. The systematization of the results obtained in academia

Area	The implication of question	Affirmation answer (Yes)
Evaluation of curriculum subjects	Interactive teaching-learning methods	39% Method for problem solving
	Learning style	87% defined by visual style, 28.2% auditory style
	economic subjects	33%
	subjects on environmental protection	10%
	CSR subjects	No
Knowledge of sustainability concept	Concept definition	13%
	Sustainability principles	2%
Adaptability of students to the needs of business	The degree of employability	18%
	Application of theoretical knowledge in the workplace	52%
	Involvement in volunteering work	32%
	Study visits in companies	75%

After analysing the results obtained the following can highlighted:

- 39% of respondents prefer as the method for problem solving the stimulating of creativity and only 15% prefer individual study.

In terms of typology of teachers, 68% of respondents want the teacher to take the role of initiator in teaching.

- Of the respondents 87% are defined by the visual style, for 28.2% the auditory style, 7.7% tactical and 2.6% kinaesthetic.
- In terms of study subjects, economic subjects are covering 33% of the curriculum, and those relating to environmental and social practices are not covered very well.
- From the perspective of sustainability, very few respondents were able to define the concept of sustainability, and its implications have not been identified.
- 18% of students are employed (those in final years) and 52% apply the theoretical knowledge in the workplace.
- Study visits are present starting with the 2<sup>nd</sup> year of study, being performed annually, together with internships.

#### **Interpretation of results obtained in business**

After analysing the results obtained after applying the questionnaire to 100 companies in Romania it is seen that most know the concept of sustainability and perform various activities in this direction. The results are summarized in Table 1.38 and are discussed below.

Table 1.38. The systematization of results obtained in business

Area	The implication of question	Affirmation answer (Yes)
Risk management in organizations	The existence of risk manager	52%
	Risk management	91%
	risk retention	32%
	risk transfer	68%
Standardization and globalization	The implementation of at least one standard (ISO 9000, ISO 14000, ISO 26000, ISO 31000)	92%
	Involvement in international efforts on globalization	61%
Sustainability	Knowing the concept of sustainability	75%
	What are the dimensions of sustainability	69%
	Carrying out the actions to protect the environment	96%
	Carrying out the actions to support society	100%

	Cost-benefit analyses	92%
	sustainability reporting	85%
	Sustainability reporting using GRI	43%

From the results obtained from the business environment on the 100 companies it is observed that:

- In 52% of these there is a risk manager and 91% of them consider as important the risk management for the organization.
- 32% of organizations bear the financial consequences directly, using borrowed or own funds, and 68% transfer the risk, that means that they have an insurance contract.
- Most companies have implemented at least the quality standard, registering a proportion of 92%
- 61% of the organizations are involved in international efforts that lead to global development and are contributing directly to the development of the company.
- From the perspective of sustainability, it is noticed that lately the concept of sustainability is fully understood by most organizations, registering a 75% percent.
- Sustainability defining was done correctly by 69%. They correctly identified the 3 responsibility of sustainability: economic, social and environmental.
- Over 90% of respondents develop activities to protect the environment and all companies support the society.
- Financial analyses are performed mainly at the end of the year, and costs and benefits analysis is performed by most companies, i.e. 92%.
- Reporting sustainability is achieved by 85% of companies and only 43% of them use the Global Report Initiatives - GRI.

Finally, it can be concluded that inclusion of materials on sustainable development contributes to the development of a sustainable environment and sustainable businesses. The relationship between education and sustainable development is a directly proportional one.

From the analysis conducted in this paper, in Romania, the following can be concluded:

- The concept of sustainability is perceived by most companies, but reporting is not realized in standardized form. This could be complemented by a series of courses that can be achieved in the years of study.
- Respect for the environment and society can be shaped even during the years of study so that when the student is hired this culture to already exist.
- Various financial analyses are performed at the superficial level or only on the final financial results, which could be supplemented by courses in academia.
- To apply the theoretical knowledge as many agreements with companies should be concluded to increase employability percentage in last year of study.
- Introducing new trends and directions concerning the development of the business environment.

In conclusion, it can be said that the business environment in Romania is in continuous development and is aligning with international requirements. The students are interested in business requirements and prefer to be employed after graduation. This is supported also by the idea that during the years of study, hiring students is done without the necessary qualifications and the thus the pay is low.

*The issue of renewable energies is another direction of sustainable development.* Fierce competition in today's global markets, the emergence of modern technologies with increasingly shorter life cycles and increased expectations from customers pushed business enterprises to invest in, and focus attention on supply chain fluctuations to set up various collaboration agreements for buffer management at each link in the chain. (Proștean & Badea, 2014) More specifically, exemplifying the phenomenon described above, highlight through this part, express collaboration difficulties between project developers in renewables energy and supply chain links. Although the implementation of renewable energy projects offers superior characteristics on green energy wide distribution, the complexity of implementing these projects require to search mutually beneficial collaborations between suppliers and wind industry components manufacturers. Wind energy manufacturers that aspiring to enter the supply chain for supplying components of a wind power plant found that quality standards imposed by RES projects developers are rigorous and must meet unique technical parameters. Wind blades manufacturers looking to optimize long-term

relationships with raw materials suppliers, although difficulties access to capital and failure to comply with contractual terms causing delay or interruption of production orders.

This part presents a conceptual model for collaboration of supply chain links that support strategic activities for implementation of RES projects.

**The general model of an alliance limitations** (Popa, 2009) it contains defined procedures for performance continuous measurement without specifying an algorithmic way of obtaining collaborative operating rules. Identifying facilitators for determining the expected efficacy is not based on a decision-criteria method for optimizing the collaboration. Search and select criteria presents implementing constraints without using a bidirectional advantageous formalism.

**Collaboative model-potential and intensity limitations** (Bititci and Mokadem, 2010) shows no formalism by which can be measure the trust degree between partners in supply chain under risk conditions. Collaborative culture and trust are very important components for maintaining a lasting relationship but does not include a decision-making mechanism to establish a hierarchy for collaborative alternatives. It is necessary to formalize the innovation level in the organization by which the contractual constraints enable collaboration between partners with other entities.

**Collaborative Performance System limitations** (Simatupang, 2004) it involves aligning decisions with performance, taking appropriate decisions jointly. Specific information that facilitates the process and provides visibility status is not guided by a dimensioned algorithm to ensure a cooperation agreement synchronized with chain objectives. Performance metrics that guide members toward improving supply chain performance do not define through decision method the weight that holds each indicator. The third level of the performance system compares collaborative expectations and actual results of cooperation but not identifies clearly by analysis a mechanism for unwanted effects of the system.

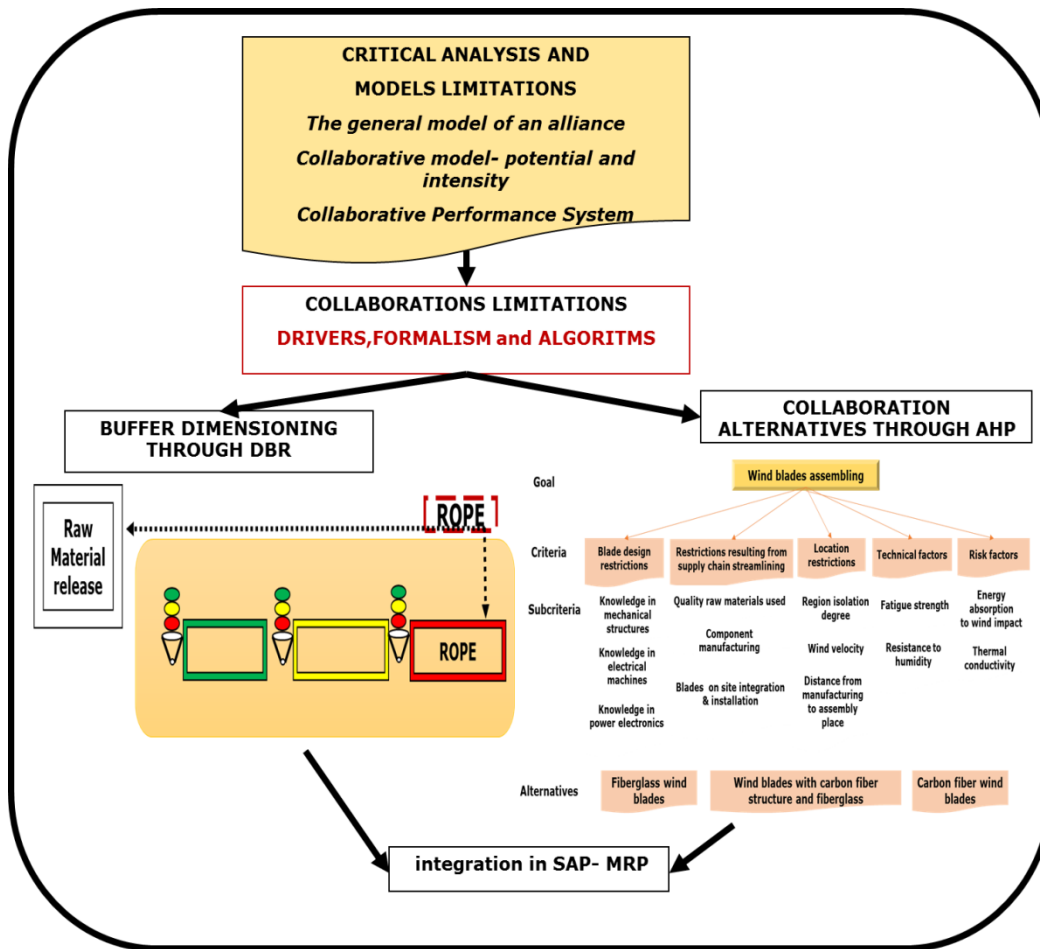


Figure 1.59. Conceptual model

Analysis of the three collaboration models, the general model of an alliance (Popa, 2009), collaborative model-potential and intensity (Bititci and Mokadem, 2010) respectively, collaborative performance system (Simatupang, 2004) presents connections adapted to the strategy, performance and intensity which facilitates the collaboration process between links in the chain. These connections highlight the drivers as knowledge and trust premise that implemented effectively contribute to a collaborative space in the logistics chain. Knowledge and trust drivers facilitates collaboration among supply chain links and together with facilitators offer collaborative leverages by varying degrees.

**Knowledge drivers** - The continuing need for creating a valuable knowledge flow enable supply chain partners to be engaged in interconnected processes and dispose important information to process and create new knowledge (Malhotra et al. 2005).

**Trust drivers** - Moody (1993) defines trust as the fastest way that leads to achieving the partnership. Trust is the decision to rely on a partner with the hope that he will act in accordance with a joint agreement (Currall and Inkpen, 2002).

**Factors and relational facilitators** - Bejarano (2013) identified in his study a relevant set of relational factors which characterize the simultaneous operation in supply chain. Each relational criterion has a significant importance if the collaborative process involves partners in the supply chain. Depending on their degree of impact collaborative process relational factors can lead to success or failure. Knowledge and trust drivers, positive and negative relational factors and collaborative relationships facilitators help to shape collaborative attributes that enable development of collaborative strategic alliances in supply chain. Thus it can be argued that the collaborative attributes are an important part, ensuring a profitable alliance that can solve problems.

Critical analysis of the collaborative factors highlights aspects related to organizational and human environment. It is noted that there are barriers that are related to collaborative relationship development and barriers related while maintaining a collaborative relationship. Also the collaborative attributes are divided into factors that strengthens the collaboration process to solve problems in the supply chain and the factors restricting the collaboration process and make it difficult to maintain a profitable supply chain collaboration.



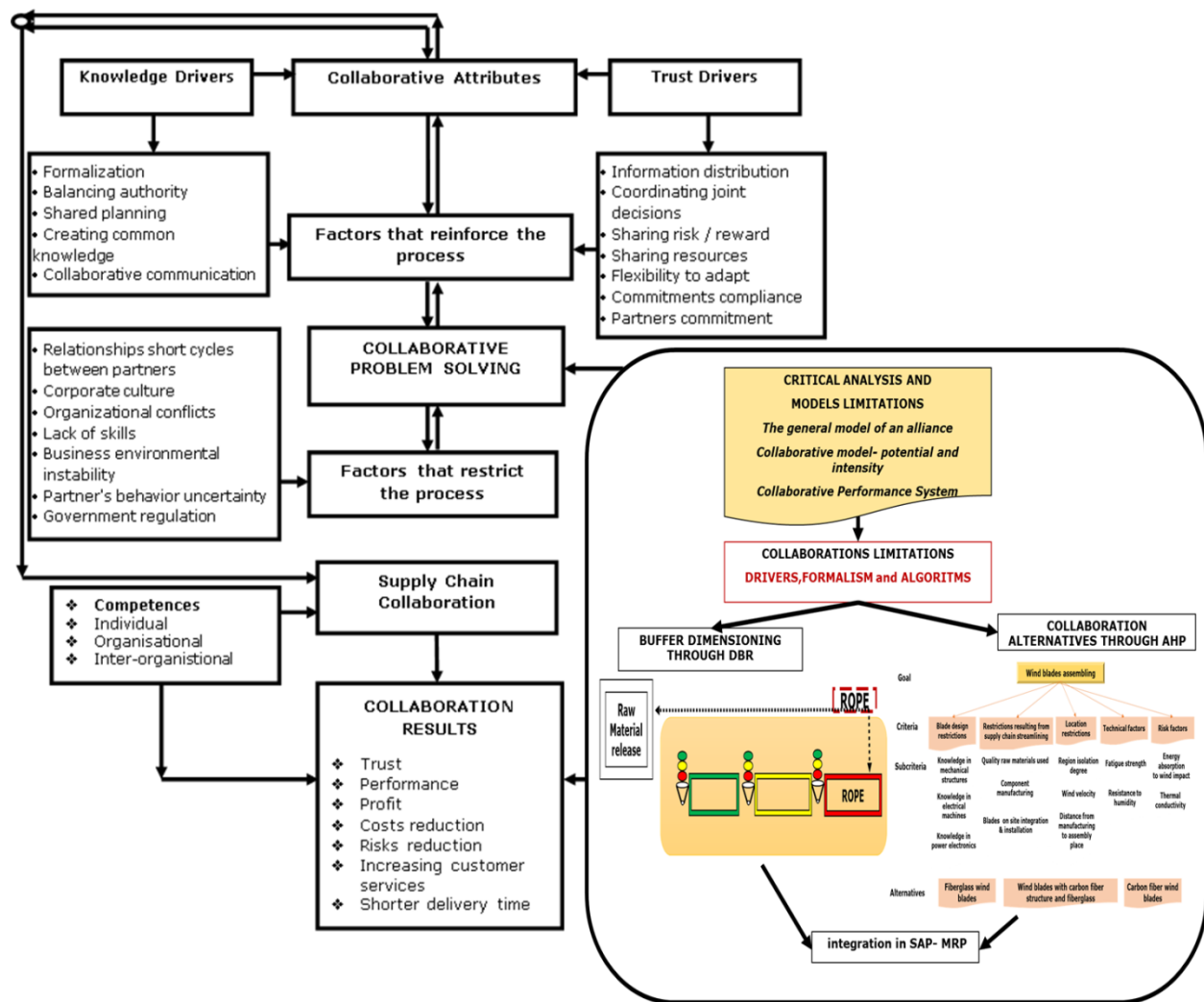


Figure 1.60. Multi-Criteria Decision-Making through AHP Methodology

Multi-Criteria Decision-Making (MCDM) methods provide a logical framework to investigate, analyse, and solve different problems. MCDM methods are usually categorized in multi-object decision making (MODM) and multi-attribute decision making (MADM). MADM again can be categorized in outranking relation-based and utility function-based approaches. The AHP approach, which is used in our study, is a utility function-based MADM method. Analytic Hierarchy Process (AHP) it was developed between 1971-1975 by Thomas L. Saaty at the Wharton

School (University of Pennsylvania) and is a tool for prioritizing alternatives to a problem. AHP decision-making method is used to highlight reasoning and subjective views of stakeholders in relation to each issue, summarizes the views expressed, establishes priority structures and analyse conflict situations. (Saaty 1986) AHP developed by Hamllainen and Seppalainen (1986) solve a large-scale socio-technical decision problem with intangible criteria. Ernest H. Forman, Saul I. Gass (2001) offers a remarkable synthesis in different sectors to the interest paid of the Analytic Hierarchy Process method.

Finding quality raw material components of a wind plant is an important step, which involves multiple criteria and objectives to join complex decisions. Through AHP method was obtained the final decision and were taken into account all technical aspects, risk exposure, environment accessibility and not at least logistics elements so selected raw materials for the manufacturing process to be available at the appropriate time, even if they are not yet integrated into a logistic flow. Evolution of intermediate and final results of AHP methodology out clearly in evidence the importance of logistical aspects to select the final alternative. Re-search stages results obtained by the research team in a wind energy project in a remote region with extreme weather and challenging landforms showed that the solution provided by the algorithm AHP, using the scale Saaty 1 (Equal Importance) - 9 (Extremely high importance) provides conclusive results. AHP decision tree structure for assembling blades contains 4 levels. The highest level describes the general decision, goal, the middle level describes the criteria to be considered in choosing the best alternative, the role of sub-criteria at the intermediate level involve a more complex analysis in choosing the final decision, and the lowest level shows the three alternatives. A first step the comparison results provided by the initial criteria matrix shows the contribution of each criterion to the purpose defined in the decision tree.

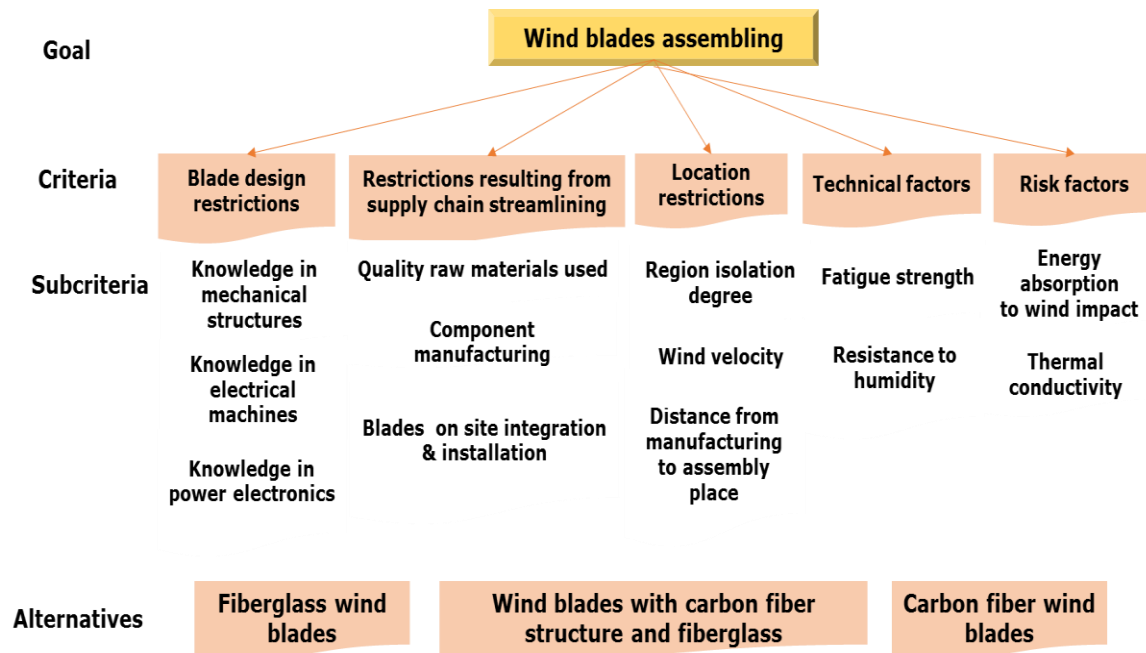


Figure 1.61. TOC through Drum-Buffer-Rope Philosophy

Appeared in 1984, Theory of Constraints (TOC) started with production optimization system and has distinguished itself as a management philosophy proposed by E. Goldratt (1990), which aimed to initiate and implement improvements discovered by focusing on a constraint. (Goldratt & Cox, 1984). TOC has evolved from a production planning program to a suite of integrated management tools that include three interdependent areas: logistics / production, performance measurement tools and solve problems through thinking processes. (Spencer & Cox, 1995) Simatupang (2004) exemplifies through bibliographic study the applicability of TOC strategy proving interest of the research in this area by publishing a number of considerably scientific articles and books. Rahman (1998) analyzes the TOC approach to manufacturing firms. Siha (1999), applies TOC to tackle different types of services in organizations. Klein and Debruine (1995) and Dettmer (1998) used TOC thinking processes to identify the core issues in public policy. Womack and Flowers (1999) applied the TOC approach in the health system to improve its performance. (Simatupang, et al. 2004)

Originally solutions offered by the TOC method have tried to solve the basic problems in production systems using methods such as Drum-Buffer-Rope scheduling, performance meas-

urement focused on a constraint and buffer management (Goldratt & Cox, 1992). The continuing evolution of this method was extended to Supply Chain Management by applying Drum-Buffer-Rope (DBR). TOC-DBR paradigm asserts, in essence, that each organization at a time, experiencing at least one constraint. Goldratt and Cox (1992) define a constraint any element or factor that limits the system to achieve all that has been designed to meet (eg, reaching its objective). TOC through DBR uses a process focus to identify the constraint, restructuring the rest of the organization around it. Constraints can be internal or external to the system. There is an internal constraint when the market demands more from the system than can deliver and external constraint when the system can produce more than the market will bear. Constrained operations system makes difficult material movement causing a break in the chain that can be restored only if the information flow update in the transportation program allow necessary time for delivery buffer so that correlated informations are sent to start releasing materials in production.

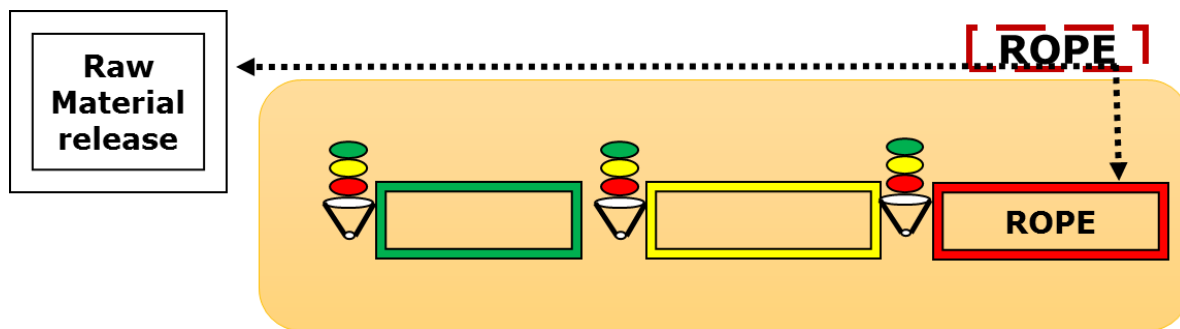
### **Buffer dimensioning for fiber glass through DBR philosophy**

DBR method levels orders delivery in logistics chain through security stocks that are placed and sized so as to protect individual rhythm of each link of supply chain. The purpose of using DBR solution for intermediary stock dimensioning is designed to protect chain links against orders fluctuations that occur within the chain with the condition to keep the same rhythm at every link in the supply chain. Dimensioning these buffers is closely linked to variations identified in each link in the right hand, as to avoid placing orders only when it reaches stock intermediary minimum level. DBR method avoids this disturbance through setting rhythm by each link (D-Drum) and sizing algorithm of the three decision-making levels (B-Buffer, R-Rope) for each buffer individually. Specifically, according to the study conducted by Proștean and Badea (2014), DBR method is designed to optimize a flow process, getting the maximum capacity of the most constrained links (CCL) in supply chain. Then the rhythm of CCL represents the drum for the rest of the system. The rope represents the mechanism of releasing the raw material into the flow process, protecting the CCL from being swamped with “work in progress”. The rope regulates the rate of inserting the raw material into the flow process. The inserting rate is no faster than that impose by the drum. The rope is connected with the drum with the help of the safety buffer that protects the CCL from starving because of the work during the process. (Proștean & Badea, 2014).

DBR helps to move important raw materials (fiberglass) in supply chain in safety stocks that are placed and dimensioned to protect the rhythm of each individual link in the chain. DBR method helps at any time to supply raw materials for creating security stocks, which are placed and sized to ensure fluency tests included in the project development cycle phases. In the SAP- MRP procurement system is integrated and facilitated Purchasing Info Record, with transaction code "ME11". This facility is useful, offering information about buying a cer-tain raw materials or subassembly in connection with their suppliers. Material determination is done either by adding the requirement reports prepared by each department (PNM) or using automated functionality for planning and material control MRP (Material Requirements Plan-ning -MD02 and MD03). MRP is a control and planning system of production and inventory used to manage manufacturing processes. Most MRP systems are software-based, but it is also possible to perform manual MRP based on an algorithm.

MRP system is designed to simultaneously meet three objectives:

- based on customer delivery sales orders is synchronize material flows with production ca-pacity
- helps to optimizes the inventory
- are synchronizes key activities of supply chain, production and sales.



The model and the study case presented have implications to academic as well as to policy makers and practitioners in the field of supply chain and RES project implementation in order to be more efficient and effective. Project managers in wind power can prevent potential blockage in supply chain if they carefully choose their suppliers, and adopt a formalism driver.

The conceptual model applied provide immediate responses through AHP, DBR and SAP-MRP therefore, assessing strategic collaboration, allow project developers to examine the relationships between suppliers and manufacturers.

The AHP methodology utilized demonstrate that criteria and alternatives can be asses as part of the framework to facilitate and support project developers to identify good decisions. The efficient use of the DBR application in wind power supply chain can ensure material procurement at any time and develop a good linkage between suppliers .In this part are highlight very clearly the advantage of applying SAP- MRP tool, which notifies the facility "Purchasing Info Record" adjusts the amount purchased, cumulating an additional amount of raw material, which how-ever provides the necessary production process without requiring activation of another specif-ic procurement process.

*Collaborative decision-making on wind power projects based on AHP method is a important direction for sustainable development.* Given that presently discussions about dramatic decline in fossil fuel prices are still debated, the benefits provided by renewable energy development has already proven to be a very good solution to the actual problem of global energy. The development of renewable energy sector has the tendency to maximize the benefits that nature has to offer, more than that, wind project developers being aware of the long-term benefits propose major investments in developing countries even more than investments in already industrialized countries (REN21, 2016). Development projects that support renewable energy production have a significant potential which contributes to a sustainable development in green energy and aims to improve and implement new methods which streamline the implementation process of RES projects (Zamfir, 2011). Accomplishing all EU directives through Directive 2001/77/EC, RES projects implementation in Romania has rose by 2.9 percent last year, or 124 MW, to 4.400 MW, according to Transelectrica.

The increase of installed capacity in renewable energy is due to the fact that Romania has complex areas of landforms, which allows it to exploite wind, solar and biomass energy. A particular situation respectively real areas isolation of many human communities, are deprived of RES benefits due to the landform conditions. Such locations are relatively numerous in Romania, with wide range of applications: dwellings, isolated agriculture farms, sheepfolds, touristic chalets,

stations broadcast relay etc. In these situations, economic efficiency is the determining factor that lead to the assessment of the opportunity for this kind of projects.

This research presents a RES exploitation project in isolated regime made by a team composed by key representative from a company, direct interested in research theme, and the authors. In this project the research team identifies through long debates and multi-criteria decision an efficient and economical way to choose a wind turbine power and an optimal assembly method in isolated regime. These decisions were based on project activities which involved research, development and implementation corellated with some disciplines that include a wide range of specialties such as: Mechanical structures and wind turbines (MSWT); Electrical machines (EM); Power electronics (PE); Automatic controlling strategies (ACS); Project management and administrative problems (PM).

*Wind power projects implementation* - RES exploitation project in isolated regime covers a wide range of activities, this requiring a dispersed set of skills. A major challenge for these kinds of project empowered wind power project developers to identify and surpass the obstacles that they encounter in their way, when implementing project specifications. These obstacles were present for the entire project life cycle, namely research, development and implementation.

Activities within the project:

- ✓ Research: the tower, the nacelle, and the rotor blades.
- ✓ Development: communication sessions between the parties that made the project: communication with funders, communication with local authorities (to obtain approvals and permits), communication with suppliers
- ✓ Implementation of a windmill: preparation of the site (roads cut, land graded and leveled), a concrete foundation is made with the underground cables, the tower is assembled on site and erect with a special crane, the fiberglass nacelle is assembled with inner workings off site (main drive shaft, gearbox, and blade pitch and yaw controls), the utility box for each wind turbine and the electrical communication system are installed simultaneously with the placement of the nacelle and blades.

*Specific collaboration in sharing risks in such projects*

The research team identify constraints in RES project in isolated regime and established a complex and suitable decision model which underpin the decision selection of wind power turbine and the way of assembly.

*a. Bottlenecks in wind power supply chain*

Most common situations encountered by developers in wind power project were:

- Developing a project plan, which includes defining project goals, how task and objectives will be achieved.
- What resources are need, associating budgets and timelines for completion, implementing the project plan, and ensure that the plan is being managed according to the project.
- The process of obtaining necessary permits and approvals is laborious and time-consuming and construction works sometimes can be atypical, hampered by placement location without power supply and water. Weather conditions also can influence the development work in the field.
- The analysis and research of the cost reduction possibilities, through diversification and simplification of the equipping, multiple usages of the components.
- The necessary financial funds, various reorganizations and restructurings are necessary to complete the project in time and achieve the desired goals.
- It can be difficult finding companies that have the ability to achieve some different materials elements of high precision.
- Transportation of heavy components, processing orders to purchase quality raw materials, storage and materials handling, packaging.
- Bottlenecks in infrastructure, implementation and logistics.

*b. Problem statement*

The first part of the project was very complex because of the region isolation special conditions so finding suitable sites and transportation routes for turbine installation it was a challenge for project developers.

Another aspect was the deficiency quality of rural roads that are designed for low traffic or light vehicles. New roads construction on slopes to access grows, lead to erosion causing degradation of the landscape location. Higher components transportation that need to be assembly at the farm site implies a higher cost.



A possible solution to obtain minimal costs transportation implies that the assembly process of the wind turbine should integrate more possible operations at the component manufacturing (Faiz, 2014).

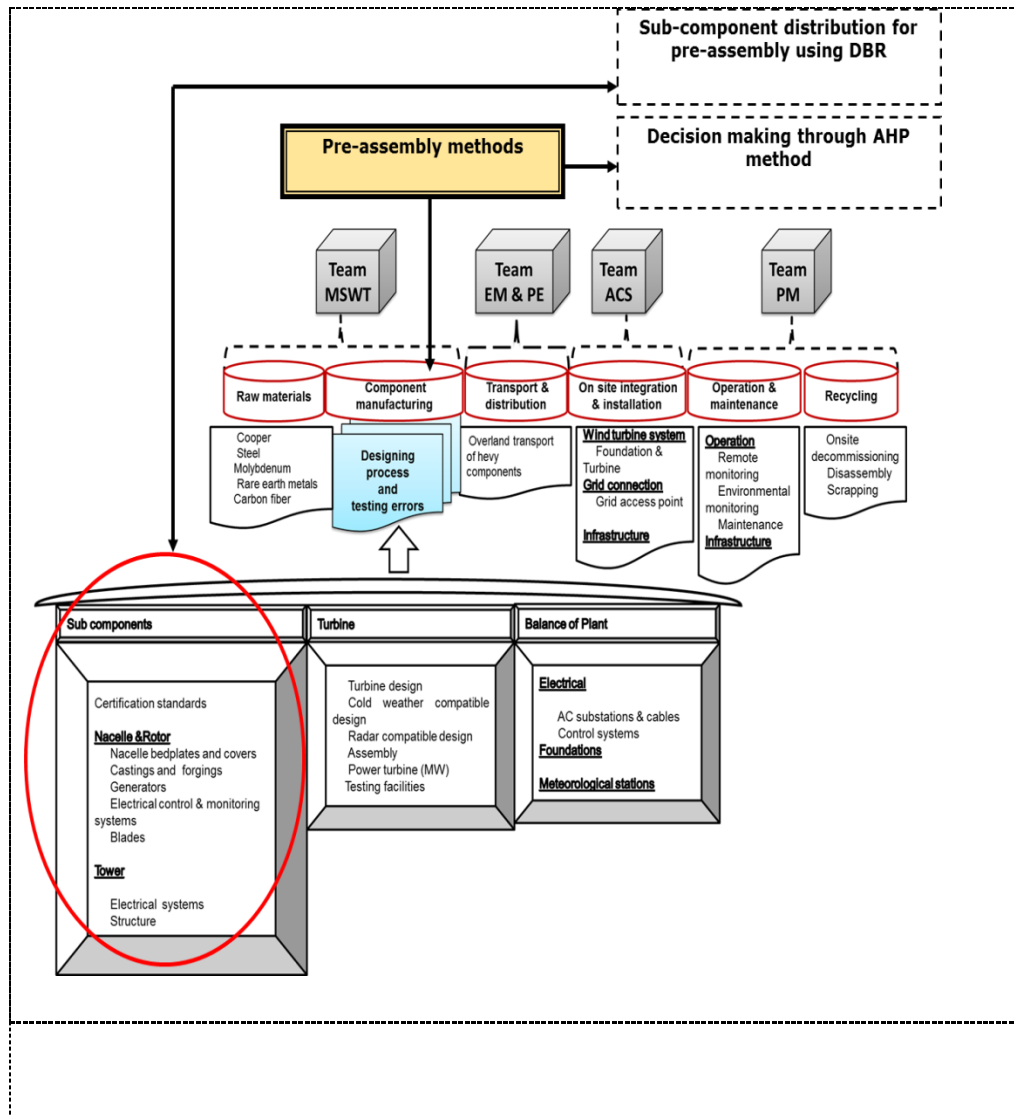


Figure 1.62. Bottlenecks in wind power supply chain

### c. Optimal collaboration alternatives

In this part there are presented several pre-assembly methods with different characteristics that are technically adequate to achieve the economic objective for such projects identified above. The methods are classified according to the number of lifts required for each turbine (Kaiser, 2010).

**Method 1** -low-power wind turbines: less than 12m blades diameter rated power of less than 1.0 MW and turbine pillar 7 m height. Hub and all three blades are assembled at the farm site. Remaining sub-assemblies (lower tower and transition piece, lower and upper tower sections, upper tower and nacelle) are done at the farm site. Two tower sections and the nacelle are transported separately. 4 lifts (operation) are required for each turbine during loading and during installation.

**Method 2**- medium power wind turbines: less than 45m blades diameter rated power between 1.0 MW and 2.0 MW turbine pillar 9 m height. Two tower sections are assembled at the farm site, also the nacelle and hub are assembled together all the remaining components are transported separately to farm site. For each turbine, 5 lifts (operation) are required during loading and during installation. During installation, first the tower is assembled to the transition piece, then the nacelle and hub sub-assembly is attached to the tower, finally three blades are lifted and assembled to the hub.

**Method 3** -high power wind turbines: 46m blades diameter exceeding rated power over 2 .0 MW- 2.5 MW turbine pillar 12 m height. The nacelle and hub are assembled together at the farm site all the other components are transported to the farm site separately. 6 lifts are needed for each turbine for loading and for installation. During installation, first the lower tower is assembled to the transition piece, then two tower sections, after that the nacelle and hub sub-assembly is attached to the upper tower; finally, three blades are bolted to the hub one by one.

### **Methodology**

Finding suitable sites and transportation routes for wind farms is a complex decision-making problem, involving several, sometimes conflicting, criteria and multiple objectives. Apart from the manufacturing turbines cost, energy cost is significantly affected by transportation and installation costs operations of wind turbines and turbine components maintenance operations.

Through optimum selection of decision variables, such as turbine installation method and rated power output of each turbine, cost of transportation and installation operations can be minimized. Pre-assembly at the farm site area is another controlling variable of transportation and installation cost. More pre-assembly done results in lower number of lifts and assembly.

### *Decision making methods*

In order to have a clear classification of the presented pre-assembling methods we identify base on our RES project very important criteria that need to be assess when pre-assembly components must be achieved at the component manufacturing. The criteria presented are: region isolation degree, wind velocity, distance from electrical grid, accessibility settlement degree and distance from manufacturing to assembly place. To rank this classification, the research team used a software online application (Priority Estimation Tool-AHP) (Siraj et al., 2015) (Figure 1.63)

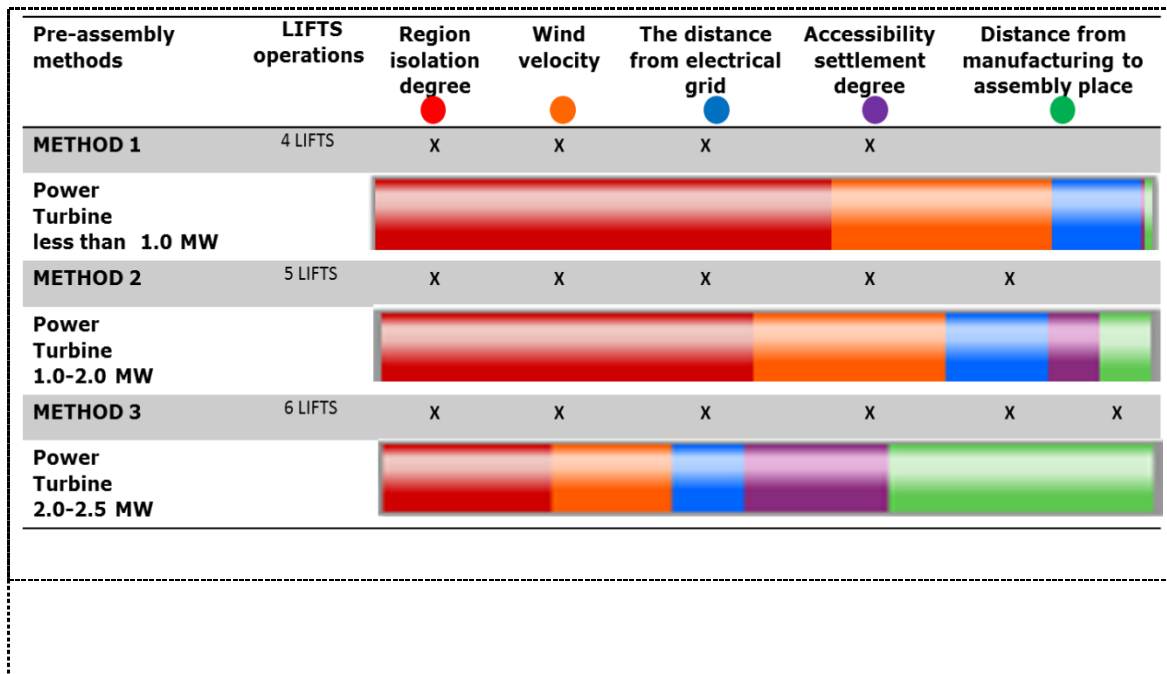


Figure 1.63. Wind turbine pre-assembling methods

To achieve optimal selection a multi-criteria decision making (MCDM) methods provide a logical framework to investigate, analyze, and solve such problems:

- provide an effective structure in decision-making process;
- shows objectives which decision maker has identified;
- measurable evaluation criteria of objectives are established;
- provides several ways of aggregating data concerning criteria for obtaining indicators (scores) of alternatives performance;
- helps to maintain decision makers thinking models by deriving the relative weight of each component;

- it is assigned a numerical value to each alternative of the problem;
- through mathematical calculation is chosen the optimal alternative.

#### *Analytic Hierarchy Process Method*

The algorithm AHP is done in six stages:

1. Hierarchical scheme composition of the problem that need to be analyzed; (Figure 3). In this phase it is presented fundamental purpose of the problem to be analyzed. Decision criteria are identified and, if necessary, separating them into sub-criteria. Depending on the preferences of the analyst alternatives are presented and ranked by the decision.
2. Establish relative weights by comparing them in combinations of two; The relative weights are based on a numerical scale from 1 to 9 through Saaty scale followed by subjective evaluation of the decision-maker comparisons are made in pairs. By comparison is obtained the degrees of importance of a criterion to each other (Saaty, 1980). (Figure 1.64)
3. The decision alternatives are compared two by two according to each decision criterion in order to rank them as appropriate in relation to the factor (sub-criterion);

Figure 1.64. Relative importance through Saaty scale

Numerical value	Verbal meaning for risk factor evaluation	Verbal meaning for alternative evaluation
1	Equally important	Equally preferred
2	Equally to moderately more important	Equally to moderately preferred
3	Moderately more important	Moderately preferred
4	Moderately to strongly more important	Moderately to strongly preferred
5	Strongly more important	Strongly preferred
6	Strongly to very strongly more important	Strongly to very strongly preferred
7	Very strongly more important	Very strongly preferred
8	Very strongly to extremely more important	Very strongly to extremely preferred
9	Extremely more important	Extremely preferred

The comparison of alternatives is achieved by setting the weights based on a numerical scale of 1 to 9. The decision maker's subjective evaluation comparisons are made in pairs. At this stage matrix comparison are composed the alternatives are ranked according to each criterion set.

Comparison matrices  $\{D(k), 1 \leq k \leq n\}$  it is performed:

-two by two alternatives form set  $\{A1, A2, A3, \dots, Am\}$  are next to each according to each criterion  $C_k$  from the set of decision criteria  $\{C1, C2, \dots, Cn\}$ .

The first part of the step 3 involves setting up matrices for gross comparing  $D(k)$ , so each decision factor  $C_k$  ( $1 \leq k \leq n$ ) is constructed with a graphical representation a matrix  $m$ ,  $D(k) = \{d_{ij}(k), 1 \leq i \leq m, 1 \leq j \leq m\}$ . The composition of a matrix  $d_{ij}(k)$  respectively  $i$  line and column  $j$ , it is represented by a number that compares alternative decision  $A_i$  with alternative decision  $A_j$  to fulfill the decision-maker  $C_k$  ( $1 \leq k \leq n$ ).

Second part of the step 3 it assumes the normalization of matrices.

1. Perform pairwise comparison of decision criteria; to obtain a relative ranking them.
2. Establishing performance matrix and calculation of scores for all criteria decision alternatives using variants ranking obtained in Step 3 and ranking criteria from step 4.
3. The final decision is obtained by choosing the alternative with maximum points and argumentation solution obtained. At this stage it presents the final decision means selecting alternative with the highest score.

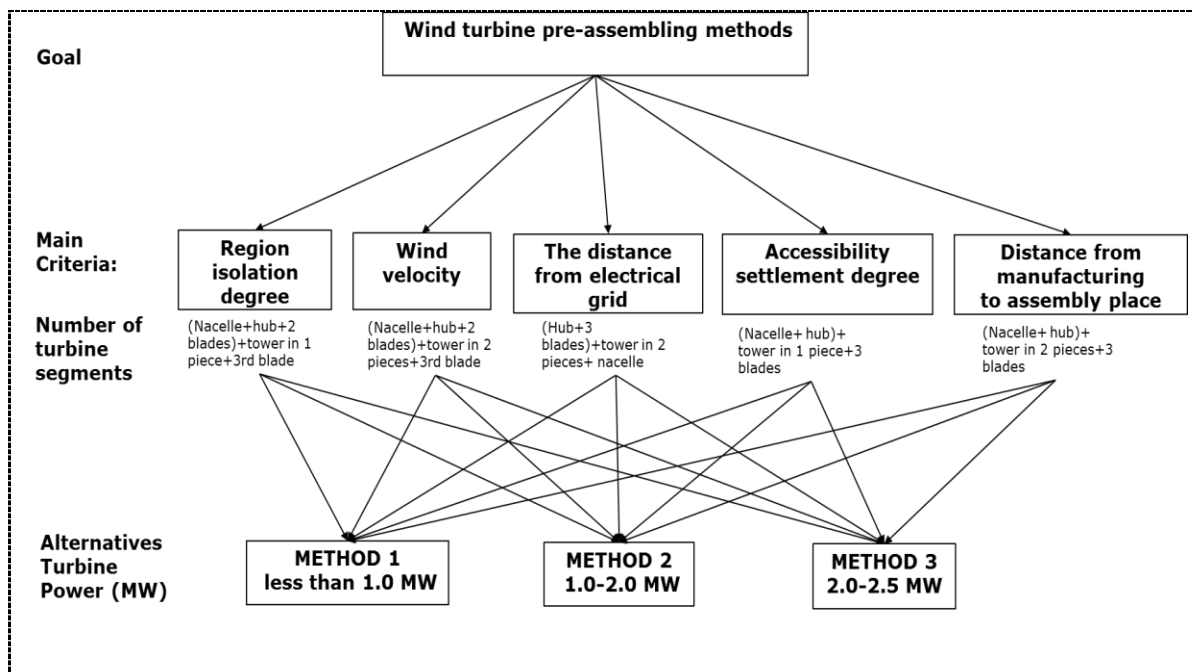




Figure 1.65. Decision tree through AHP method

Utilization of AHP method involves the decision tree decomposition into criteria and alternatives (Figure 1.65). AHP method designated as region isolation degree, wind velocity and the distance from electrical grid that they were the main important criteria with higher rank to emerge from the analysis decision. For wind turbine pre-assembling methods, they were chosen turbines with different powers, namely, less than 1.0 MW, 1.0-2.0 MW and 2.0-2.5 MW.

Figure 1.66. Decision tree decomposition into criteria and alternatives

Applying the method AHP, has required to use Method 1, namely the importance given to each criterion and by comparison matrices, revealed a very high value on **region isolation degree** (0,5271). In this scenario the isolated region characteristics they had relative disadvantages because of the extremely weather conditions and landform, which made it the wind turbine difficult to implement. The number of panels where smaller, and the size of wind generators were also reduced, namely a theft implies a critical impact. In this case it is knowing that Method 2 and Method 3 involve a greater risk for pre-assembling of wind power turbine in such conditions. Inspection of the local areas around the target site and many visits to select the site was made by the research team to estimate wind power potential, namely wind velocity measurements. Analysis of daily and annual **wind velocity** (0.2641) measuring system was delivered and in-house tested

together with data processing system and wireless communication. Also, the **distance from electrical grid** (0.1122) has implied a system which is not vulnerable to surges from lightning, solar flares, earthquakes, ice storms, wind. This technique provides delivering renewable energy over long distances.

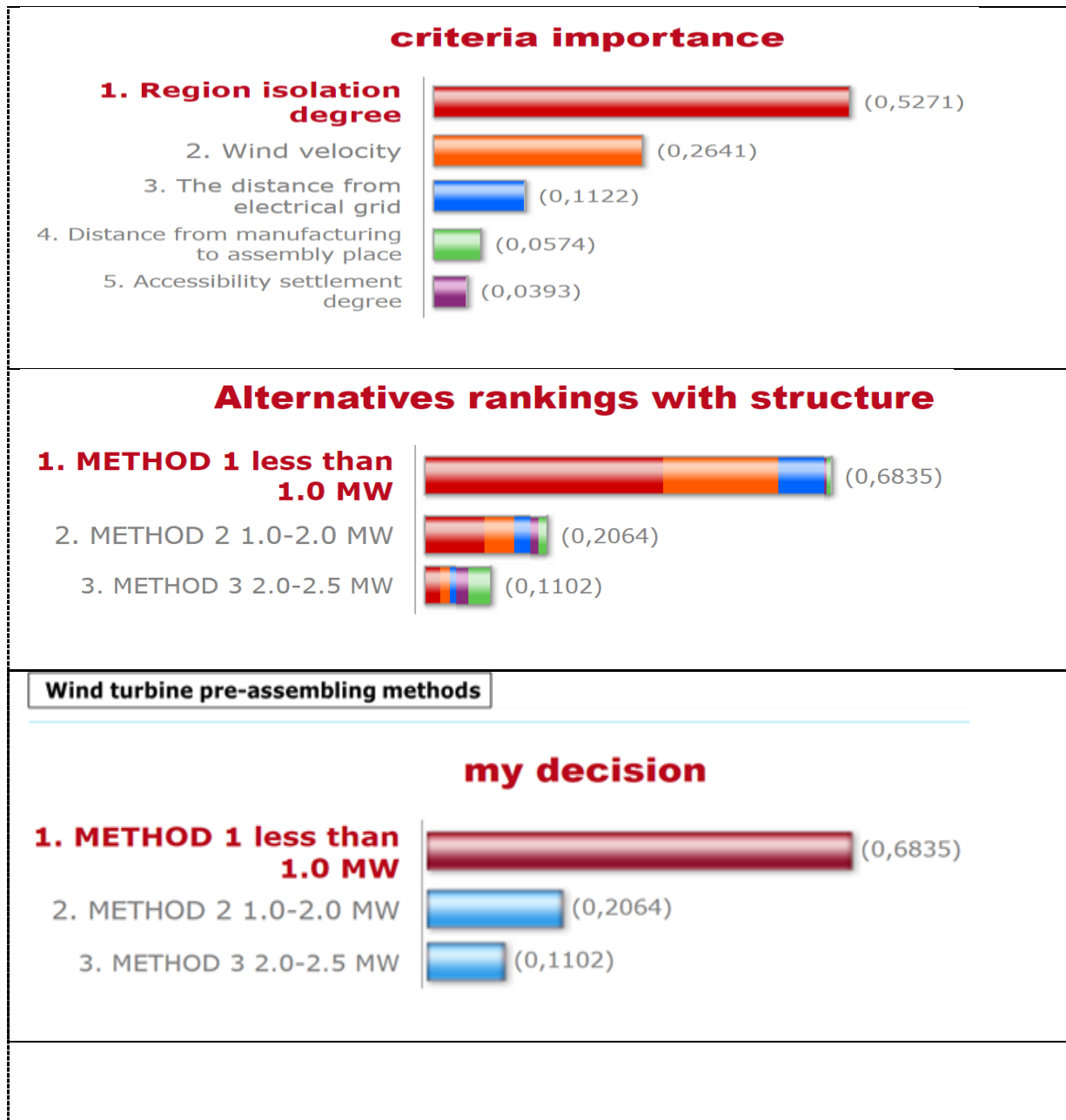


Figure 1.67. Final results presentation

The solution provided through AHP, Method 1 provides a framework for detecting the optimal alternative and avoid less costs in the wind supply chain by choosing the right method of pre-assembling components and obtain minimal transportation cost to install the wind turbine in special conditions. Using AHP algorithm offers both advantages and disadvantages as its defining by the elements it can be decide which combination is suitable to elaborate a wind turbines economical installation plan in isolated regions.

AHP method also highlights the ability to obtain correct weights of each criterion in the case of the present study, these being developed on the economic point of view. This method allows alternatives and criteria analysis to be upgraded during the RES project development so that all beneficial factors to be considered and lead to the fulfillment of the ultimate goal. RES projects in isolated regime are a compromise solution, but implementation on such projects provides local energy needs in isolated locations. Even in this case these represent an important way for generating green energy which in a visible manner sustain the strategy to achieve Romania's mandatory targets within the EU strategy 20/20.

*Evaluating and prioritizing municipal solid waste management-related factors in Romania using fuzzy AHP and TOPSIS* is a last direction evaluated in this research. The current situation of waste management in Romania is still in need of further improvements. The present study aims at identifying the main drivers underlying the development of municipal solid waste management (MSWM) so as to ensure effective enhancement of the current waste management system and significantly improved recycling rates.

Currently existing MSWM in Romania is characterised by several deficiencies that trigger major environmental problems, as well. Additionally, the recycling rate in Romania is considerably lower than the average recycling rate in the European Union (EU). In 2017, in Romania, the recycling rate stood at 14.5%, while at the EU level it reached 46.9%. Needless to say that the MSWM must be revived and important factors must be identified and oriented to increase competitiveness and to achieve the EU's goal of recycling 50% of the municipal waste by 2020.

An overview of the current situation of the municipal waste management at the EU and Romanian levels will be further shown. Based on the factors identified in the qualitative evaluation of the



deployed statistics and using fuzzy multi-criteria decision-making (MCDM), these factors are hierarchized and the competitive strategic alternative is selected/customised for Romania. The judgment of eight experts from the eight major regions of Romania has been used in the applied fuzzy AHP and TOPSIS methodologies. The robustness of the results is analyzed against the sensitivity analysis. Following the sensitivity analysis, the alternatives retained their rank so that the eight experts' assessments have been validated. By developing a sustainable MSWM, the authors claim / it is claimed that the recycling rate in Romania will increase.

The rapid industrialization of the cities has led to the explosion of population in urban environments. The existing EU solid waste management challenges are closely linked to the recycling, re-use and recovery targets of organic waste stipulated in European directives and regulations. In accordance with the European Commission, the Indicator 11 of Sustainable Development Goals refers to the development of environmentally sustainable communities and cities. In this respect, the EU has taken important steps to reduce its impact on the environment from the point of view of mining waste generation and the exposure of the urban population to air pollution (European Environment Agency, 2018; Ministry of Environment and Climate Change, 2018).

Globally, the situation shows some differences from the perspective of MSWM (National Institute of Statistics, 2018). Inappropriate elimination causes a negative impact on all components of the environment and human health (Chen et al., 2018). That is why MSWM needs to adapt to new changes so as to ensure global sustainability. At a global level, the predominant waste treatment method is storage (Sharholly et al., 2008; Guerrero et al., 2013). At the level of the United States, an annual quantity of 730 kg of waste / person is produced, while at EU level about 475 kg (Guerrero et al., 2013). At the EU level, most countries store waste even though landfill is the least favorable option in the waste management hierarchy. This is a waste of valuable resources and could lead to a greater impact on the environment compared to the situation in which this amount of waste could be incinerated and the resulted energy harnessed in different industrial and economic activities. A similar situation is registered in the United Kingdom (Jeswani and Azapagic, 2016). Austria, on the other hand, aligns itself with the EU targets, registering a recycling rate of 57.6%. Despite that, major technology measures on collection and sorting will be

needed to increase the competitiveness of MSWM (Van Eygen et al., 2018). Finland generates 460 kg of waste / person / year, and recycling is driven by the need to close loop material, thus reaching the principle of circular economy (Dahlbo et al., 2018).

Various studies (Dahlbo et al., 2018; Jeswani and Azapagic, 2016; Jouhara et al., 2017; Van Eygen et al., 2018) claim that if household waste is evaluated, it can be seen as made up of a range of materials that vary according to composition and depend on the community and consumers' income and lifestyle, on the industrialization level, as well as on the economic development of the country and the educational level. These studies also show that the season of the year and the number of people in the household influence waste quantity and composition. In summer, more food waste and less paper are generated. The larger the household, the less waste per capita is generated (Karak T, 2012; Pichtel, 2014).

The composition of the municipal waste in developed and developing countries has the distribution displayed in Table 1.39.

Table 1.39. Municipal waste composition in different countries (Jouhara et al., 2017)

<b>Country</b>	<b>Percent</b>	<b>Country</b>	<b>Percent</b>
EU	32% food and garden waste	Great Britain	33% paper
	29% paper		28% food residue
	11% glass		14% yard trimmings
	8% plastics		10% plastics
	5% metals		7% glass
	2% textiles		5% metals
	13% others		3% leather, textiles,
SUA	27% paper	China	55% food residue
	15% food residue		18% non-combustibles
	14% yard trimmings		11% plastics
	13% plastics, 9% metals		9% paper
	9% leather, textiles		3% leather, textiles
	4% glass		3% wood waste
	9% other		1% other
Kenya	58% organic material		
	17% paper		
	12% plastic		
	8% leather, textiles		
	3% metals		
	2% other		

MSWM systems are fairly diverse depending on the country's level of development, economic factors, environmental sustainability, information availability as well as on individual factors such as culture, level of education, level of training, workplace, etc. (Barr et al., 2010; Barrena et al., 2014; Couth and Trois, 2010).

Starting from the above-mentioned considerations and the outline provided with respect to the current situation within EU and Romania, the present research aims at identifying and structuring the factors contributing to the development of a competitive MSWM, while identifying the importance exerted by MSWM factors and shaping a framework of the actions to be taken for the implementation of a competitive MSWM at the macroeconomic level of Romania. The research objectives are developed in line with EU requirements and customized for the specific situation of Romania.

**EU-developed policies** contribute to reducing the country's environmental impact, economic efficiency, improved living conditions and, last but not least, its global sustainable development. In 2016, amount of 246320 thousand tons of municipal waste was generated in the EU. The recycling plays an important role, being involved in the highest amount of waste. The use of landfills is predominant in the southern European countries (European Environment Agency, 2018; Ministry of Environment and Climate Change, 2018. Storage rates have declined in recent years, and recycling rates have started to increase, according to studies made by the European Commission.

Table 1.40. Municipal waste landfilled, incinerated, recycled and composted in the EU-28, 2017

<b>Method</b>	<b>Million tonnes</b>
Landfill	57
Incineration	68
Recycling	73
Composting	40
Other	8

Given that a considerable amount of waste is recycled, the situation of waste recycled at the EU level is presented. 46.9% of the municipal waste was recycled or composted in 2017. This rate has increased by 26% compared to 2000. In 2016 there is a 45.8% recycling rate, and in 2015 a 45% rate. Based on an assessment of the EU recycling rate presented in Figure 1.68, it can be noted that the percentage has increased annually over the analyzed period 2010-2017 (European Environment Agency, 2018). The polynomial equation generated for this evolution is shown in Figure 1.68.

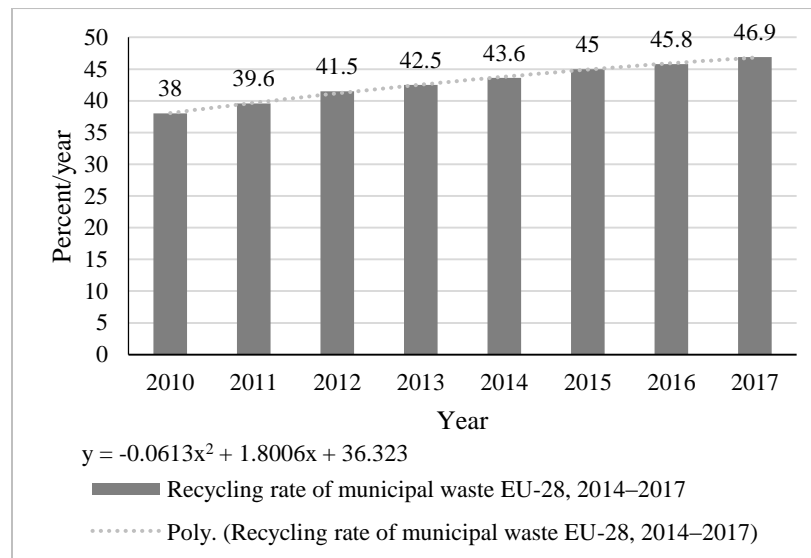


Figure 1.68. The recycling rate of the municipal waste (% of total waste generated) EU-28, 2014-2017 (European Commission, 2018)

Assessing the recycling rate of municipal waste at the level of the EU member states, it can be seen that most countries, 60% of them, register a recycling rate above 20%. The year 2016 was chosen to exemplify the situation at the EU level, by country, as it was the most complete data series available for numerous countries. Figure 1.69 shows the existing EU data series, with some countries not having the recycling rate set for 2016. For Poland, Turkey, France, Germany, and Czech Republic data are estimated. Austria has the highest percentage of municipal waste recycling, registering 57.6%, but this percentage is down 10% compared to 2014 when it was 63.5%. The next position is held by Switzerland, which in 2016 recorded a 52.5% increase of 4% compared to 2014, when it recorded a level of 50.5%.

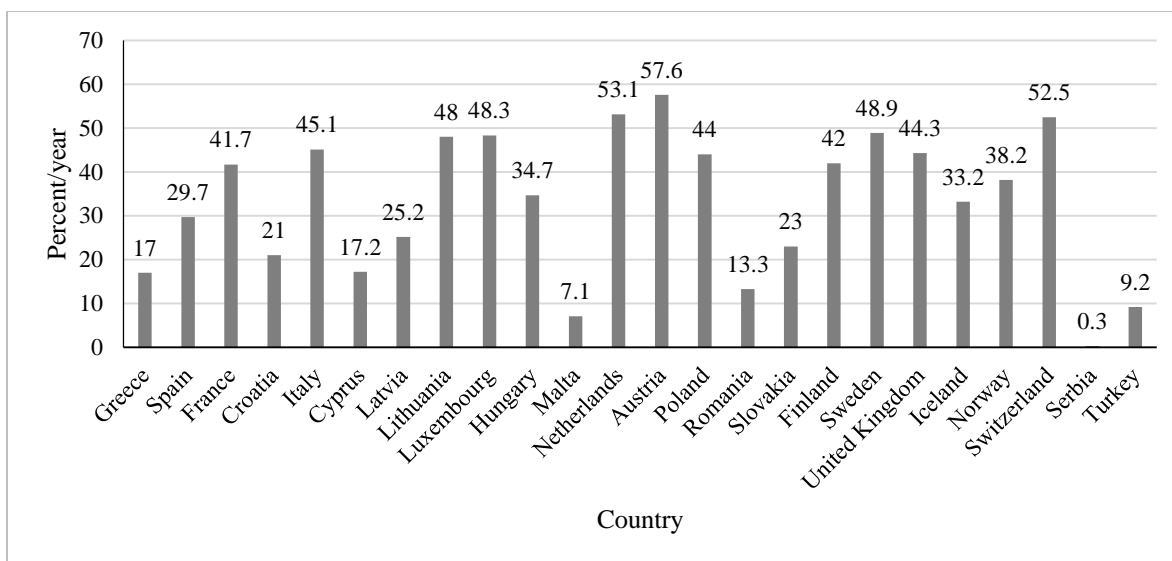


Figure 1.69. The recycling rate of the municipal waste (% of total waste generated) EU countries member, 2016 (European Commission, 2018)

As the EU strategy outlines, the main challenge for Romania is the development of a clearly defined strategy that will apply for the separate collection and recycling of municipal waste. As available studies of the specialized literature point out (Barr et al., 2010; Cioca et al., 2015; Kawai and Tasaki, 2018), Romania falls within the category of countries where the development is at an average level and the inhabitants' literacy regarding waste management is minimal. The MSWM strategy must take into account these economic and social aspects.

Romania has been a member state of the European Union since 2007. Romania's entire waste management activity is regulated by: Ministry of Environment, Ministry of Economy and Trade, National Authority for Public Services, National Environmental Guard, and local authorities. By applying the existing Directive 2008/98/EC at the international level, Romania is required to reduce the impact on the environment and greenhouse gases. The EU's goal is to recycle 50% of the municipal waste by 2020 (European Commission, 2018). For packaging materials according to European Directive 94/62/EC (glass, metals, and plastics) and for biodegradable waste, EU legislation imposes recycling targets. For these types of packaging, it is necessary to recycle at least 55% of the total weight of packaging materials contained in packaging waste, at least 60% for glass and cardboard, at least 50% for metals and at least 22.5% for plastic, of the weight of each type of material contained in the total municipal waste.

For Romania, the amount of waste generated is presented in Figure 1.70. The amount of waste decreased by 15% in 2017, compared to 2010, due to the beginning of the process of implementation of integrated and monitored waste collection systems, training campaigns among population and the decreasing number of inhabitants. In 2010, there were 20.3 million inhabitants in the country, and in 2017 there were 19.6 million inhabitants, lower by about 4%.

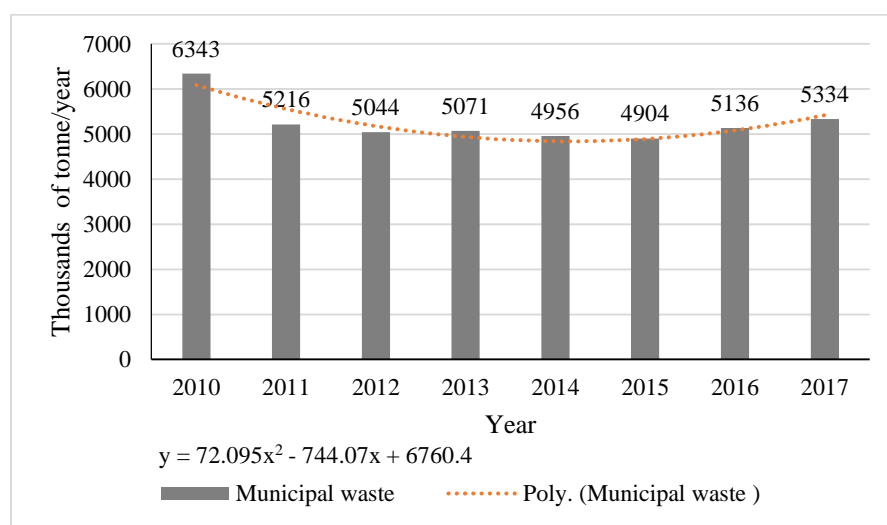


Figure 1.70. Municipal waste generated at the level of Romania during 2010-2017 (Ministry of Environment and Climate Change, 2018)

The amount of municipal waste generated in 2017 is 5334 thousand tons. The composition of waste in Romania is presented in Table 1.41 (European Commission, 2018). It can be seen that, of the total municipal waste generated, the biodegradable one accounts for 57% of the total waste generated.

Table 1.41. Composition of municipal waste in 2017 in Romania (European Commission, 2018)

Method	Percent (%)
Biodegradables	57%
Paper and paperboard	13%
Glass	7%
Plastic	12%
Metal	2%
Other waste	9%

The recycling rate registered in Romania for the period 2010-2017 is presented in Figure 1.71 (Ministry of Environment and Climate Change, 2018). It can be noticed that, in 2017, there was an increase of 13.2% in the recycling rate compared to 2010 and of about 10% compared to 2014. The increase of the recycling rate at the level of Romania can be seen to be rather slow, so the assessment and ranking of the important factors for the development of waste recycling strategy are very important on a national level.

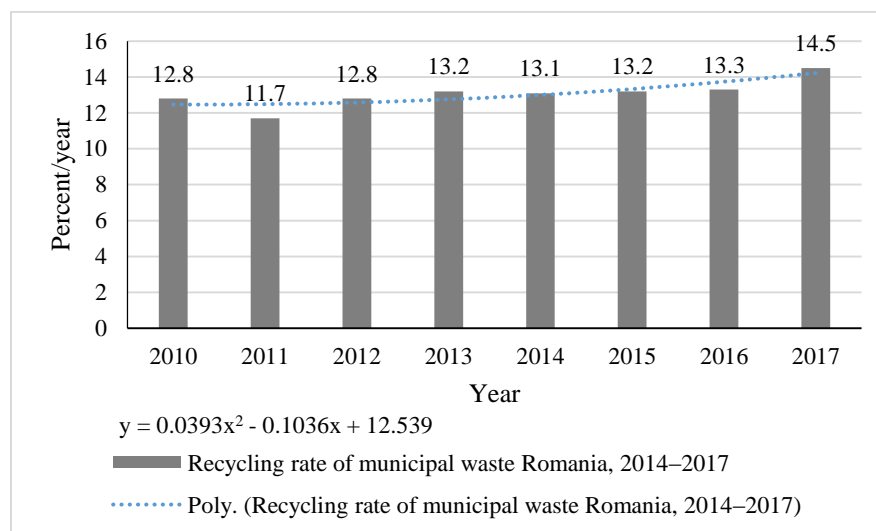


Figure 1.71. The recycling rate of the municipal waste (% of total waste generated) of Romania, 2014-2017 (Ministry of Environment and Climate Change, 2018)

The recycling infrastructure of Romania consists of: sorting stations with the capacity of 110 000 tons/year, centralized composting plants (able to treat 50 000 tons/year of biodegradable waste), local composting equipment (for residential areas that include houses), anaerobic fermentation equipment, capacity for separate fermentation (dry method and wet method), and equipment for incineration, pyrolysis and gasification.

Although municipalities have already spent between 30% and 40% of their budgets on solid waste management, the services provided still do not cover all citizens. To reduce the financial implications, municipalities should: address fundamental aspects of the sector, change citizens' behavior and separate the sources of organic waste, provide access to basic services for underdeveloped areas and an average level of waste management literacy, as well as increase transparency and accountability in the use of public funds by developing a strategy based on

continuous monitoring (Allesch and Brunner, 2014; Kayakutlu et al., 2017; Mihajlović et al., 2016). Considering the above-mentioned facts and the different strategies existing at the national level (Ministry of Environment and Climate Change, 2018), the situation in Romania can be characterized as follows:

- Modest sanitation actions in numerous cities due to the lack of a locally developed strategy;
- Lack of sanitation actions in rural areas except for the ones located in the neighbourhood of several large-sized cities;
- Population's lack of civic spirit derived from the lack of information as well as from the limited or absent waste collection-related education in kindergartens, schools and universities;
- Prevalence of several discrepancies in the Romanian legislation disregarding already-enforced EU requirements;
- Low level of access to funding to develop the existing infrastructure;
- Insufficient actions by non-governmental organizations to support the environment and to inform the population about EU regulations;
- Lack of civic education that should be done starting with preschools.

Although Romania's population has declined in recent years and the amount of municipal waste generated has been fluctuating (rising in 2017 as compared to 2016), the recycling rate has increased as a result of the development of efficient actions customised for current conditions in Romania, which all contribute to a sustainable MSWM.

The fuzzy MCDM methodology is used to evaluate and prioritize the factors contributing to MSWM. Starting from the definition of the problem, it continues with the identification of the factors based on the knowledge of the MSWM experts and then the methodology described below is applied (Kayakutlu et al., 2017).

While determining the importance of factors contributing to the development of frameworks is essential, developing strategies or schemes is equally important. The use of a numerical scale (1 to 5 or 1 to 10) to assess the importance of each factor cannot capture the whole of the human reasoning (Coban et al., 2018; Kim et al., 2013). The use of the AHP method with numbers from 1 to 9, or another scale, does not take into account experts' uncertainty during the evaluation. The use of fuzzy logic also takes into account the uncertainty associated with mapping a number (Fuss



et al., 2018; Song et al., 2016). Thus, the linguistic evaluation of MSWM factors is done with triangular fuzzy numbers (TFN). By using this fuzzy AHP methodology, a ranking of MSWM factors has been achieved. Following the ranking of MSWM factors, the implementation strategy is selected using the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) (Estay-Ossandon et al., 2018; Gumus, 2009; Mardani et al., 2015).

The Set Theory was introduced for the first time by Latfi Zadeh in 1965, and fuzzy logic was derived from this theory to be used in various applications (Achillas et al., 2013; Antonopoulos et al., 2014; Zhao and Li, 2015). The Fuzzy triangular numbers are used.

Applying the fuzzy AHP method leads to the following steps:

1. *Building the hierarchical structure of the criteria* that contribute to the development of a competitive MSWM. The hierarchical structure is developed in accordance with the needs of the problem to be solved.
2. *Forming fuzzy pairwise comparison matrix* of criteria and determining the weighting of decisions. The Saaty scale is used to compare the pairs of criteria (Achillas et al., 2013; Antonopoulos et al., 2014; Kaya and Kahraman, 2011; Zhao and Li, 2015). The decision-maker will compare criteria on a two-by-two basis using triangular fuzzy numbers. The values presented in Table 1.42 are used. For example, if the scale chosen for the comparison of the two criteria is 1, this means that the two criteria have the same importance of the analysed issue. The fuzzy triangular number scale (l, m, u) is (1,1,1). If the selected scale is 3, this means that the first criterion is more important than the second criterion.

Table 1.42. Scale for comparing fuzzy pairs

Scale	Linguistic scale	Triangular fuzzy number (TFN)	Triangular fuzzy reciprocal number (TFRN)
1	Equal importance	(1,1,1)	(1,1,1)
3	More important	(1,3,5)	(1/5,1/3,1)
5	Strongly more important	(3,5,7)	(1/7,1/5,1/3)
7	Very strong importance	(5,7,9)	(1/9,1/7,1/5)
9	Extreme importance	(7,9,9)	(1/9,1/9,1/7)
2	Intermediate values	(1,2,3)	(1/3,1/2,1)
4		(3,4,5)	(1/5,1/4,1/3)

6	(5,6,7)	(1/7,1/6,1/5)
8	(7,8,9)	(1/9,1/8,1/7)

- a. All  $n$  criteria are positioned in a square matrix of comparative size ( $n \times n$ ). The number of pairs' comparisons is equal to the value obtained by applying the relationship (1.3.23).

$$\frac{n(n-1)}{2} = \frac{n^2 - n}{2} \quad (1.3.23)$$

- b. To calculate the consistency ratio of the comparison matrix with  $n$  criteria, the relationship is used (1.3.24).

$$CR = \frac{\lambda_{max} - n}{n - 1} \quad (1.3.24)$$

where,

$\lambda_{max}$  – eigen value

$n$  – number of criteria

The CR value must be within certain limits based on the number of evaluated criteria. These limits are presented in Table 1.43.

Table 1.43. Consistency rate limits

n	3X3	4X4	5X5	$> n$
CR $\leq$	0,58	0,90	1,12	1,24

3. Determine the synthetic value/relative weight for each decision criterion using the relationship (1.3.25)

$$S_i = \sum_{j=1}^m M_{gi}^j \otimes \left[ \sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1} \quad (1.3.25)$$

where,

$S_i$  is the value of the correlation of the criterion on line  $j$  with the one on column  $I$ , and  $(l_i, m_i, n_i)$  is a TFN.

The value  $\sum_{j=1}^m M_{gi}^j$  is obtained using the relationship (1.3.26).

$$\sum_{j=1}^m M_{gi}^j = \left( \sum_{j=1}^m l_j, \sum_{j=1}^m m_j, \sum_{j=1}^m u_j \right) \quad (1.3.26)$$

Obtaining the transposition  $\left[ \sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1}$  for  $M_{gi}^j$  ( $j = 1, 2, \dots, m$ ) using the relationship (1.3.27) and (1.3.28)

$$\sum_{i=1}^n \sum_{j=1}^m M_{gi}^j = \sum_{i=1}^n l_i, \sum_{i=1}^n m_i, \sum_{i=1}^n u_i \quad (1.3.27)$$

And the transposition uses the relationship,

$$\left[ \sum_{i=1}^n \sum_{j=1}^m M_{gi}^j \right]^{-1} = \left( \frac{1}{\sum_{i=1}^n l_i}, \frac{1}{\sum_{i=1}^n m_i}, \frac{1}{\sum_{i=1}^n u_i} \right) \quad (1.3.28)$$

These values will be also fuzzy triangular values. The consistency of the normalized matrix containing the information obtained is verified. The value and vectors of this matrix are determined.

4. The degree of possibility (the bigness degree of  $S_i$ ) is determined,  $\widetilde{M}_2 \geq \widetilde{M}_1$ , as a criterion  $j$  to be preferred to the criterion on line  $i$ . Two triangular numbers  $\widetilde{M}_1$  and  $\widetilde{M}_2$ , lead to the degree of possibility obtained with the relationship (1.3.29) and (1.3.30).

If  $\widetilde{M}_1 = (l_1, m_1, u_1)$  and  $\widetilde{M}_2 = (l_2, m_2, u_2)$  are two triangular fuzzy numbers, and

$$\widetilde{M}_1 = (l_1, m_1, u_1) \geq \widetilde{M}_2 = (l_2, m_2, u_2) \quad (1.3.29)$$

it is defined as,

$$S(\widetilde{M}_2 \geq \widetilde{M}_1) = \sup[\min \mu_{M_1}(x), \min \mu_{M_2}(x)] \quad (1.3.30)$$

The relationship (1.3.30) is equivalent with the relationship (1.3.31)

$$S(\widetilde{M}_2 \geq \widetilde{M}_1) = hgt(\widetilde{M}_2 \cap \widetilde{M}_1) = \mu_{M_2}(d) = \begin{cases} 1, & \text{if } m_2 \geq m_1 \\ 0, & \text{if } l_1 \geq u_2 \\ \frac{l_1 - u_2}{[(m_2 - u_2) - (m_1 - l_1)]}, & \text{else} \end{cases} \quad (1.3.31)$$

where d is ordered by the highest value by intersection  $\mu_{M_1}$  and  $\mu_{M_2}$ .

5. *Calculating the weights by the possibility degree.* The degree of possibility for a fuzzy convex number to be larger than convex fuzzy numbers k,  $M_i$  ( $i = 1, 2, 3, \dots, k$ ) is defined using the relationship (1.3.32).

$$S(\widetilde{M}_1 \geq \widetilde{M}_2, \widetilde{M}_2, \dots, \widetilde{M}_k) = S[(\widetilde{M} \geq \widetilde{M}_1) \text{ and } (\widetilde{M} \geq \widetilde{M}_2) \text{ and } \dots \text{ and } (\widetilde{M} \geq \widetilde{M}_k)] \quad (1.3.33)$$

$$= \min V(\widetilde{M} \geq \widetilde{M}_i), \quad (i = 1, 2, \dots, k)$$

Assuming the relationship (1.3.34),

$$d'(A_i) = \min V(\widetilde{S}_i \geq \widetilde{S}_k), i=1,2,\dots,k; k \neq i \quad (1.3.34)$$

Then the weight of the factor is given by the relationship (1.3.35),

$$W' = (d'(A_1), d'(A_2), \dots, d'(A_n))^T \quad (1.3.35)$$

where,

$S_1(i = 1, 2, \dots, n)$ , are n elements.

At this step, the vector of the decision weights will be determined by calculating the average values. These values represent the decision weights of the criteria selected for analysis.

6. *By normalizing the previous values* we get the vector W of the normalized weights related to the decisional criteria. This vector is obtained by applying the relation (1.3.36).

$$W = (d(S_1), d(S_2), \dots, d(S_n))^T, \quad (1.3.36)$$

where  $W$  is a non-fuzzy number.

Hwang and Yoon have proposed the TOPSIS (Technique for Order of Preference by Similarity to Ideal Solution) method (Kaya and Kahraman, 2011). This is a technique for order preference by similarity to ideal solutions. The method selects the alternative closest to the positive ideal solution and the furthest to the negative ideal solution. The fuzzy method TOPSIS uses linguistic variables and sorts preferences according to the closeness coefficient (Achillas et al., 2013; Antonopoulo et al., 2014; Kaya and Kahraman, 2011; Zhao and Li, 2015). For the application of the TOPSIS method, there are a number of developed tools, and ETL software plays an essential role in business intelligence for present research.

The sensitivity analysis is typically performed to verify the robustness of the results obtained. Whenever there is uncertainty about an estimation of the parameters or hierarchies achieved, the sensitivity analysis can be applied (Achillas et al., 2013). This technique is used to determine how the values of the independent variables will influence a certain dependent variable within a set of assumptions. In the case of the fuzzy AHP and TOPSIS methodology, the application of the sensitivity analysis is performed to test the accuracy and effectiveness of the proposed solutions (Kaya and Kahraman, 2011; Zhao and Li, 2015).

The model proposed for assessing and prioritizing the factors contributing to the development of an MSWM is presented in Figure 1.72. Based on its experience and literature (Achillas et al., 2013; Antonopoulo et al., 2014; Kaya and Kahraman, 2011; Zhao and Li, 2015; Wu et al., 2009) the categories of factors that are the subject of this assessment and their prioritization are established. These data represent the input variables for applying the AHP fuzzy methodology. After determining the factors to be evaluated, data from experts is collected. Based on the data obtained from the experts, the matrix of the compared criteria is established. We calculate relative weights of elements and the ratio consistency.

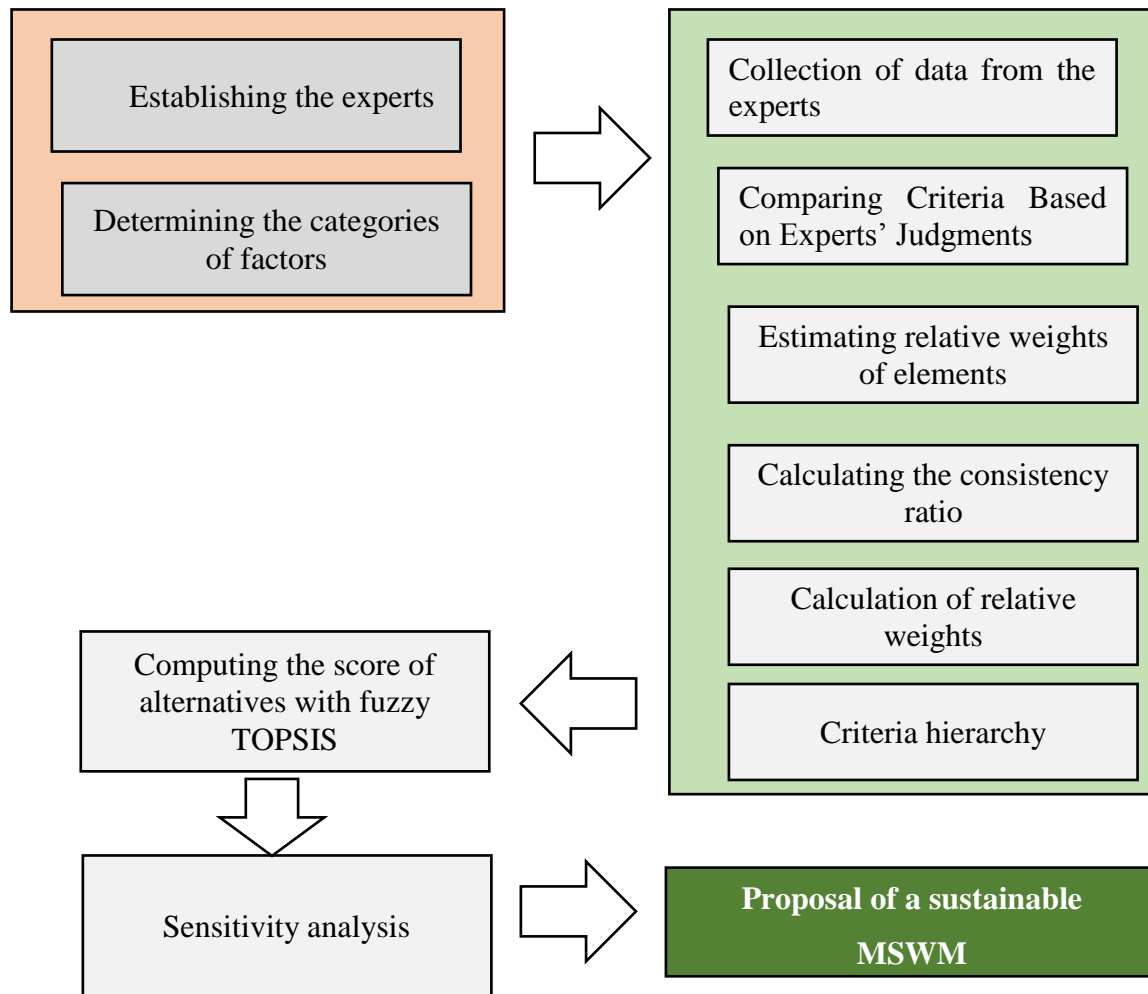


Figure 1.72. The proposed framework for the development of a competitive MSWM in Romania

If the consistency ratio is within the admissible limits shown in Table 1.43, the next step is the calculation of the relative weights. Finally, the normalizer vector is obtained, which is a non-fuzzy value. Thus, at the end of the fuzzy AHP methodology, the hierarchy of factors contributing to the development of a competitive MSWM system is achieved. The development of a competitive MSWM in Romania is a prominent problem since the recycling rate is below 15% and the deficiencies in the waste management are stringent.

Using a methodology close to human reasoning and common appraisals helps to increase the efficiency of the proposed model (Achillas et al., 2013; Antonopoulo et al., 2014; Harijani et al., 2017; Kaya and Kahraman, 2011; Laforest et al., 2013; Wang et al., 2018).

This section presents the results obtained by applying the proposed framework from Figure 1.72 and the steps outlined above. The categories of factors and subfactors considered for prioritization are presented in Figure 1.73, and then the application of the AHP fuzzy methodology to obtain a competitive MSWM is shown. Such an improved system is needed since Romania lacks a MSW management. Improving management practices contributes to a sustainable national and global development.

The review of specialized literature combined with the assessment of the variuos judgements issued by waste experts has enabled the outline of those categories of factors that contribute to a genuine increase of the MSWM efficiency and the recycling rate. They include: environmental, economic, technological and social factors (Achillas et al., 2013; Antonopoulo et al., 2014; Harijani et al., 2017; Kaya and Kahraman, 2011; Laforest et al., 2013; Wang et al., 2018). The objective of this research is to develop a competitive MSWM by prioritizing the factors and subfactors tangential to the field in question. The hierarchical structure of these factors and subfactors is rendered in Figure 1.73.

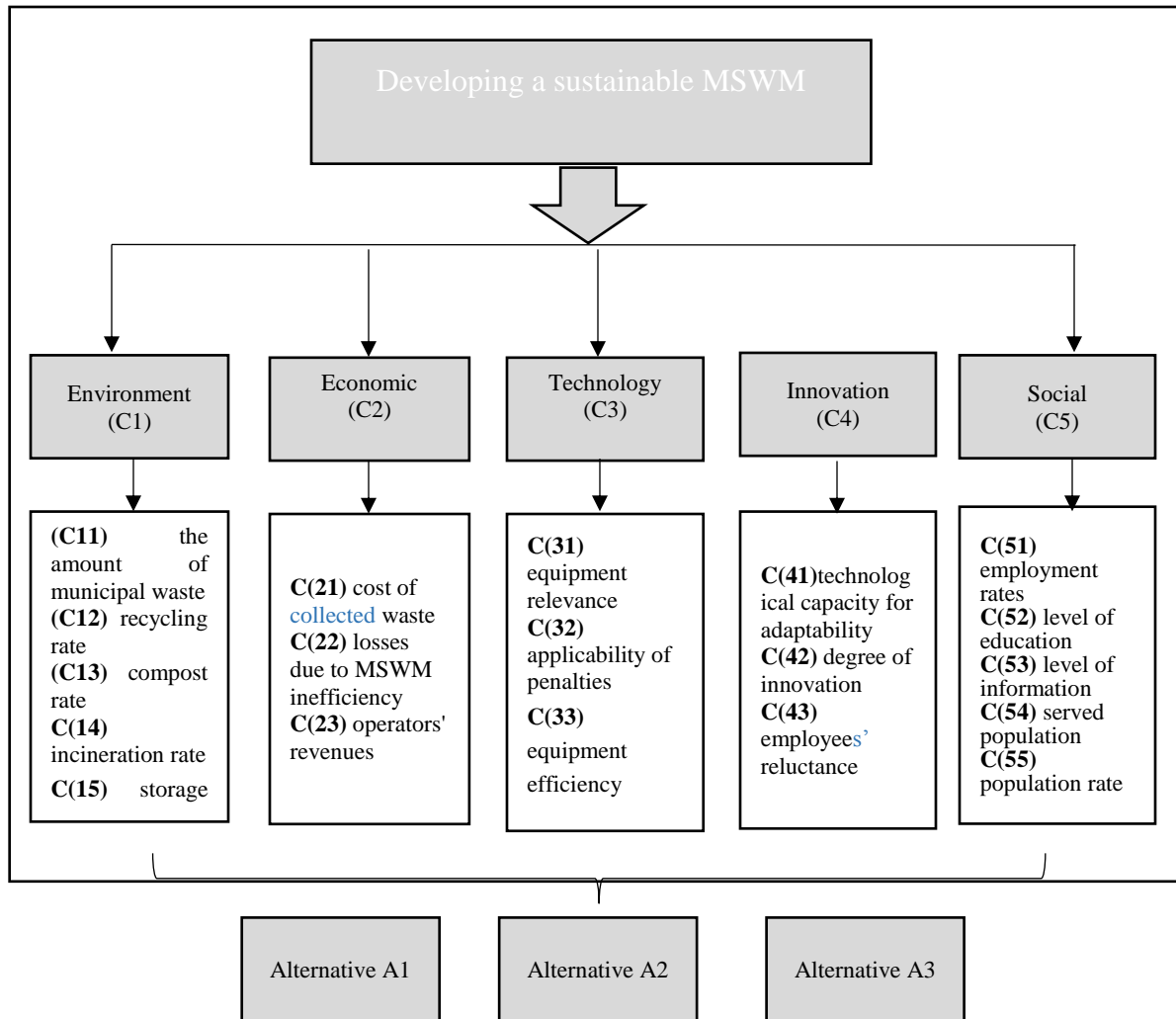


Figure 1.73. Hierarchical structure of factors and subfactors considered for the present research

The categories of factors that impact the development of a competitive and sustainable MSWM are:

1. Environment (C1) –which involves factors that influence waste management. The factors considered for evaluation and prioritization are: (C11) the amount of municipal waste; (C12) recycling rate; (C13) compost rate; (C14) incineration rate; and (C15) storage rate.
2. Economic (C2) –which refers to the economic implications of municipal waste management. The factors considered for this category are: (C21) cost of collected waste; (C22) losses due to MSWM inefficiency; (C23) operators' revenues.



3. Technology (C3) – which is linked to the level of technology and infrastructure existing at a national level. It also includes a national methodology and sets of regulations. This category includes: (C31) equipment relevance; (C32) the applicability of penalties; (C33) equipment efficiency.
4. Innovation (C4) – which entails the ability to adapt to technological advances and to implement innovative concepts in waste management. This category includes: (C41) technological capacity for adaptability; (C42) innovation degree; (C43) employees' reluctance.
5. Social (C5) ) – which refers to the national population. This category includes: (C51) employment rates; (C52) level of education; (C53) level of information on waste collection; (C54) served population; (C55) population rate involved in selective collection and recycling.

Experts from the eight regions have proposed three alternatives that are compatible with the current situation in Romania. The MSWN follows:

1. Alternative A1 - education of the population at different levels of training, information and awareness of the importance of MSWM.
2. Alternative A2 - Accessing funding sources for building and developing the infrastructure
3. Alternative A3 - Increasing R & D in companies

Based on this hierarchy, the results obtained following the application of the fuzzy MCDM methodology are presented.

Considering the hierarchical structure in Figure 1.74, the experts' judgments and the AHP fuzzy methodology, the authors determine the weights of all categories of factors and subfactors considered for evaluation in order to hierarchize their importance.

For the judgment applied in this methodology, in-depth interviews were conducted with eight experts from Romania, one expert selected from each development region. Development regions are eight statistical sizes that correspond to the EU NUTS II divisions (Nomenclature of Territorial Units for Statistics) and do not have legal personality. These Development Regions include: North-East Region (RO 01), South East Region (RO 02), South-Muntenia Region (RO 03), South West Region (RO 04) (RO 05), the Northwest Region (RO 06), the Centre Region (RO 07) and the Bucharest Region (RO 08). These regions are presented below.



Figure 1.74. The eight development regions of Romania (European Environment Agency, 2018)

1. The hierarchical structure is presented in Figure 1.74.
2. Making comparisons between pairs of factors and subfactors. The detailed methodology for the five categories of factors is further applied. The same methodology applies to each category of subfactors for which the final result is presented in Table 1.40. Municipal waste landfilled, incinerated, recycled and composted in the EU-28, 2017
  - a. According to the relationship (1), the number of comparisons must be at least equal to 10.
  - b. Using the relationship (2), the matrix consistency rate in Table 1.43. Consistency rate limits was calculated. A value of 0.29 was obtained. It can be observed that, for a 5X5 matrix, the value of the consistency ratio must be less than 1.12. This requirement is fulfilled. As a result, the judgment used in comparing the categories of factors could be considered correct. If this rate is within acceptable limits, move to the next step, otherwise the judgment resumes from step 2.

Table 1.44. The fuzzy aggregate matrix of the comparison of the categories of factors with respect to the main objective of the research

	C1	C2	C3	C4	C5
C1	(1,1,1)	(3.75,5.75,7.75)	(1.25,3,4.75)	(1.25,3,4.75)	(5.25,7.25,9)
C2	(0.13,0.17,0.27)	(1,1,1)	(3.5,5.5,7.5)	(0.11,0.14,0.19)	(4.5,6.5,8.5)
C3	(0.21,0.33,0.8)	(0.13,0.18,0.29)	(1,1,1)	(0.12,0.11,0.15)	(1.25,3,4.75)
C4	(0.21,0.33,0.8)	(5.25,7.25,9)	(6.75,8.75,9)	(1,1,1)	(1,3,5)
C5	(0.11,0.14,0.19)	(0.12,0.15,0.22)	(0.21,0.33,0.8)	(0.2,0.33,1)	(1,1,1)

3. Using the relationships (3) and (6), the synthetic values of the five categories of factors considered for evaluation are obtained. These data are presented in Table 1.45.

Table 1.45. Preliminary calculation of synthetic values for the five categories of factors

Category	Row sum	Column sum
C1	(11.5; 20; 27.25)	(1.66; 1.97; 3.06)
C2	(9.24; 13.31; 17.46)	(10.25; 14.33; 18.26)
C3	(2.71; 4.62; 6.99)	(12.71; 18.33; 23)
C4	(14.21; 20.33; 24.8)	(2.68; 4.58; 7.09)
C5	(1.64; 1.95; 3.21)	(13; 19.75; 28.25)
	Columns sum	(40.3; 58.96; 79.66)

And the synthetic values for the five categories of criteria are also FTNs with values:

$$\begin{aligned}
S_1 &= \left( \frac{11.5}{79.66} + \frac{20}{58.96} + \frac{27.25}{40.30} \right) = (0.14; 0.34; 0.68) \\
S_2 &= \left( \frac{9.24}{79.66} + \frac{13.31}{58.96} + \frac{17.46}{40.30} \right) = (0.12; 0.22; 0.48) \\
S_3 &= \left( \frac{2.71}{79.66} + \frac{4.62}{58.96} + \frac{6.99}{40.30} \right) = (0.03; 0.08; 0.17) \\
S_4 &= \left( \frac{14.21}{79.66} + \frac{20.33}{58.96} + \frac{24.80}{40.30} \right) = (0.18; 0.34; 0.62) \\
S_5 &= \left( \frac{1.64}{79.66} + \frac{1.95}{58.96} + \frac{3.21}{40.30} \right) = (0.02; 0.03; 0.08)
\end{aligned}$$

4. Calculation of relative and normalized weights is made using the relations (10), (11) and (12).

Table 1.46 shows the values obtained.

Table 1.46. Calculation of relative weights and normalized weights for the five categories considered

	Relative weight criterion	Weight of the normalized criterion
$V(S_1 \geq S_2, S_3, S_4, S_5)$	1	$1/3.071=0.33$
$V(S_2 \geq S_1, S_3, S_4, S_5)$	0.764	$0.764/3.071=0.25$
$V(S_3 \geq S_1, S_2, S_4, S_5)$	0.080	$0.080/3.071=0.03$
$V(S_4 \geq S_1, S_2, S_3, S_5)$	0.615	$0.615/3.071=0.20$
$V(S_5 \geq S_1, S_2, S_3, S_4)$	0.612	$0.612/3.071=0.21$
<b>Total</b>	<b>3.071</b>	

5. Calculating the weights by the possibility degree

$$d'(C1) = \min(1, 1, 1, 1) = 1$$

$$d'(C2) = \min(0.764, 1, 1, 1) = 0.764$$

$$d'(C3) = \min(0.080, 0.235, 1, 1) = 0.080$$

$$d'(C4) = \min(0.615, 0.706, 0.891, 1) = 0.615$$

$$d'(C5) = \min(0.844, 0.712, 0.612, 1) = 0.612$$

$$W' = (1, 0.764, 0.080, 0.615, 0.612)$$

6. W vector of normalized weights related to decisional criteria. This vector is obtained by applying the relation (13).

$$W = (0.33, 0.25, 0.03, 0.20, 0.21)$$

Following the fuzzy AHP methodology, the following hierarchy of the categories of factors considered to be assessed was obtained: environment, economic, technology, innovation, and social. This hierarchy of criteria, based on the judgments of the eight experts, is presented in Table 1.47

Table 1.47. The weight criteria for the five categories of factors considered for this research

Main category	Weight	Rank
Environment (C1)	0.33	1
Economic (C2)	0.25	2
Technology(C3)	0.03	5
Innovation (C4)	0.20	4
Social (C5)	0.21	3

Following the application of the fuzzy AHP methodology, it has resulted that the environment criterion is ranked first in terms of importance for the improvement of MSWM. On the second position is the economic criterion, followed by the social one. The last two positions are held by the technology and innovation criteria.

After applying the fuzzy AHP methodology for each category of subfactors the situation presented in Table 1.48 has emerged.

Local weight was calculated by applying the AHP fuzzy methodology and the global weight was obtained by determining the multiplication between local weight and weight. If two local or global weights have the same value, the experts decide which of them stands as priority. Finally, the overall rankings are presented; they are shown on the "global rank" column.

Table 1.48. Criteria weight, local weight and global weight for developing a sustainable MSWM

Main category	Weight	Sub-factors	Local weight	Global weight	Global rank
Environment (C1)	0.33	(C11) the amount of municipal waste	0.300	0.099	1
		(C12) recycling rate	0.245	0.081	5
		(C13) composting rate	0.150	0.050	9
		(C14) incineration rate	0.172	0.057	8
		(C15) storage rate	0.133	0.044	14
Economic (C2)	0.25	(C21) cost of waste collected	0.219	0.096	2
		(C22) losses due to inefficient MSWM	0.303	0.076	6
		(C23) operators' revenue	0.368	0.092	3
Technology(C3)	0.03	(C31) equipment relevance	0.413	0.012	17
		(C32) the applicability of penalties	0.330	0.010	18
		(C33) equipment efficiency	0.257	0.008	19
Innovation (C4)	0.20	(C41) technological capacity for adaptability	0.403	0.081	4
		(C42) degree of innovation	0.233	0.047	12
		(C43) employees' reluctance	0.364	0.072	7
Social (C5)	0.21	(C51) employment rates	0.233	0.048	10
		(C52) level of education	0.233	0.048	11
		(C53) level of information on waste collection	0.211	0.044	13
		(C54) served population	0.188	0.039	15
		(C55) population rate involved in selective collection and recycling	0.135	0.028	16

For the hierarchy of alternatives, the fuzzy TOPSIS method was used. Linguistic ratings are used for the subcriteria of five criteria. For this evaluation, the ETL software was used and the following hierarchy of alternatives was obtained (see Table 1.49). The evaluation is based on the judgments of the eight experts. This hierarchy was made according to the closeness coefficient.

Table 1.49. The weight criteria for the five categories of factors considered for this research

Alternative	CC <sub>i</sub>	Rank
A1	0.8476	1
A2	0.6578	2
A3	0.4053	3

This section makes an inventory of the results obtained and highlights their practical applicability. With respect to the hierarchy of the five categories of factors, the following aspects can be claimed:

- 19 factors were identified for the categories in question, (5 factors for the "environment" category, 3 factors for the "economic" category, 3 factors for the "technology" category, 3 factors for the "innovation" category, and 5 factors for "Social").
- The technology and innovation criteria are placed on the last two categories in the hierarchy of categories inasmuch as Romania is among the countries with an average development and its ability to integrate the new technologies and to apply the concepts of innovation is limited. This limitation is mainly driven by limited financial resources.
- In order to improve the real-time MSWM, awareness actions on the importance of selective collection should be made for the population with the currently-existing resources. This action does not entail considerable costs. The criteria on the first two positions are environmental (with a weight of 0.33) and economic (with a weight of 0.25). As stated in this research (12), social and environmental factors are important to increase the MSWM competitiveness. At Romania's level, the gross domestic product will decrease by 3.6% in 2018, compared to 6.8% in 2017. The absorption capacity of European funds is reduced on average in Romania. The average take-home salary in Romania in 2018 is around 2,360 RON per month (510 Euros or \$ 630) compared to 1,520 euros in the EU. Taking into account the economic situation of Romania, the social and environmental factors are associated with the economic factors, which are ranked second.
- Third place in the hierarchy of categories is "social" with a weight of 0.21, followed by "innovation" with a weight of 0.20. This means that the inhabitants' involvement in the improvement of the management system is very important. As shown by local rates, (C51) employment rates and (C52) levels of education, the level of education of the population contributes to improving society and increasing the recycling rate. Simultaneously the factor (C53) information on waste collection, which has a local weight of 0.211 and a total weight of 0.044, is important for the population. Continuous information of the population to increase recycling is vital. A considerable proportion of the population [1-3] is not aware of the significance of the bin's colours.

- The "technology" category is on the last position because the experts considered that the equipment owned at the current level is medium as the driving technique, but there are major deficiencies in informing the population and the major impact of the waste on the environment.
- From the perspective of global ranks, one can notice that the first three positions are (C11) the amount of municipal waste with 0.099, (C21) the cost of collected waste by 0.096, and (C23) operators' revenues by 0.092. Indeed, these factors are very important for the national strategy because the directives require all EU countries to reduce their waste by 2020. At present, the recycling rate in Romania is below 15%, and the amount of waste and storage costs are an important problem to be solved by an enhanced MSWM.
- Factors (C41) adaptability of technological capacity with a global weight of 0.081, (C12) recycling rate with 0.081, and (C43) employees' reluctance with 0.076 are the factors on the following positions in the global ranking. The use of adequate equipment to increase the recycling rate is very important, and employees need to know clearly the objectives of the organizations.
- Population's involvement, (C53) their level of information on/familiarization with waste collection, (C54) the percentage of served population, and (C55) the rate of population involved in selective collection and recycling are on the last position since, first and foremost, a well-developed strategy is needed at a national level, followed by consistent informing and active involvement of population in waste (selective) collection.

The authors have further developed a sensitivity analysis to test the accuracy and effectiveness of the proposed framework and to analyse the outcomes. For this analysis, several situations/scenarios are discussed where weights have a value of 10%, 20% and 30% lower than the base weight and by 10%, 20% and 30% higher than the basic weight.

Figure 1.75 presents the results for which the sub-criteria related to "Environment" become more important or less important. It can be noticed that as (C11) becomes more important, the A1 alternative increases. Exits A2 and A3 do not present significant differences. If (C12) becomes less important, there is a slight decrease in A3 score. If (C13) fluctuates, there are no significant changes.

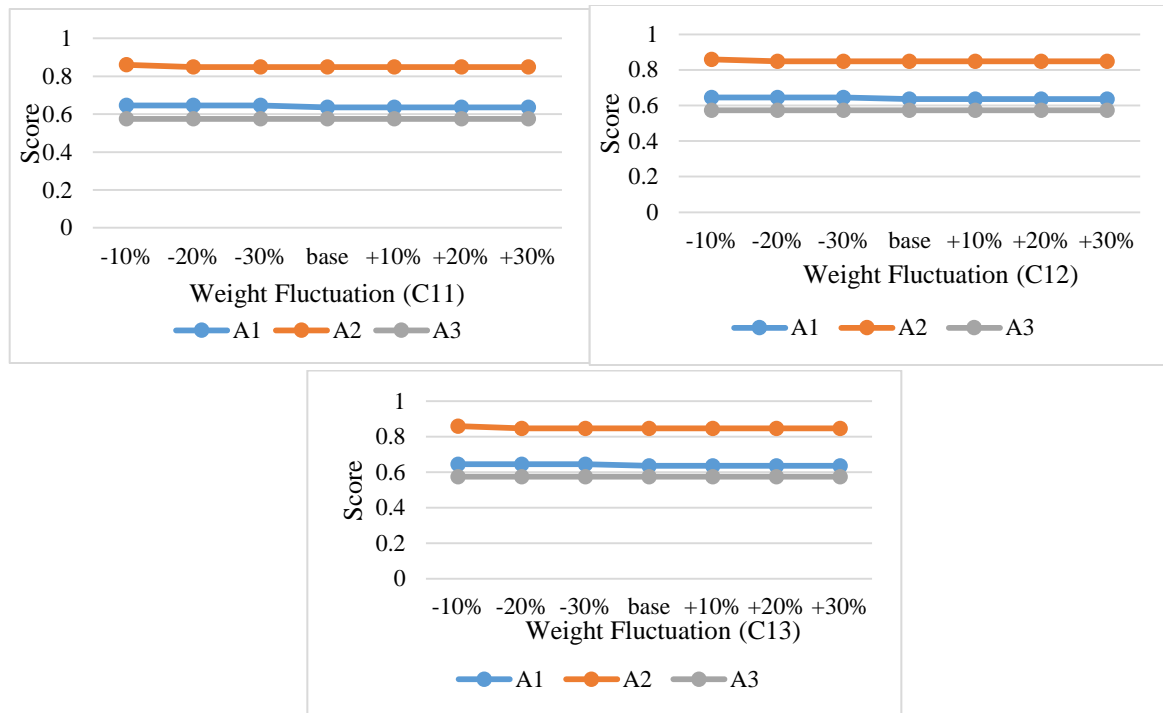
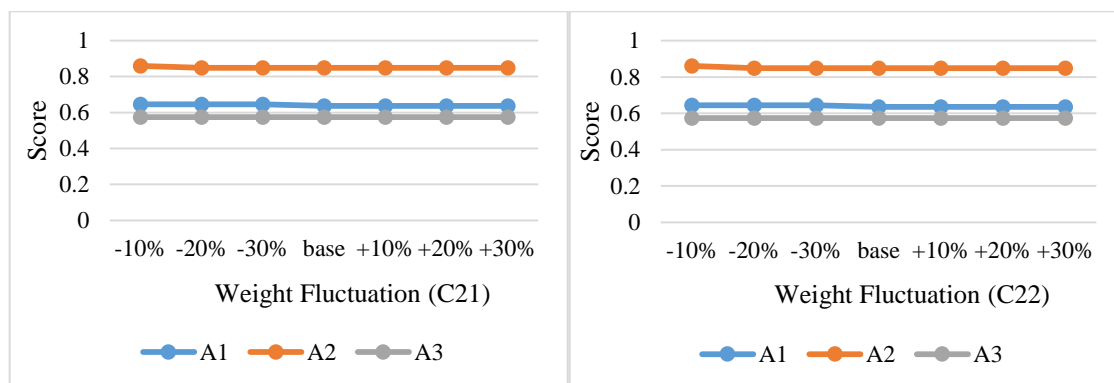


Figure 1.75. Sensitivity analysis results of sub-criteria in environmental group

Figure 1.76 presents the results for which the sub-criteria related to "Economy" become more important or less important. For the situation where (C21) and (C23) become more important, the A1 and A2 output scores increase. The alternative score A3 approaches A2, when (C22) becomes more important.





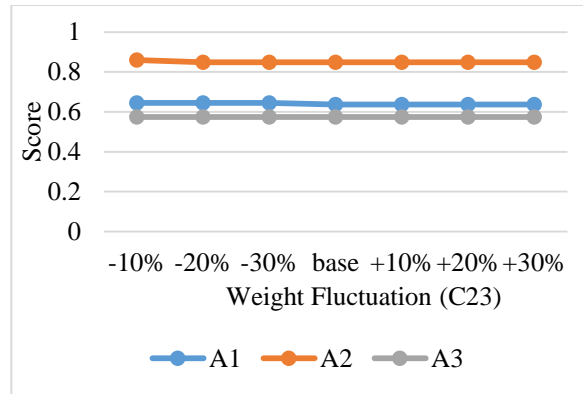


Figure 1.76. Sensitivity analysis results of sub-criteria in economy group

Figure 1.77 presents the results for which the sub-criteria related to "Technology" become more important or less important. If (C31), (C32) and (C33) become more important, the A1 and A2 output scores show a significant increase. If sub-criteria become less important, there are no significant differences.

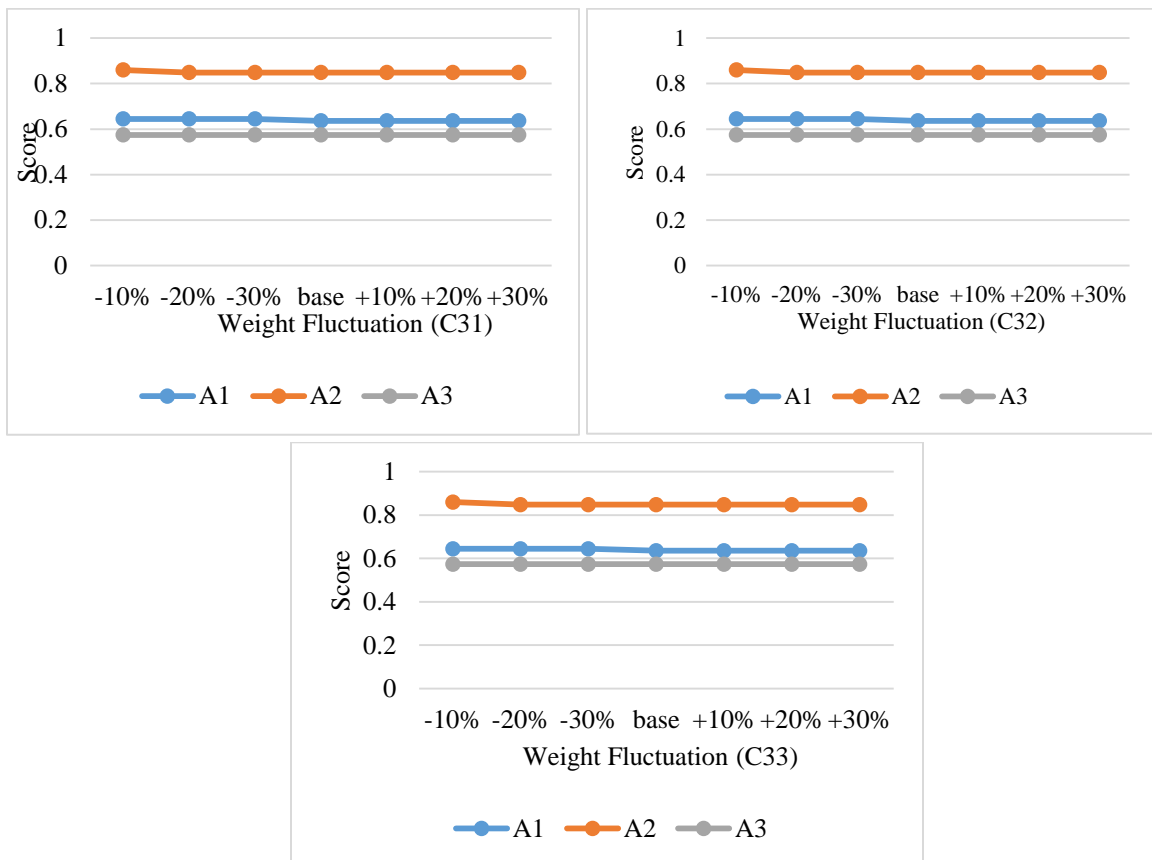


Figure 1.77. Sensitivity analysis results of sub-criteria in social group

Figure 1.78 presents the results for which the sub-criteria related to "Innovation" become more important or less important. For the situation when (C41) and (C43) become more important, A1 and A2 output scores show an increase. For the situation where (C42) becomes less important, there is a decrease in the score of the A3 alternative.

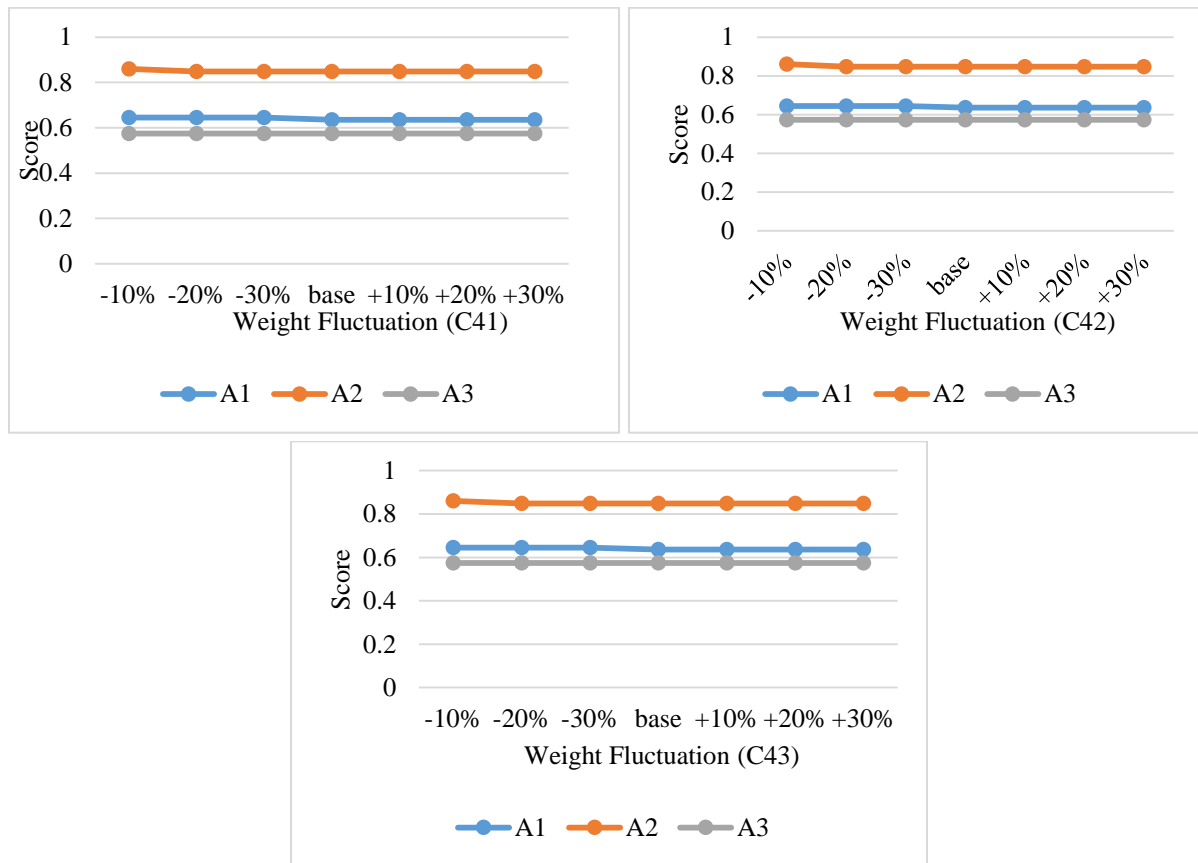


Figure 1.78. Sensitivity analysis results of sub-criteria in innovation group

Figure 1.79 presents the results for which the sub-criteria related to "Innovation" become more important or less important. When (C51), (C52) and (C53) become less important, A1, A2 and A3 output scores show an increase. There are no significant differences in the situation when (C54) and (C55) fluctuate.

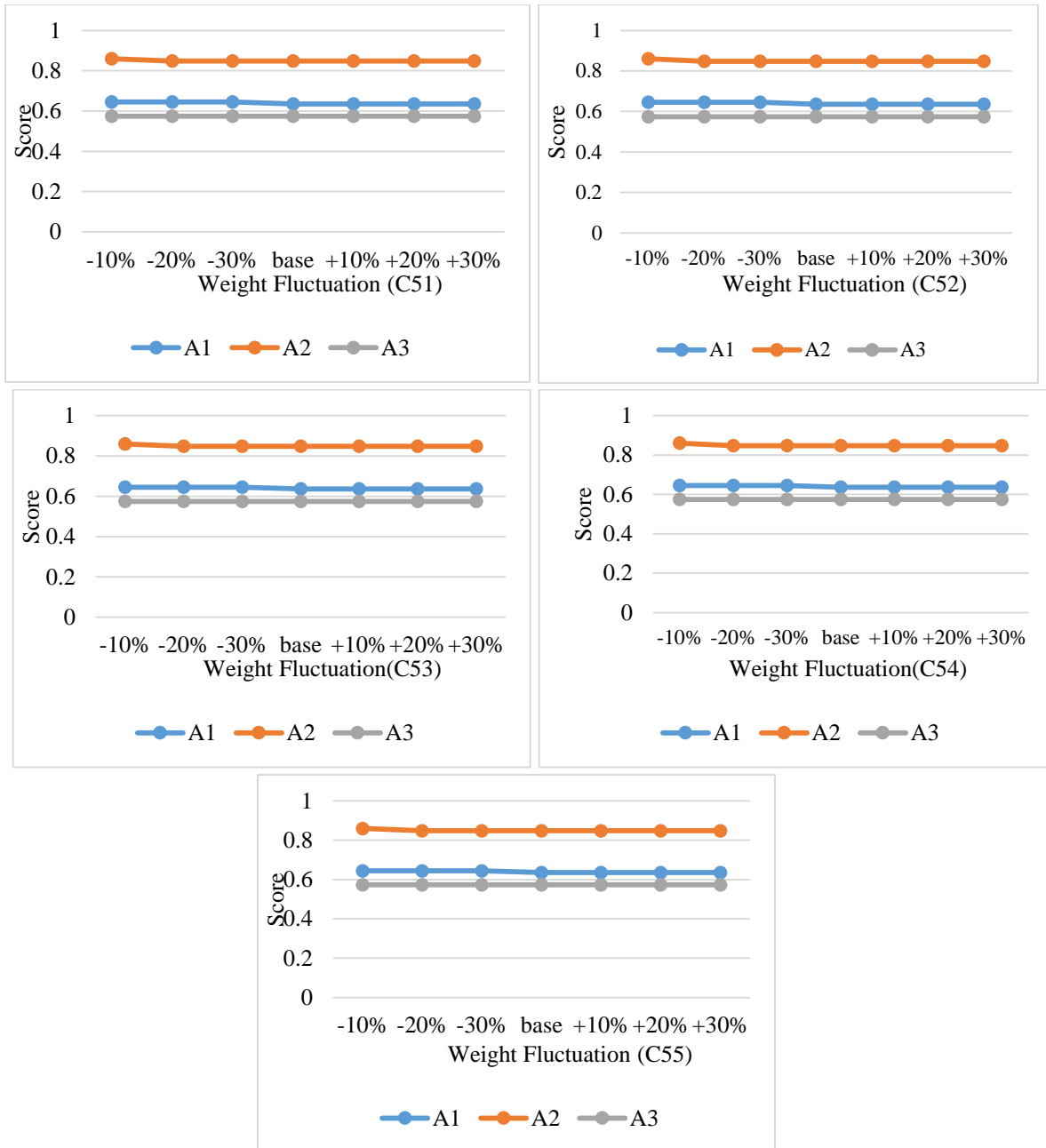


Figure 1.79. Sensitivity analysis results of sub-criteria in technology group

Above all, the three alternatives retain their rank even though there are fluctuations in weights. This leads to the idea that the fuzzy AHP and TOPSIS methodology is robust and efficient.

This research points out that environmental (C1), economic (C2), technology (C3), innovation (C4) and social factors (C5) are central to sanitation companies. The judgment applied in the fuzzy

MCDM methodology is adapted to the economic conditions characteristic of Romania and to the country's capacity for development and adaptability. Based on the outputs of the fuzzy AHP and TOPSIS methodologies, the following actions are proposed for the winning alternative (A1):

- Promoting the economic implications of waste disposal;
- Promoting the reduction of waste generation in residential production;
- Increasing the awareness of the individual carbon footprint (i.e. how much each individual /each family/each region pollutes);
- Increasing the awareness of the waste route from the generator to the storage (from the household to the landfill);
- Implementing educational actions, ranging from the first levels of education to the university environment, related to the importance of selective collection and reduction of waste amount;
- Enhancing promotion across different environments and present the situation at national and EU levels;
- Consistent information on the achievement of the objectives set at the national level.

These proposals are relevant for the situation in Romania. Updating and improving current MSWM contributes to improving people's quality of life and reducing environmental pollution. Since, at a national level, there is a need to develop a sustainable waste management system, it is necessary to choose indicators that best translate into a comprehensive and meaningful assessment of waste management systems. At the level of Romania, innovation and technological advance should be used to achieve the average level of EU activities (Feniser et al., 2017).

Further research directions will address the application of fuzzy AHP to the composition of municipal waste to determine factors contributing to the reduction of the generated waste amount, simultaneously focusing on applying sustainable methods based on the concept of reverse logistics.

The limitations of the research refer to the fact that some data sets used from the databases of the European Commission, of the European Environment Agency, of the Ministry of Environment and Climate Change, and the Romanian National Institute of Statistics (NIS) are incompletely defined, presenting an average degree of uncertainty.

*Sustainable education is also present in production processes. In this direction, together with the team of researchers, we developed a game entitled SLIM.* Currently, there are a number of management approaches that contribute to increasing competitiveness and business development

capacity. Some businesses are targeting environmental practices to improve process activities and improve public image. Many businesses are concerned about the tools, methods, and techniques that help streamline process resource utilization. Most are involved in corporate social responsibility activities to improve their public image. These CSR activities are complementary to processes streamlining actions. Sustainability is addressed in many companies (Dues, et al., 2013; Martínez-Jurado et al., 2014; Piercy, 2015). The three dimensions of sustainability are addressed: social, economic, and environmental. Some organizations address cumulatively the three responsibilities, others partially. Involvement in sustainable development is not mandatory at the national or international level. Sustainability reporting is also optional (Adebanjo, et al., 2016), but many businesses report their sustainability to improve their impact on stakeholders. From a production efficiency perspective, lean manufacturing or lean production, often simply “lean”, involves reducing the amount of waste without minimizing production capacity (Tasdemir et al., 2018). These goals can be achieved by using less resources to generate the same result. Operations management plays an important role in delivering positive results. The interaction between lean and sustainability is addressed in specialized literature, highlighting the benefits of the integrated use of the two concepts. The approach of the two concepts, lean production and sustainability, within enterprises can contribute to increasing the competitiveness, capacity to develop, and make more efficient use of organizational resources (human, financial, informational, and material resources) (Govindan et al., 2015; Egbue et al., 2014; Cherrafi et al., 2017)

The objective of this part is to introduce a new enterprise game and indicator developed by the authors following the research in the interdisciplinary domain related to two concepts: sustainability and lean. These two concepts are considered here together, and integrated with similarities and complementarities which should lead to improvement in companies’ competitiveness.

### **Introducing Concepts of Lean and Sustainability with Enterprise Games**

From the perspective of enterprises, their actions on increasing competitiveness and making production more efficient have become necessary and mandatory. The urgency to get involved in environmental protection, sustaining society, and improving economic performance (the triple baseline—TBL) was mainly due to the fact that companies began to feel more pressure from stakeholders than ever (Ben Ruben et al., 2017; Das et al., 2017; Camuffo et al., 2015) Long-term organizational survival conditions have changed so that social and environmental performance

aspects in addition to financial excellence are included (Shou et al., 2017). They, therefore, sought to respect the widespread recognition of voluntary and imposed regulations, actions and standards developed by national and global authorities such as: International Standards Organization (ISO): ISO 14000 series—Environmental Protection Oriented, ISO 9000 series—Quality Oriented, ISO 45000 series—Health and Safety Oriented, ISO 27000 series—Information Security Oriented, Occupational Safety and Health Administration (OSHA); Occupational Safety and Health Administration (OSHA): Occupational Safety and Health Act of 1970—Safety and Health Oriented; British Standards Institution (BSI): OHSAS 18000 series—Health and Safety Oriented; US Environment Protection Agency (EPA); Lean and Environment Toolkit—Environment Protection Oriented; Lean, Energy and Climate Toolkit—Environment Protection and Resource Preservation Oriented; European Union (EU) Standards: Eco-Management and Audit Scheme (EMAS)—Environment Protection Oriented, Health and Safety at Work Act, 7 Waste; Life Cycle Sustainability Assessment—LCSA; Resource Efficient and Cleaner Production-RECP and other (Vinodh et al., 2011)

Sustainable development targets 17 principles and 169 targets. The 17 Sustainable Development Goals (17 SDGs) are accompanied by 169 specific targets and are part of the strategic document called the “2030 Agenda for Sustainable Development”. The implications of the 17 SDGs are presented in Table 1.50.

Table 1.50. Short description of the 17 Sustainable Development Goals.

Goal	Short Description
SDG 1	Eradicate poverty in all its forms
SDG 2	Food safety and sustainable agriculture
SDG 3	Healthy life at all ages
SDG 4	Lifelong learning
SDG 5	Equality between women and men
SDG 6	Sustainable water management and sanitation for all
SDG 7	Affordable prices and sustainable resources
SDG 8	Promoting economic growth, productive and decent work
SDG 9	Promoting industrialization and stimulating innovation
SDG 10	Reducing inequalities between countries
SDG 11	Developing secure living environments
SDG 12	Sustainable consumption and efficient production
SDG 13	Urgent action to combat climate change
SDG 14	Sustainable use of marine resources
SDG 15	Restoration of terrestrial ecosystems
SDG 16	Responsibility of society and equity of institutional levels
SDG 17	Partnerships for the goals

The development of this strategic document was based on a series of steps that have taken place since 1951 (see Figure 1.80).

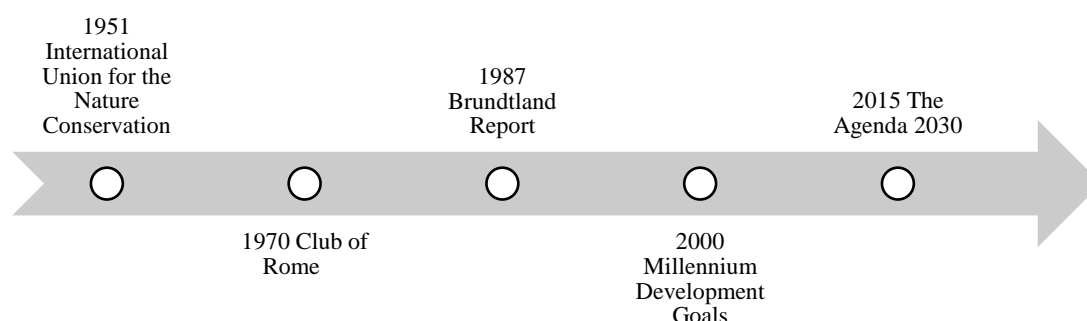


Figure 1.80. The evolution of Agenda 2030.

The first actions aimed at sustainable development took place in 1951 at the International Union for Nature Conservation. The Rome Club has set up environmental actions. Our Common Future, also known as the Brundtland Report, has laid the foundations for sustainable development,

being an important document for this endeavor. In 2015, on the basis of Agenda 2030 sustainable development goals are set out (Faulkner, W et al., 2014). Sustainability at enterprise level addresses a number of improvements that can be structured in the form of 12 principles. The proposed principles cover the objectives of Agenda 2030, as outlined in Table 1.51.



Table 1.51. The 12 principles of sustainability proposed, the implications and objectives of Agenda 2030 covered by them.

No.	Principle	Implication	Goal
S1	Reducing resources	Reducing process losses contributes to improving financial results.	SDG9, SDG12
S2	Time efficiency	Improving the time of the enterprise processes contributes to increased production capacity and reduced costs.	SDG9, SDG12
S3	Reducing waiting time	The company has to reduce its waiting time to improve its production capacity.	SDG9, SDG12
S4	Monitoring fixed costs	Reducing energy consumption, mainly to improve financial results and reduce environmental impact.	SDG12, SDG17
S5	Stakeholder engagement in strategic decisions	Strategic decisions, in particular, need to be agreed by stakeholders, thereby increasing the attractiveness and efficiency (by involving stakeholders from within)	SDG6, SDG8, SDG17
S6	Supporting community activities	The enterprise must meet the needs of the communities and thus the level of competitiveness can be improved.	SDG2, SDG3, SDG16
S7	Training human resources	Through continuous training of human resources, the company's performance level is improved.	SDG4, SDG5
S8	Corporate Social Responsibility (CSR)	The company's involvement in CSR activities increases the company's attractiveness and improves some activities.	SDG 1, SDG10
S9	Increasing recycling capacity	The enterprise must have the capacity to recycle the waste generated in order to reduce the impact on the environment.	SDG14, SDG15
S10	Increasing the capacity of the reuse, remanufacturing, reconditioning	Process-generated waste must be input for other processes. Thus the amount of waste generated could decrease considerably.	SDG7, SDG12
S11	Reducing energy consumption	Improving enterprise processes so that energy consumption is reduced. Increasing the enterprise's capacity to generate energy.	SDG9, SDG13
S12	Greenhouse gas reduction	Reducing pollution to the environment.	SDG11, SDG13

Operations management plays an important role in delivering positive results.

Research is beginning to correlate lean operations with sustainability, breaking down the “lean is green” approach (Taucean et al., 2018; Taucean et al, 2018b). One of the lean operation goals is to use fewer resources to generate the same result. This is obviously environmentally friendly: since less use of materials in production leads to reduced environmental impact and also quality improvements reduce reuse, reconditioning, or remanufacturing, waste is reduced and pollution costs diminished, so the environmental benefits are obvious. Reducing materials used in operations

leads to cost savings, thus addressing the economic sustainability dimension. Efficiency of operations contributes to reducing energy, water and other costs. Therefore, lean principles match the main sustainability objectives and reach the main objectives of the sustainability agenda. This is because the lean concept can reduce the amount of waste eliminated, improve the whole process, and reduce the negative impact of processes on the environment, streamline resource consumption, improve product quality, and more (Hugos, 2012) It is said that lean produces a very favorable operational and cultural character for minimizing waste and reducing greenhouse gases. By reducing greenhouse gas emissions and minimizing waste, the lean concept promotes sustainability in business processes (Iftimescu, 2008) Among the most used tools lean for sustainability purposes were identified to be Value Stream Mapping (VSM), 5S, Kaizen, Just-In-Time (JIT), Cellular Manufacturing, Single Minute Exchange of Dies (SMED), Standardized Work, and Total Preventive Maintenance (TPM), Plan-Do-Check-Act (PDCA), and Problem Solving. Other lean tools, methods, and techniques that have a potential contribution to sustainable development are: Sort-Set In order-Shine-Standardize-Sustain (5S), Six Sigma, Jidoka, Gemba Walk, Kaikaku, Shop Floor Management (SFM), Bottleneck Analysis, and others. Lean manufacturing leads to a series of improvements (Wells, 1980; 21. Tartavulea et al., 2012; Taucean et al., 2014; Ionita et al., 2015) in the short- and long-term, at the level of the enterprises, as follows:

- Improving quality—a considerable part of lean environment activities is directed to improving the quality of operations.
- Improved visual management—an improved visual scan helps to increase time for operations.
- Increased efficiency—standardized activities contribute to increasing resource efficiency.
- Manpower reductions—if emphasis is placed on standardized work and increased efficiency, the ability to perform operations with fewer people becomes a very real possibility.
- Easier to manage—standardization activities and increased operations efficiency contribute to the development of an easy-to-manage environment.
- Problem elimination—lean principles force the investigation of the identified problem until it is eliminated.

- Redundant space—streamlining raw material consumption, waste reduction and standardized work contributes to reducing the space used (stocks no longer occupy a lot of space vertically and horizontally).
- Safer work environment—unnecessary things taken from current operations contribute to conducting an organized job (example 5S technique).
- Improved employee morale—if the lean concept implementation is accepted by employees, there will be a decrease in the stress level and employee morale will improve.

### The Relation between Lean and Sustainability Indices

Between lean and sustainability there is a relationship and interaction that contributes to increasing competitiveness and making production more efficient (Wells, 1980; 21.Tartavulea et al., 2012; Taucean et al., 2014; Ionita et al., 2015). The lean represents the holistic vision of sustainability and streamlines processes in terms of costs, time, waste, and quality. This approach covers part of the sustainability objectives (SDG9, SDG12, SDG13) taking into account the quality of the environment, social equity, and the economy. Following the evaluation of the specialized literature and the implications of the lean concept, 12 principles are proposed, presented in Table 1.52.

Table 1.52. The 12 principles of sustainability (S1–S12) and the 12 principles of lean (L1–L12).

No.	Sustainability's Principle	No.	Lean's Principle
S1	Reducing resources	L1	Reducing/Eliminating activities that do not add value
S2	Time efficiency	L2	Reducing uncertainty
S3	Reducing waiting time	L3	Focus on customer requirements
S4	Monitoring fixed costs	L4	Reduce cycle time
S5	Stakeholder engagement in strategic decisions	L5	Simplifying the process
S6	Supporting community activities	L6	Increase production flexibility
S7	Training human resources	L7	Increase process transparency
S8	Corporate Social Responsibility (CSR)	L8	Controlling the entire process
S9	Increasing recycling capacity	L9	Improving the process continuously
S10	Increasing the capacity of the reuse, remanufacturing, reconditioning	L10	Gathering information about competitors

S11	Reducing energy consumption	L11	Reduction of raw materials
S12	Greenhouse gas reduction	L12	Efficient allocation of human resources

Following the identification of the 12 principles of sustainability and 12 principles of lean, this research identifies a number of similarities and complementarities in order to increase the interest of enterprises in implementing the tools targeted by the two concepts. In the first stage, Table 4 presents a matrix of the interaction of the principles of sustainability with those of lean. This matrix is presented in Table 1.53. It can be seen that S1 principle of sustainability presents the same areas of interest with L1, L2, L4, L7, L9, L11, and L12 principles of lean. The sustainability principle S4 presents areas of common interest with lean principles L9 and L11. The S12 principle interacts with lean manufacturing L1, L4, L5, L8, L9, and L11.

Table 1.53. The interaction matrix between lean operation and sustainability criteria in management process.

Sustainability's Principle	Lean's Principle											
	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12
S1	x	x		x			x		x		x	x
S2		x	x				x					
S3			x		x							
S4									x		x	
S5										x		x
S6			x									x
S7								x				x
S8												x
S9					x	x			x			
S10	x					x		x				
S11		x			x	x	x	x	x			
S12	x			x	x			x	x		x	

From the perspective of similarities and complementarities that can be identified between the 24 principles, the proposal in Table 1.54 is presented. It can be seen that the principle S3 and the principles L3–L5 refer to the waiting time. Lean aims to get the wanted product in the shortest time, and the sustainability is reducing the allocation of resources to achieve goals for a long time. The S7 principle interacts with the L8–L12. The action of these concepts is similar in relation to human resources, and as a complementarity, lean pursues the efficiency of resources, and sustainability supports employee training (employee continuous training).

Table 1.54. Addressing the similarities and complementarities of lean and sustainability principles.

Sustainability's Principle	Lean's Principle	The Similarities of Principles	Complementarity of Principles
S1	L1, L2, L4, L7, L9, L11, L12	Reducing resources	Lean respond punctually on different resources
S2	L2, L3, L7	Time efficiency	Lean streamlines operations, and Sustainability plans
S3	L3, L5	Waiting time	Lean gets the product in a short time, and Sustainability reduces the time allotted
S4	L9, L11	Process costs	Lean controls operations for efficiency, and Sustainability reduces fixed costs
S5	L10, L12	Interest towards stakeholders	Lean evaluates competitors' operations and allocates efficient human resources, and Sustainability involves stakeholders in decision-making
S6	L3, L12	Activities for people	Lean involves employees, and sustainability supports the organization's involvement in society
S7	L8, L12	Human resource	Lean pursues resource efficiency, Sustainability supports employee training
S8	L12	CSR	Lean sustains organizational efficiency, and Sustainability activities for society
S9	L5, L6, L9	Recycling	Lean aims to reduce losses, Sustainability aims to increase recycling rate
S10	L1, L6, L8	Reverse logistics	Lean supports loss reduction, and Sustainability supports reverse logistics (returning waste to production as raw materials)
S11	L2, L5, L6, L7, L8, L9	Energetic efficiency	Lean reduces loss, sustainability sustains the production of green energy
S12	L1, L4, L5, L8, L9, L11	Pollution Reduction	Lean reduces waste, and Sustainability is aimed at reducing greenhouse gases

Based on these interactions, similarities and complementarities, at the level of specialized literature research, the next step is realized in the present research. The following are the results obtained from a market research aimed at identifying the needs and wants of training and implementation in the economic environment.

### Enterprise Games

This part proposes an inter-disciplinary research in the domain of “engineering and management”, starting from 2005, and developed from 1990 with different names and directions (industrial engineering, production system engineering) and 1992 (engineering economy). This needs modern educational systems to improve the efficiency and quality of graduates for a fast

integration in the labor market. The main advantages of the new game proposed will not only help to reduce and eliminate existing bottlenecks in university education. It will support the educational process through modern tools; the efficient use of educational resources; superior learning process facilitation; phenomena simulation that otherwise will be impossible or highly costly; and creativity and competition stimulation of individual and teamwork.

The Bologna Declaration of 1999 has had a very high impact on educational programs. The aim was to create a European Higher Education Area (EU 2000), and the Lisbon Strategy of 2000 (EU 2000) to create a European research and Innovation Area. The Lisbon Summit stated that, in order to make Europe the most competitive knowledge-based society in the world by the 2010, we need more and better trained researchers (EU 2000). By the end of 2010, most of the goals of the Lisbon Strategy were not met. Official appraisal of the Lisbon Strategy took place in 2010 at a European Summit, where the new “Europe 2020” strategy was also launched. It aims at “smart, sustainable, inclusive growth” with greater coordination of national and European policy (EU 2010). The strategy promotes modernizing education and training. Quantitative targets are proposed, including increasing the employment rate to at least 75% from the current 69% and boosting spending on research and development to 3% of gross domestic product—it is currently only 2% of GDP, significantly less than in the US and Japan (Wells, 1980; Tartavulea et al., 2012; Taucean et al., 2014; Ionita et al., 2015).

One of the most efficient ways to learn by experience in management and engineering (in initial training, in universities and business schools, as well in continuous training in enterprises where employee work) is the use of enterprise games. Enterprise games were developed from the war game model of training, by simulating conflict situations and by applying efficient war strategies. The first one was realized by the American Management Association in 1950 (Wells, 1980; Tartavulea et al., 2012; Taucean et al., 2014; Ionita et al., 2015). Later, many universities on business administration introduced games in university curricula, and some companies (IBM, General Electric) elaborate their own games which were used in training managers or to support strategic decisions (especially investments decisions) (Wells, 1980; 21. Tartavulea et al., 2012; Taucean et al., 2014; Ionita et al., 2015). With games, an organization can shift from an outmoded top-down hierarchy to an agile network structure that promotes coordination over control. Industrial Age business structures from the 20th century no longer work. It is necessary to

design real-time business collaboration systems, using massively multiplayer game concepts, making in-house systems more agile.

Simulation of production processes is a less common (usually simulation is about information flows) and is usually harder than other enterprise departments because of the differences in each type of production system (even in the same domain, with the same products) and the multitude of activities category and different procedures/algorithms. Benchmarking analysis will lead to improved academic organization structure, of educational options for students (new study plans for license and master levels, new directions of research at the doctoral level, improvement of existing ones and correlation of them), will ensure a better students and graduates training to cope with labor market challenges, and will lead to better trainer quality by using new/innovating training tools (Condurache et al., 2006; Pavaloiu et al., 2016; Trifan et al., 2015; Ivascu and Cioca, 2019).

In Romania, the educational system was pushed towards using games (simulation games, enterprise games, management/business games, practice enterprise), integrated in teaching activities, by necessity from the 1990s (Condurache et al., 2006; Pavaloiu et al., 2016; Trifan et al., 2015; Ivascu and Cioca, 2019). The necessity of students' training in the same conditions as in future workplaces, with minimum costs, was implemented in universities and high school education through practice enterprise tools, in which we have identical activities as in real enterprises, using the same procedures and benefits from the same structure (Condurache et al., 2006; Pavaloiu et al., 2016; Trifan et al., 2015; Ivascu and Cioca, 2019). There is a European network where practice firms can affiliate, entitled the European Practice Enterprises Network (EUROPEN), founded in 1997. The practice firms in the domain of Engineering and Management has existed in Romania from 2001.

The new game was developed by the authors within a project framework especially to be used in an educational laboratory for student teaching. The approval of this project to be implemented in the university also explains the policy-makers' implications of the new methods and instruments to be used in university education.

In the first part of this approach we conducted a literature review to evaluate qualitatively and empirically the concepts of sustainability, lean, and enterprise games, and the possibility to integrate the first two concepts into a new instrument applied into a new enterprise game. The

authors have identified a number of improvements that develop a sustainable development into an enterprise. (online survey), and then in the new algorithm of the new game developed by the authors.

Using an online survey, we collected data regarding the needs to use “lean” and “sustainability” tools within companies in our region. The survey contained a total of 14 questions, out of which 10 structured question with predetermined response options (dichotomic answers, multiple answers and a five-point Likert scale), while the rest of them were structured for open response options. The purpose of the survey was to identify which tools of “lean” and “sustainability” concepts are used within the companies, how and what training tools they used, which are the reported benefits of using the tools, and if the companies create an annual sustainability report.

Addressing the sustainability and lean concepts is very important for organizational competitiveness. A number of important directions have been identified through this online survey. Based on the “Interaction matrix between lean operation and sustainability criteria in the management process (Table 1.53)”, and the results of the online market research, the authors developed a new game. Our approach, based on an enterprise game, proposes a number of improvements to the enterprise’s issues. In Figure 1.81 are presented the enterprise architecture (EA) issues. There are several EAs, as follows: EA developed by Sparx Systems in Australia, BIZZdesign developed by IBM in Netherland, PowerDesigner developed by Novalys in France, ArchiMate developed by team from the Telematica Instituut in cooperation with Dutch partners from government, industry and academia in the Netherlands. We used ArchiMate® to build the enterprise architecture. This is one of the open standards hosted by The Open Group® and is fully aligned with TOGAF®. Enterprise issues solved by our enterprise game are: enterprise management, production efficiency, warehouse efficiency, quality assessment, customer relationship management (CRM), and environmental impact (Chicernea, 2007; Zamfir et al., 2009; Mocofan et al., 2016)



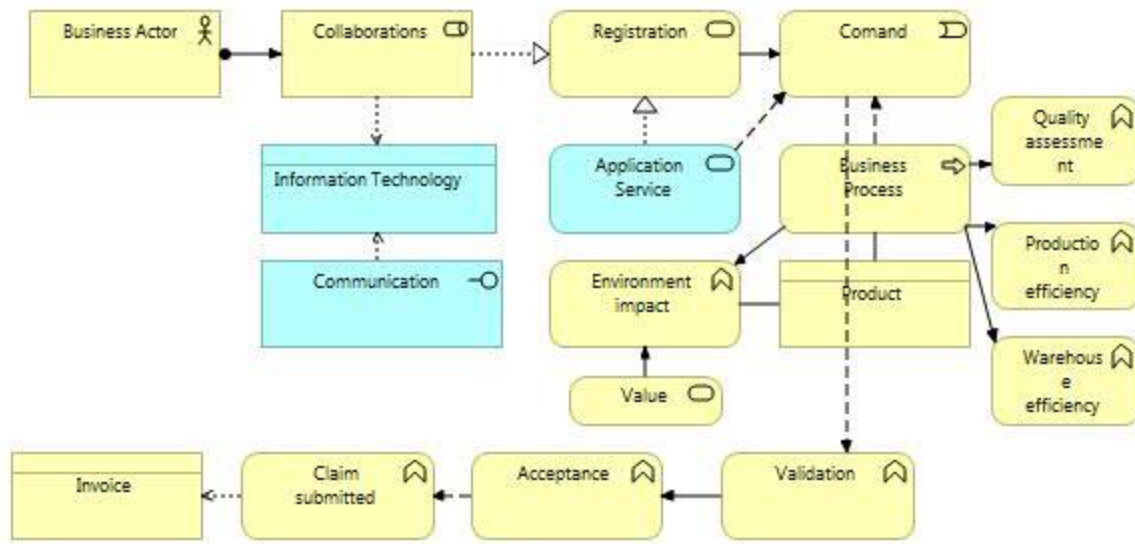


Figure 1.81. Enterprise architecture issues.

Using on the survey results, we design and tested an enterprise game. The game follows the framework of an enterprise game, considering the simulation of an enterprise classical functions and departments, jobs implemented in order that the enterprise activity is simulated in rounds (like work days or shifts). The purpose of the game is to improve the activity results in successive rounds, using sustainability and lean tools. A scorecard is used to compute the key performance indicators (KPIs), and the main indicator used here is an aggregate one from sustainability and lean indicators.

### Results of the “Lean” and “Sustainability” Surveys

A total of 65 valid responses (N) were obtained from companies’ employees situated in the western region of Romania and represent the database for our descriptive statistics and main results. We have conducted statistical analysis on our survey result by computing in SPSS the standard deviation (Std. Dev. or SD) to determine if our responses are concentrated around the mean and standard error (Std. Err or SE) to indicate the reliability of the mean.

From Figure 1.82 we can observe that most respondents are from the administrative or support department (43.08%), followed by the technical department (35.38%). The answers have been obtained from the following areas: production areas (21.54%), thus recoding smaller percentages for production managers (16.92%), and respective production operators (4.62%).

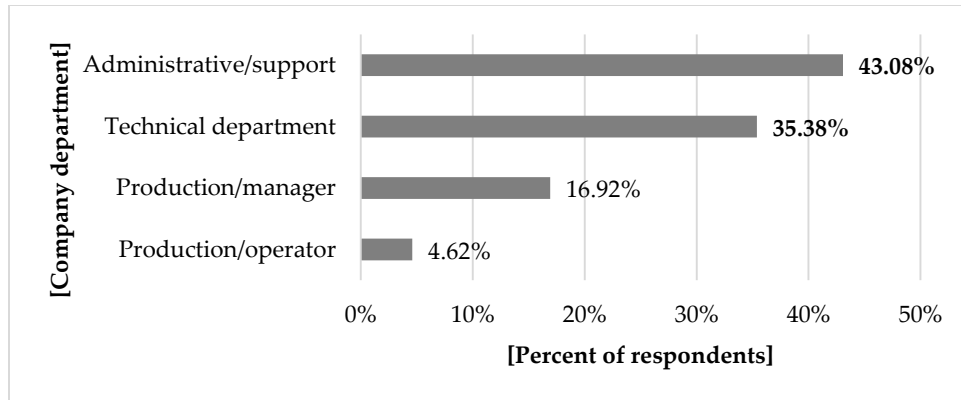


Figure 1.82. The percentage of respondents based on company department.

After coding our responses with “1” for production/operator, “2” for production/manager, “3” for administrative/support, and “4” for technical department, in Table 1.55 we can observe the distribution of respondents based on company department. Looking at the mean (3.09) and SD (0.843) values we can observe that most of the respondents are from the administrative/support and technical department.

Table 1.55. Descriptive statistic for the number of respondents based on company department.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err.
Company department	65	1	4	3.09	0.105
					0.843

Figure 1.83 presents the percentage of respondents based on the companies’ business sector, from which we can observe that half of the respondents are from companies operating in the automotive business sector (50.70%). The high percentage was to be expected due to the large number of companies situated in the western region of Romania operating in this specific business sector.

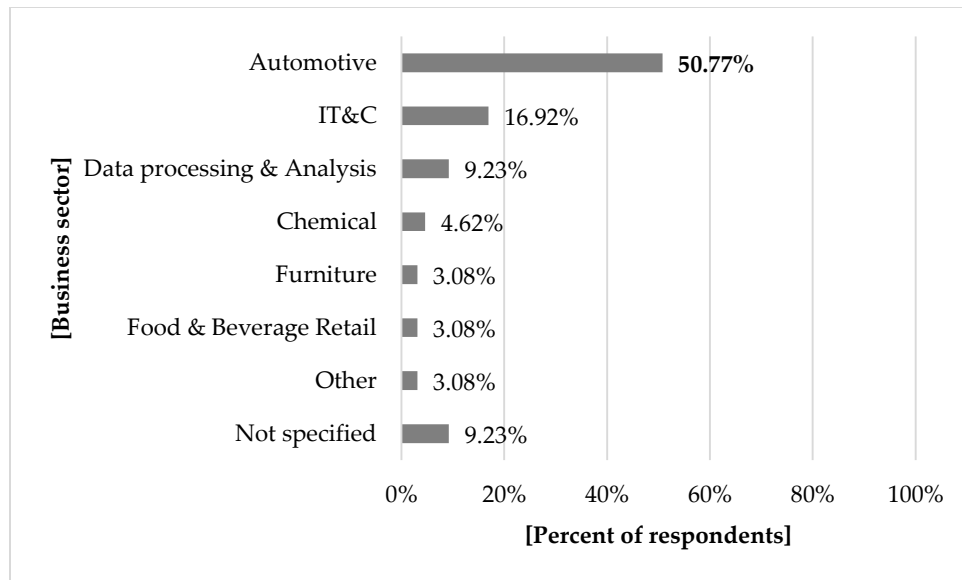


Figure 1.83. The percentage of respondents based on company industry.

Table 1.56 show the distribution of respondents based on company industry. We coded with values from 1 to 8 the industries that can be found in the Western Region of Romania: automotive, IT and C; data processing and analysis; chemical, food, and beverage retail; furniture; and included possible responses for “other industries”, respectively “not specified”. The high value of the SD (2.317) indicates a wide distribution of responses, meaning that we obtained several responses for each industry, while the mean (2.60) and SE (0.287) values, show that the responses are concentrated around the first two industries: automotive and IT and C.

Table 1.56. Descriptive statistic for the number of respondents based on company industry.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err.
Company industry	65	1	8	2.60	0.287
					2.317

Figure 1.84 describes the percentage of respondents’ knowledge of the “lean” and “sustainability” concept, showing us that individually asking about the concepts 73.85% have knowledge about the “lean” concept, while 89.23% about the “sustainability” concept. Additionally, 63.08% of respondents have knowledge regarding both concepts.

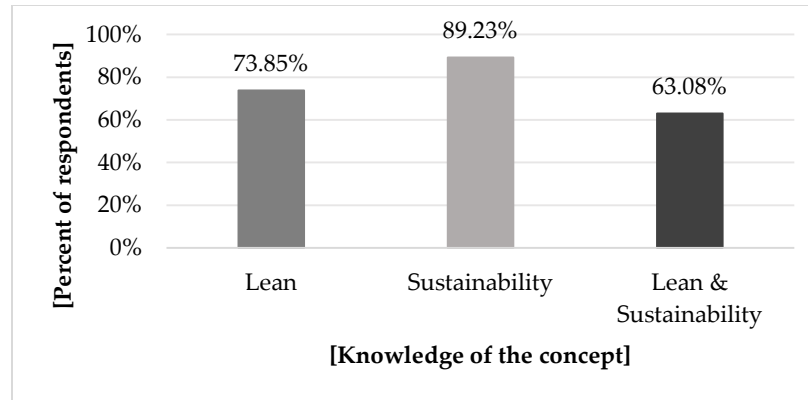


Figure 1.84. The percentage of respondents knowing the “lean” and “sustainability” concepts and both.

In Table 1.57, we observe the small values of SD and SE describing a normal distribution in relation to the Mean, taking in consideration that we coded with “1” knowing the lean, sustainability, respectively both concepts, while with “0” not knowing the lean or sustainability concept, respectively knowing at least one. Our results clearly indicate that, statistically, there are more than 2/3 respondent that have knowledge of one or both concepts.

Table 1.57. Descriptive statistics for the number of respondents knowing the “lean” and “sustainability” concepts.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err.
Lean	65	0	1	0.74	0.055
Sustainability	65	0	1	0.89	0.039
Both	65	0	1	0.63	0.060

Our survey contained a structured question with predetermined answers regarding the particular “lean” and “sustainability” tools used (a total of 23 tools) by the respondents. Figure 1.85 presents the top seven “lean” and “sustainability” tools and we can observe that ISO Standards (75.38%), 5S (64.62%), and Problem Solving (56.62%) are the most used tools in the interviewed companies. The other ones recorded over 40% of responses: Kaizen (47.69%), Kanban (44.62%), EMS—Environmental Management System (43.08%), and Jidoka (41.54%) and are entitled to be included in our top seven “lean” and “sustainability” tools used by respondents.

After coding our responses with “1” for “Yes, I use this tool” and “0” for “No, but it’s implemented in the company”, in Table 1.58 we can observe the relative small SD and SE values indicating that the responses are more concentrated around value “1”, thus can be included in the top seven “lean” and “sustainability” tools used by respondents.

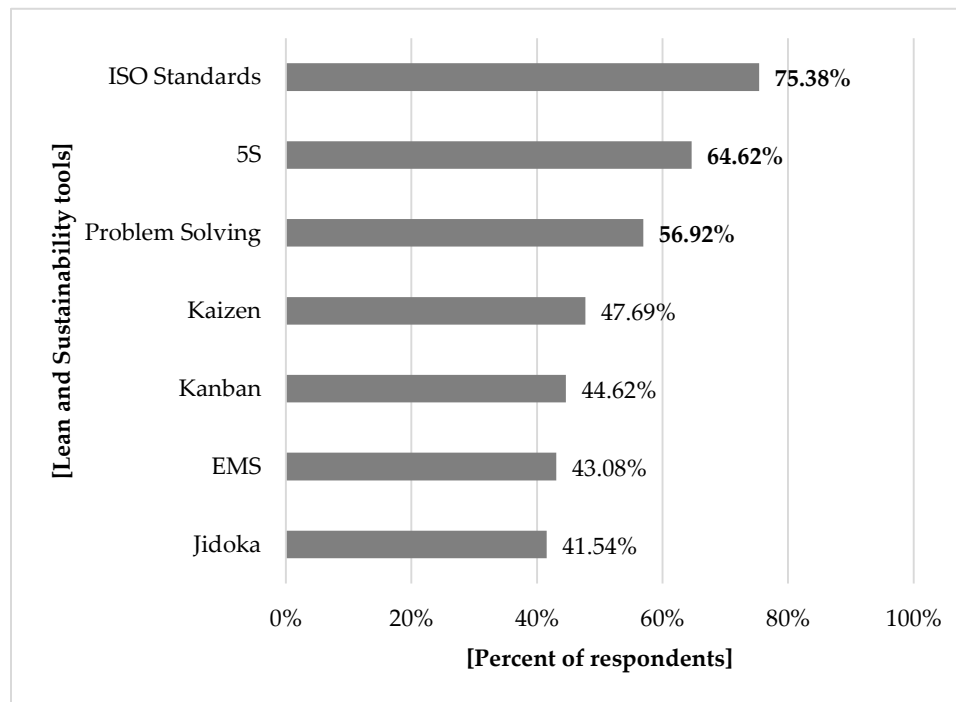


Figure 1.85. Top seven “lean” and “sustainability” tools used by respondents.

Table 1.58. Descriptive statistics for the top seven “lean” and “sustainability” tools used by respondents.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Statistic
ISO Standards	65	0	1	0.75	0.434
5S	65	0	1	0.65	0.482
Problem Solving	65	0	1	0.57	0.499
Kaizen	65	0	1	0.48	0.503
Kanban	65	0	1	0.45	0.501

EMS	65	0	1	0.43	0.062	0.499
Jidoka	65	0	1	0.42	0.062	0.497

The same structured question with predetermined answers regarding “lean” and “sustainability” tools shows the ones not particular used by respondents but implemented in the company. Thus, Figure 1.86 presents the top seven “lean” and “sustainability” tools not particular used by respondents but implemented in the company. We can observe that Kaikaku (89.23%), SMED—Single-Minute Exchange of Dies (83.08%), and Six Sigma (81.54%) are the most implemented tools, while six of them: JIT (Just in Time), Bottleneck Analysis, SFM (Shop Floor Management), GRI (Global Report Initiative), EMAS (Eco Management and Audit Scheme), and RECP (Resource Efficient and Cleaner Production) record the same value (78.46%).

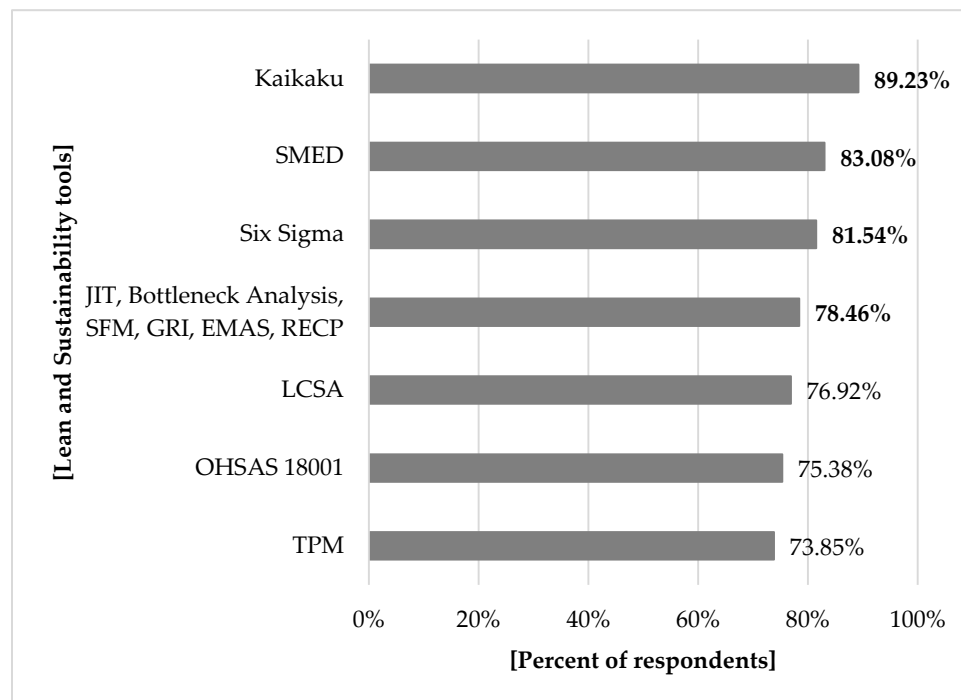


Figure 1.86. Top seven “lean” and “sustainability” tools not used particularly by respondents but implemented in the company.

Using the same responses coding principle, as mentioned above, in Table 1.59 we present the computed values of the SD, SE and Mean for the tools included in the top seven “lean” and “sustainability” tools not used by respondents but implemented in the company. The small values of the Mean indicate that the responses are more concentrated around value “0”, meaning that the

tools are not particularly used by respondents, but they do have knowledge of them being used in the company.

Table 1.59. Descriptive statistics for the top seven “lean” and “sustainability” tools not used by respondents but implemented in the company.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err.
Kaikaku	65	0	1	0.11	0.039
SMED	65	0	1	0.17	0.047
Six Sigma	65	0	1	0.18	0.048
JIT	65	0	1	0.22	0.051
Bottleneck Analysis	65	0	1	0.22	0.051
SFM	65	0	1	0.22	0.051
GRI	65	0	1	0.22	0.051
EMAS	65	0	1	0.22	0.051
RECP	65	0	1	0.22	0.051
LCSA	65	0	1	0.23	0.053
OHSAS 18001	65	0	1	0.25	0.054
TPM	65	0	1	0.26	0.055

Figure 1.87 presents (a) the percentage of respondents receiving training for the lean tools used (52.31%), while (b) for the ones receiving training for the sustainability tools used (36.91%), showing that the distribution for receiving and not receiving training are all most the same (50–50%).



Figure 1.87. Percentage of respondents receiving training for the used tools: **(a)** Lean tools; and **(b)** sustainability tools.

Table 1.60 show the distribution of respondents being trained for the “lean” and “sustainability” tools they use. We coded their answers with the following values: “1” for receiving training and “0” for not receiving values. Looking at the mean, SE, and SD values we observe that the answers are divided almost evenly between “receiving training” and “not receiving training”.

Table 1.60. Descriptive statistics for respondents receiving training for the used “lean” and “sustainability” tools.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err.
Lean tools training	65	0	1	0.52	0.062
Sustainability tools training	65	0	1	0.37	0.060

Figure 1.88 presents the percentage of respondents by the type of training received for the used “lean” and “sustainability” tools. A standing out observations is that 44.62% did not receive training or we recorded missing values, while 29.23% received internal company training, and others are self-taught (6.15%).



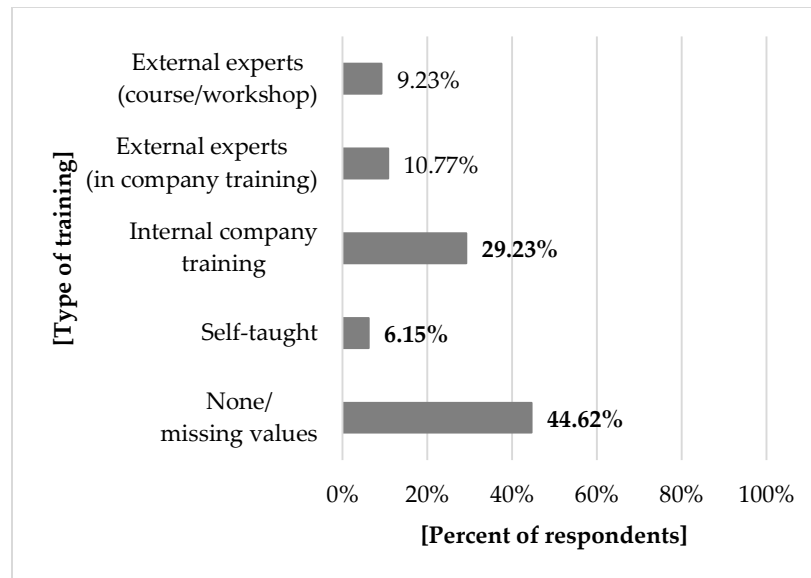


Figure 1.88. The percentage of respondents based on type of training received for the used tools.

To analyze the type of training received for the used methods, Table 1.61, we agreed on five possible answers: “0” for none/missing values, “1” for self-taught”, “2” for in house training/in company training, “3” for external experts—in house training and “4” for external experts—course/workshop. The relative high values of the mean (1.34) and SD (1.384) suggest that the answers are concentrated around no training received/missing values.

Table 1.61. Descriptive statistics for the number of respondents based on the type of training received for the tools (own calculation).

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err.
Training methods used	65	0	4	1.34	0.172
					1.384

We provided the list of the 17 Sustainable Development Goals (for reference see Table 1) in order to find out if they are pursued by the company. Thus, Figure 1.89 reports the top seven goals identified as pursued by the company and we observed that the main pursued goals are: decent work and economic growth (69.23%); industry innovation and infrastructure (64.62%); and responsible consumption and production (61.54%).

Out of the 17 Sustainable Development Goals presented in the first part of our paper (Table 1), we identify the top seven Sustainable Development Goals pursued by companies involved in

our study, based on a frequency of appearance analysis. To analyze the distribution of our answers we coded with “0” for “No, it isn’t an objective of the company”, “1” for “Yes, it’s an objective of the company” and “2” for “I don’t have knowledge about this”. The values of the mean and SD indicate that the answers are more concentrated around value 1, thus the seven goals can be included in our top, Table 1.62.

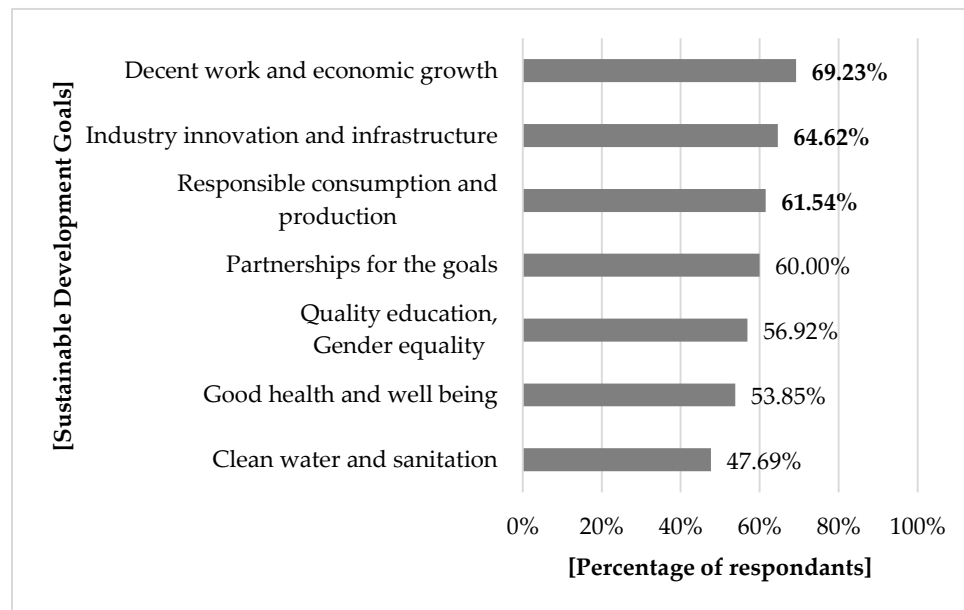


Figure 1.89. Top seven Sustainable Development Goals pursued by the respondents’ company.

Table 1.62. Descriptive statistics for the top seven Sustainable Development Goals pursued by the respondents’ company.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Statistic
Decent work and economic growth	65	0	2	0.88	0.545
Industry innovation and infrastructure	65	0	2	0.86	0.583
Responsible consumption and production	65	0	2	0.86	0.609
Partnerships for the goals	65	0	2	0.94	0.634
Quality education	65	0	2	0.91	0.655
Gender equality	65	0	2	0.82	0.635
Good health and well being	65	0	2	0.85	0.667
Climate action	65	0	2	0.68	0.752

Figure 11 presents (a) the percentage of respondents considering lean tools useful for the company (72.31%), while (b) the percentage of respondents considering sustainability tools useful for the company (84.62%), showing a mainly positive perception upon the overall usefulness on the tools.

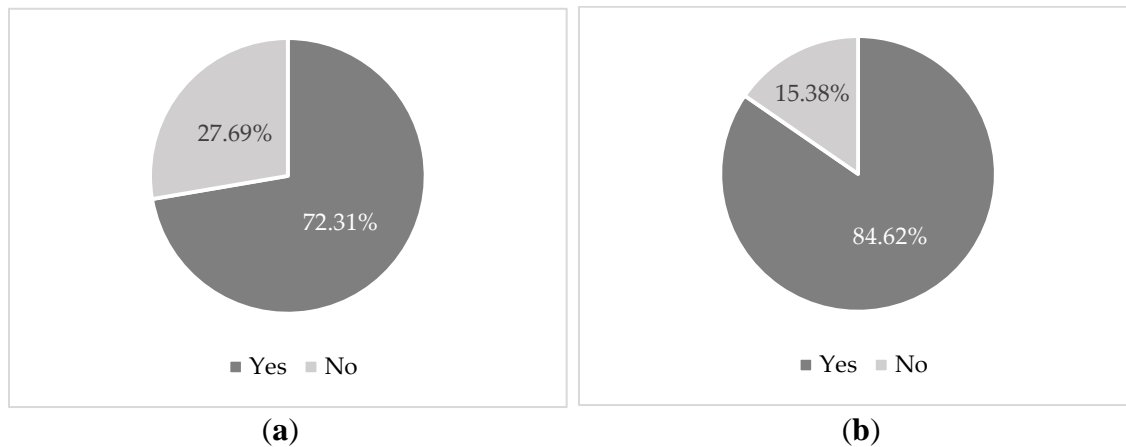


Figure 1.90. Percentage of respondents considering the concepts useful for the company: (a) Lean; and (b) sustainability.

Being a dichotomic response question, we coded the answers with “0” for not considering the tools useful, and “1” for considering the tools useful, thus the mean (0.72, respectively 0.85) and SD (0.451, respectively 0.364) show that the answers are concentrate around value 1, indicating a large number of respondents considering the tools useful for their company (see Table 1.63).

Table 1.63. Descriptive statistics for the respondents considering the concepts useful for the company.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err
Considering “lean” tools useful	65	0	1	0.72	0.056
Considering “sustainability” tools useful	65	0	1	0.85	0.045

Using a five-point Likert Scale Figure 1.91 presents the cumulative percentage of high and maximum values for the order of each benefits in the companies’ activity based on respondents’ perception: quality assurance (89.23%), working standards (81.54%), and visual management

(78.46%) being the top activities in which “lean” and “sustainability” tool implementation brought benefits.

Based on our five-point Likert scale, the high mean and SD values, Table 1.64, indicate that responses are concentrated around high and maximum values (4 and 5, respectively) based on respondents’ perception upon the activities in which “lean” and “sustainability” tool implementation brought benefits.



Figure 1.91. Company activity benefits after tool implementation, based on respondents’ perceptions.

Table 1.64. Descriptive statistics for company activity benefits after tool implementation, based on respondents’ perceptions.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err.
Stocks	65	1	5	3.74	0.139
Suppliers	65	2	5	3.86	0.109

Maintenance	65	1	5	4.02	0.127	1.023
Production planning	65	1	5	4.05	0.131	1.052
Team	65	1	5	4.09	0.120	0.964
Working processes	65	1	5	4.11	0.126	1.017
Visual management	65	2	5	4.15	0.103	0.833
Working standards	65	2	5	4.28	0.109	0.875
Quality	65	2	5	4.45	0.096	0.771

Using a five-point Likert Scale Figure 1.92 presents the cumulative percentage of high and maximum values for respondents' perception upon each overall company benefit brought by "lean" and "sustainability" tool implementation. Since some company benefits reported the same value, we placed them in groups. Focusing on the first three groups of benefits: Process and Material Losses Reduction, Increasing Resource Efficiency and Customer Satisfaction (83.08%), Cost Reduction and Increasing Product Quality (80.00%), and Productivity Improvement and Company Image Improvement (78.46%) we can also consider them high priority objectives for the overall company activity and the main reason for which companies implement "lean" and "sustainability" tools.

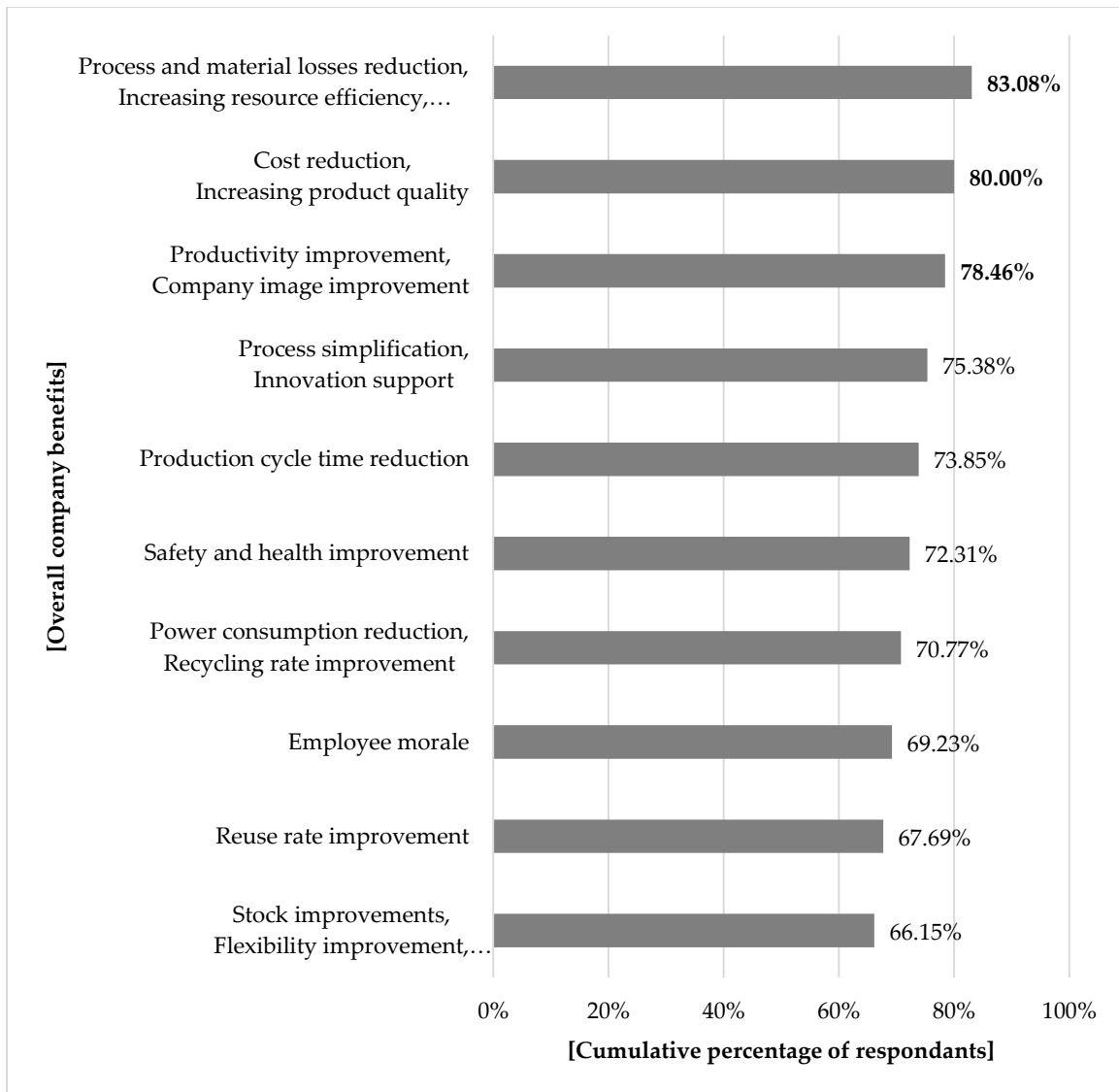


Figure 1.92. Top 10 overall company benefits based on respondents' perception.

Using the same responses coding principle for the five-point Likert scale, as mentioned above, in Table 1.65 we present the computed values of the SD, SE, and mean for the top overall company benefits brought by the “lean” and “sustainability” tools implementation and observed by the company employees. the high mean and SD values indicate that responses are concentrate around high and maximum values (4 and 5, respectively) based on respondents' perceptions upon the observed overall company benefits.

Table 1.65. Descriptive statistics for the top 10 overall company benefits based on respondents' perceptions.

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err. Statistic
Flexibility improvement	65	2	5	3.88	0.119 0.960
Production risk reduction	65	1	5	3.89	0.122 0.986
Employee morale	65	2	5	3.89	0.112 0.904
Reuse rate improvement	65	1	5	3.92	0.125 1.005
Stock improvements	65	2	5	3.95	0.113 0.909
Recycling rate improvement	65	1	5	3.97	0.132 1.060
Power consumption reduction	65	1	5	4.00	0.124 1.000
Safety and health improvement	65	1	5	4.05	0.113 0.909
Innovation support	65	2	5	4.06	0.103 0.827
Process simplification	65	2	5	4.11	0.105 0.850
Company image improvement	65	1	5	4.12	0.104 0.839
Production cycle time reduction	65	3	5	4.18	0.103 0.827
Productivity improvement	65	2	5	4.23	0.107 0.862
Customer satisfaction	65	2	5	4.25	0.096 0.771
Cost reduction	65	2	5	4.25	0.101 0.811
Increasing product quality	65	2	5	4.25	0.105 0.848
Increasing resource efficiency	65	2	5	4.28	0.102 0.820
Process and material losses reduction	65	2	5	4.32	0.098 0.793

Recoding our five-point Likert scale to a three-point Likert scale for a better view of the results, Figure 1.93 presents the frequencies of appearance for the most common drawbacks in the company's activity. From our respondents' experience, the most common drawbacks with low frequency appearance are: Over-production (46.15%), Transport (46.15%), Material or Product

Stocks (43.08%), Over-processing (41.54%) and Motion (41.54%), while the most drawbacks with high frequency of appearance are Waiting (46.16%) and Defects or Scrap (40.00%).

Based on our observations, the high mean and SD values, Table 1.66, indicate that the answers regarding the company's activity drawback frequencies are concentrated around the middle area, with two of them being in the high and maximum area ("Defect or Scrap" and "Waiting") thus probably influenced by the company's business industry sector. For a better understanding of our results see Figure 1.93, in which we recoded our five-point Likert scale to a three-point Likert scale.

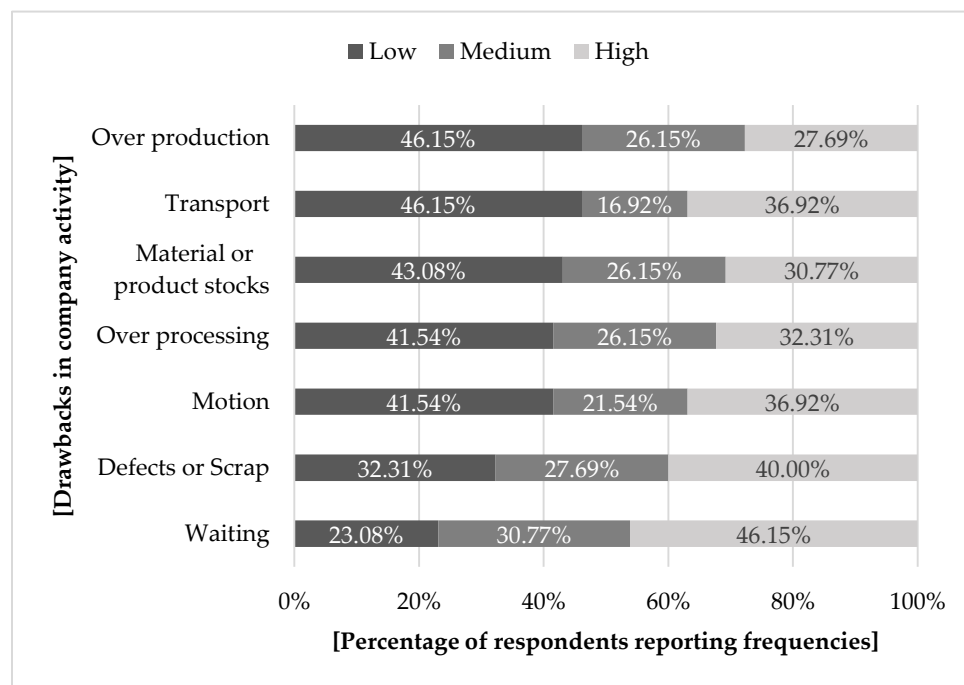


Figure 1.93. Drawback frequencies in company's activity based on respondents' experiences.

Table 1.66. Descriptive statistics for drawback frequencies in company's activity based on respondents' experiences (own calculation).

	N	Min.	Max.	Mean	Std. Dev.
	Statistic	Statistic	Statistic	Statistic	Std. Err.
Over production	65	1	5	2.55	0.171
Transport	65	1	5	2.72	0.175
Material or product stocks	65	1	5	2.75	0.149



Over processing	65	1	5	2.78	0.163	1.317
Motion	65	1	5	2.91	0.161	1.296
Defects or Scrap	65	1	5	3.06	0.162	1.310
Waiting	65	1	5	3.45	0.154	1.238

From Figure 1.94 we can observe that a high percentage of respondents have the knowledge of an annual sustainability report out of which 26.15% use an unstandardized report, while 30.77% create a standardized report based on the GRI (Global Report Initiative) recommendations. The rest of the respondents replied that the company does not create an annual sustainability report (7.69%) and a considerable percent replied as not having knowledge about all of the company's annual reports (35.38%).

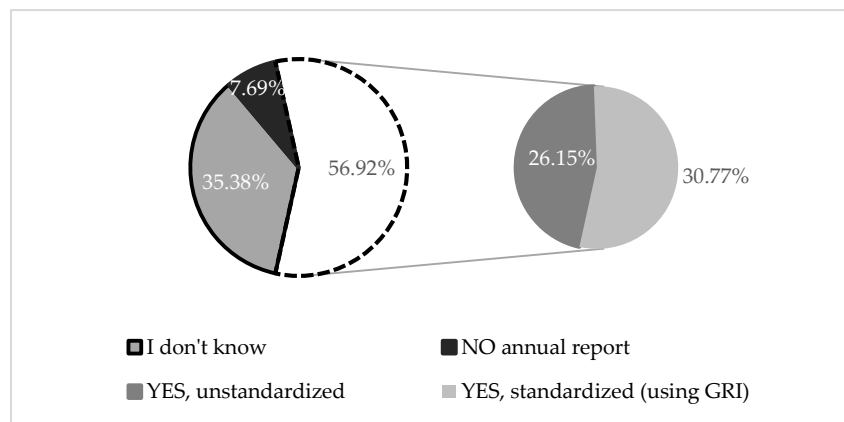


Figure 1.94. The existence of an annual sustainability company report based on respondents' answer.

To observe the existence of an annual sustainability report in the company we agreed on five possible answers: “0” for “No annual report”, “1” for “Yes, standardized (using GRI)”, “2” for “YES, unstandardized” and “3” for “I don’t know”. The relative high values of the mean (1.89) and SD (0.986) suggest that the answers are concentrated around existing an annual report standardized or not, Table 1.67. Another thing that the values suggest it that a considerable amount of respondent do not have knowledge about an existing report. For a better understanding of our results see Figure 15.

Table 1.67. Descriptive statistics for the existence of an annual sustainability company report based on respondents' answers.

	N	Min.	Max.	Mean	Std. Dev.	
	Statistic	Statistic	Statistic	Statistic	Std. Err.	Statistic
Company annual sustainability report	65	0	3	1.89	0.122	0.986

### Proposal for a New Method and Enterprise Game

The new instrument/game proposed (developed by the team of researchers) can be described using the MOSTO model (Mission, Objectives, Strategy, Tactics, and Operationalization) as follows:

- **Mission:** Raise awareness regarding the necessity for improvement of anyone's activity in order to be competitive and sustainable.
- **Objectives:** To decrease/eliminate non-value-added activities (wastes) and increase value-added activities.
- **Strategy:** Integrated use of lean and sustainability tools.
- **Tactics:** Use of enterprise games which integrate lean and sustainability tools.
- **Operationalization:** Using the SLIM game.

Playing this game will allow players: to participate to actual enterprise processes, to evaluate the process, to identify value added and non-value-added activities, to reduce/eliminate non-value-added activities and improve value-added activities, redesign the processes to eliminate wastes, apply lean and sustainability tools, and measure the efficiency of proposed solution through an aggregated indicator (SLIM indicator). The SLIM game flowchart is presented in Figure 1.95. To explain in more details the algorithm of our game, we present the Figure 1.96.

The game proposes a number of posts to cover the flow of production to meet client demands, and also the client. This includes: a warehouse for parts required for production/assembly (plastic building blocks), the production processes (assembling the parts), quality control, the manager and the client, but also the supervisor (who should be trained before the game started, or it should be

one who has previously played the game). Each post will receive the job description sheet and all the forms required for the activity.

There should be at least two rounds (a round simulates a production shift/day). This is in order to compare the results of the rounds, based on proposed indicators, but also on the basis of the players' suggestions filed in the observations form.

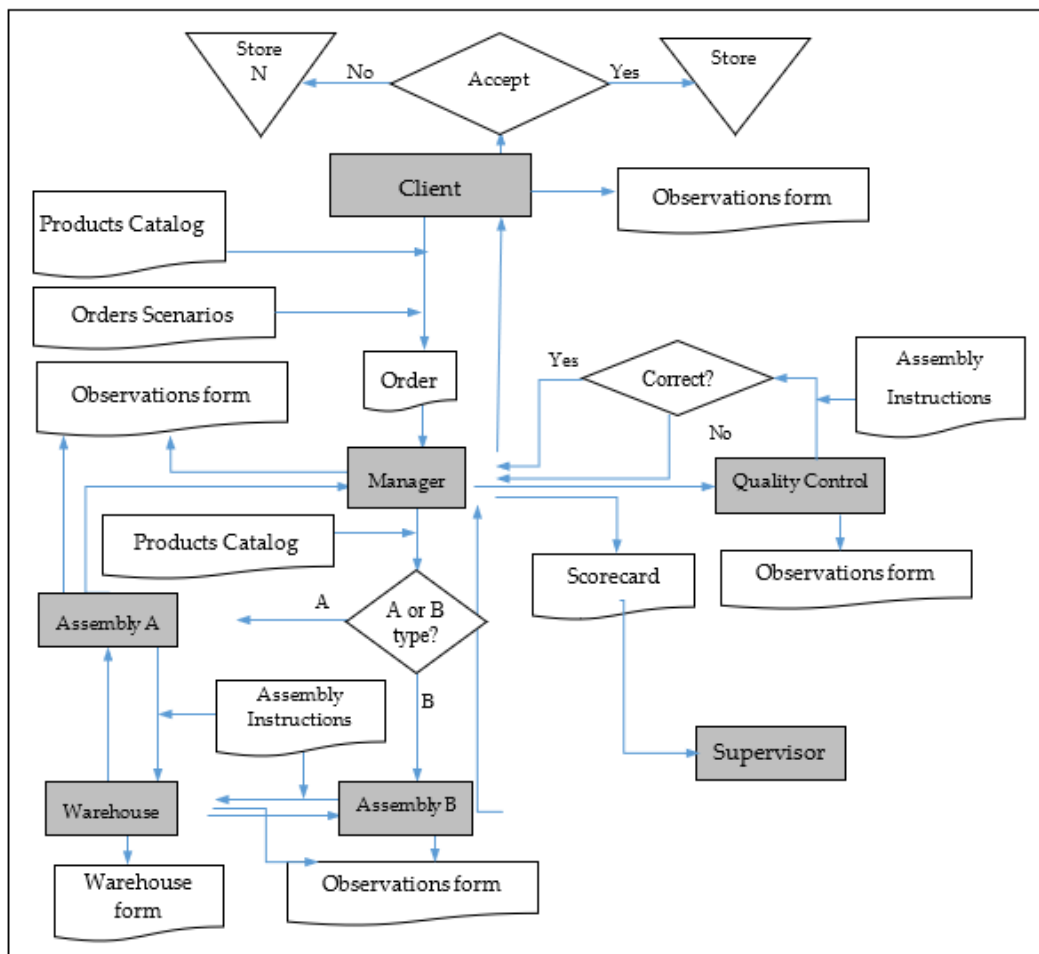


Figure 1.95. SLIM game flowchart.

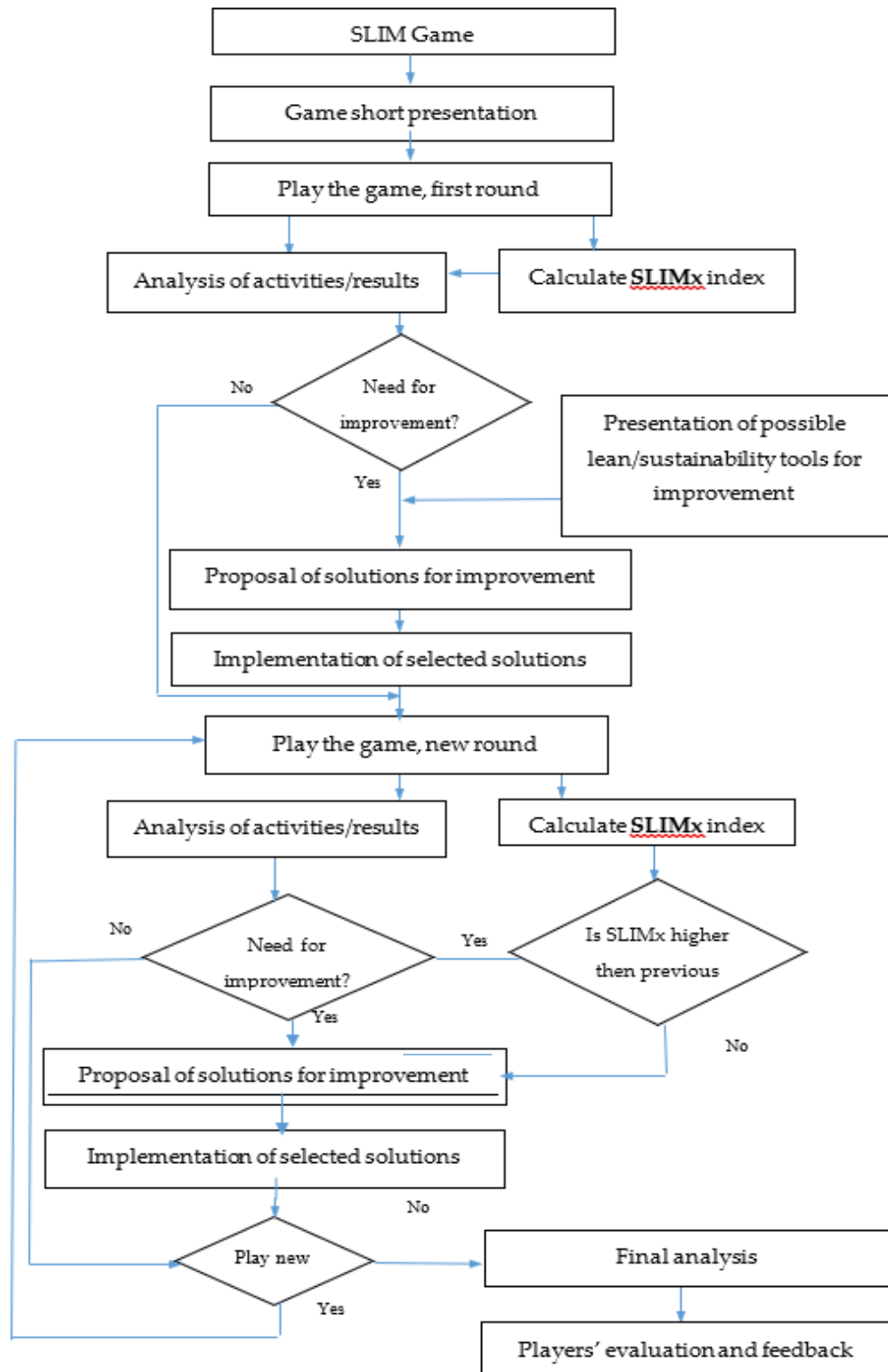


Figure 1.96. SLIM game algorithm.

We propose a SLIM aggregate index (SLIMx) that includes loss reduction and improvements using lean and sustainability tools. The SLIMx index is measured in points and, like in a game, more points means the system/activity is more “slim”. The formula for SLIMx was finalized and validated after the game was tested (see the game test phase section), and it is presented in Equation (1.3.23):

$$SLIMx_i = NPD_i + 0RC_i + 0QC_i + I_{PCT(\Delta i)} + I_{WP(\Delta i)} + I_{SC} \text{ (pts)} \rightarrow \text{maxim} \quad (1.3.23)$$

where:

$SLIMx_i$  = SLIM index for round i (pts);

$NPD_i$  = Number of Products Delivered to Client in round i (pts), where 1 piece = 1 point; and

$0RC_i$  = Indicator of “Zero Rejected Products by Client” (pts) (Equation (1.3.24)):

$$0RC_i = \begin{cases} 5, & \text{client rejected products} = 0 \\ 0, & \text{client rejected products} \neq 0 \end{cases} \quad (1.3.24)$$

$0QC_i$  = Indicator of “Zero Products Not Passing Quality Control” (pts) (Equation (1.3.25)):

$$0QC_i = \begin{cases} 5, & \text{products not passing Quality Control} = 0 \\ 0, & \text{products not passing Quality Control} \neq 0 \end{cases} \quad (1.3.25)$$

$I_{PCT(\Delta i)}$  = Indicator of Production Cycle Time (PCT) improvement (decrease) from the previous round, calculated from the second round on Equation (1.3.26):

$$I_{PCT(\Delta i)} = \begin{cases} 5, & 20\% < PCT \text{ improvement} \\ 3, & 10\% < PCT \text{ improvement} \leq 20\% \\ 1, & 0\% < PCT \text{ improvement} \leq 10\% \\ 0, & PCT \text{ improvement} = 0\% \end{cases} \quad (1.3.26)$$

$$PCT \text{ improvement} = \frac{PCT_{i-1} - PCT_i}{PCT_{i-1}} \cdot 100 \quad (1.3.27)$$

$I_{WP(\Delta i)}$  = Indicator of Workforce Productivity (WP) improvement (increase) from the previous round, calculated from the second round on Equation (1.3.28):

$$I_{WP(\Delta i)} = \begin{cases} 5, & 20\% < WP \text{ improvement} \\ 3, & 10\% < WP \text{ improvement} \leq 20\% \\ 1, & 0\% < WP \text{ improvement} \leq 10\% \\ 0, & WP \text{ improvement} = 0\% \end{cases} \quad (1.3.28)$$

$$WP\ improvement = \frac{WP_i - WP_{i-1}}{WP_{i-1}} \cdot 100 \quad (1.3.29)$$

I<sub>SC</sub> = indicator for Standard Compliant Activity (pts), which measures the players' activity with respect to the standards in place (procedure, rules, work instructions on job description, fill in necessary forms completely and correctly).

This last indicator is an objective one and is estimated by the supervisor, using a scale from 0–5 (from “not at all compliant” to “totally compliant”). All other indicators are objective and can be calculated from scorecard form (by who play the manager role or anybody else appointed by the manager). From the indicator formula, we can see that SLIM index can be as minimum as 0 (activity is not “slim”) and can go more than 10 point for round one, and 20+ for further rounds.

During each round, and between rounds, players are encouraged to write down all the problems/inconsistencies encountered in their activity, as well as possible solutions to resolve problems and for improvement. To analyze and improve the activity it is intended to propose players to use known lean and sustainability tools. The most useful tools would be here: Kaizen, 5S, Poka Yoke, Bottleneck Analysis, 7 Wastes, LCA (Life Cycle Assessment), Eco-design, Learning curve, Pull systems, and Problem solving (Trial and Error Method). From these tools students are successfully applying the following: improve each time you can (does not matter how little), sort, set in order, clean, standardize (make rules and follow them), make a habit of doing the right and only the right activity, the right way and at right time, analyzing all types of waste possible, make time to analyze the activity (player's own activity and the entire game activity), and try new ways of doing it (even if will not leading to improvement, using the trial and error learning method).

The solutions proposed by the players are discussed, approved (by the manager or by vote) and implemented. All procedures/forms needed to be modified are modified. Being a game, rewards/prizes can be considered and offered for different results obtained by the players during the game and at the end for individual and/or team success.

In the end, discussions may be moderated to find possibilities of implementing improvement proposals in enterprises, at the workplace of the players.

The game is flexible in different ways: duration, type and number of post/players, activities, ordering scenarios, etc. The game can run for a minimum recommendation of 60 min, but it can

take up to two, four, or more hours, depending on the duration of a round (recommended between 15 and 45 min), depending on the number of players (minimum six, without a maximum), depending on the number of spare parts available, or depending on the customer order scenario (more or less products can be ordered, or less or more often during a round). Other types of posts can be added: logistics (transport between posts may be one of the most probable/frequent problems), human resources (player/employee evaluation), accounting and financial (to assess the results and establish the efficiency of the activity), and marketing (to promote products, establish new products, etc.).

We recommend to start the game without prior training of the players, all that they need to know and do is written in the job description. Additionally, the work instructions must be sufficiently detailed and clear that the activity can be performed, but with obvious (or less obvious) possibilities for improvement, such as: better activities description, more detailed information, clearer/larger pictures and step-by-step or piece-by-piece assembly algorithms. The game space should be sufficient, but also with the possibility to extend it if players propose, when bottlenecks appear on the activity flows.

The game was tested by playing it in a new educational laboratory with 15 players over three rounds, with teachers playing the supervisor position. The new educational laboratory, called “LeanSusLab” was created especially for teaching students using games, in the framework of a research project “Research and didactic laboratory: “Lean and Sustainability”. The test results exceeded expectations. The players were happy, even delighted, by the game (general feedback score of 4.87 out of 5), as a role playing game (4.80) with the possibility to participate on actual processes of an enterprise, by individual and team work requirements, by the interactivity (4.93), and by the applicability of what they learn (4.60). Game shortcomings were more related to playing the game, as they do not understand exactly what and how they are supposed to do their job. A great deal of improvement possibilities and solutions were pointed out, and some of them were implemented with relative success (the trial and error method was emphasized). Following the game test in the laboratory, we validated the algorithm, activities, and forms of the game, and the SLIMx indicator was finalized as in Equation (1.3.23) previously presented (with subindicators in Equations (1.3.24)–(1.3.28)).

Possible application of the instrument/game are: students use the game for training in the mentioned domain (engineering and management) with the possibility to expand to other connected domain, at all levels (license, master, doctorate); the use of anyone who wants to perfect lifelong (post and pre-university level) learning; employees' use from the enterprises for professional perfection; and the use of potential employees and the unemployed for professional perfection/reconversion.

The use potential in the social and economic environments can be related to the possibility to exploit the intellectual property rights, especially for universities and other institutions and organizations/companies that offer training services.

The game has a limited number of job types, but with possibilities of extension already mentioned. Game applicability is limited to production processes, but with possibilities of extension to any workplace. It was designed as a paper-based system, which can be changed to a digitally-based system, using ITC technologies, mobile technologies—especially which can be used easily by players to check their role, responsibilities, work instructions, and forms to be filled in (digitally). These can help automated computation of results into KPIs, and the extension of KPIs used.

As future research the game should be used for education purposes in university and outside university, in companies interested in solutions for activity improvement. This supposes that the game should be tailored to meet specific needs anytime it is used. Before any use of the game, a needs study should be carried out, using the questionnaire already designed, but which can be modified according to research purposes.

The current research should be continued, and the questionnaire should be applied again in the future, at least yearly, with extension of the number of target companies/employees. The results can help improve the game to have a larger applicability in student education and in industry.



## Partea a II- a

## 2. Achievements. Development perspectives

According to the METHODOLOGY for obtaining the habilitation certificate at the Politehnica University of Timisoara - according to National Education Law, MECTS Order no. 5664/2012, Order no. 6560/2012 and Order no.3121/2015, respectively to UPT Senate Decision no. 152/16.07.2015 .

Achievements and Proposal to develop the academic career addresses two basic issues: **teaching and professional activity** and **research activity**. Career development proposal is based on the candidate's achievements materialized until now and continue with the description of which will focus its future work.

### 2.1. Teaching directions

#### *A1) Achievements until now*

In October 1998 I was hired as a substitute tutor in the Department of Management, University "Politehnica" of Timisoara. I held this post until 2000. In the period October 2000 - September 2006 I worked as assistant titular in the same department and from October 2006 to the present as a lecturer, obtaining Ph.D. title with distinction „CUM LAUDE” in Management in 2005.

As a member of the Department of Management have compiled and organized laboratory works, project and seminars at disciplines: Economic Engineering, Management, Marketing, Management Development Research, Industrial Engineering, Maintenance of production systems, and later as a lecturer teaching courses on : Economic-Financial Analysis, Public Marketing, Microeconomic Performance Analysis, Management and Marketing and Financial Management for the Department of Lifelong Learning in “Politehnica” University of Timisoara.

Following completion of training courses: **Strategic Management and Marketing** held by professors from the University of Tennessee, Knoxville USA, I - we filled domain knowledge and practical skills used then as a teacher.

I also attended a train the trainer trainings for adults, resulting in 2010 CNFPA trainer certificate for adults to be active as a trainer in the Department of Lifelong Learning at the “Politehnica” University of Timisoara.

Also in international grant - ResEUr – Certified EU Researcher-Entrepreneur (Leonardo da Vinci – Multilateral project, Development of Innovation Contract nr. 503021-LLP-1-2009-1-BE-LEONARDO-LMP I had the opportunity to develop my competencies and skills trainer, participating since October 2009 in many training of trainers sessions and getting from Europea Certification&Qualification Association (ECQA) in January 2013 the certificate trainer for entrepreneurs researchers.

I was part of the team that **developed** a new laboratory in the Department - *"Laboratory integrated solutions for business"* – in that were integrated ERP - SAP solutions and Microsoft Dynamic Nav.

During the period 15 to 28 July 2009, as a lecturer courses, I was involved in the "Central and South Eastern European Management" Program - the first summer school at the “Politehnica” University of Timisoara.

To complete my training level, from the perspective of university teacher especially a scientist, I followed in October 2010 - September 2012 training program post - doctoral, within School Post-Doctoral Scholar in Economics of the project "Post-Doctoral Studies in Economics: training program for elite researchers", organized by the Romanian Academy. Thus graduating in 2011 - Part I - "Deepening specialized and interdisciplinary training", participating in many interdisciplinary training conferences such as: Logic and general methodology of scientific research; Complexity theory (deterministic chaos); Cyclicity; Globalization and economic integration; Macroeconomic adjustment Policies; Multi, inter and transdisciplinarity in scientific research; Psycho-sociological foundations of economic behavior.

The entire teaching and professional activity was supported by the publication of several specialized books, manuals, courses, guidance for practical activities as sole author or co-author (6 books at recognized publishing houses - **5 in the last 6 years** and 1 course in lithography, a complex material in e-learning in English in the last 5 years, all for higher education as direct

support to ensure a high quality level of teaching. At the end of 2012 I completed two guides for practical activities that will address the students but also people who have concerns in this area.

In 2014, I published a chapter in the monograph Prof.univ.dr. Ion PETRESCU (Brasov) - the appearance of the book "Contributions to the shaping of a Romanian management model", Expert Publishing House, Bucharest, 2014.

In preparing each course had information linking concern with current standards. The analytical programs of the disciplines mentioned includes own research concerns and those taken from the specialized literature, aiming at increasing applied valence of the specialist in Engineering and Management. Thus, I maintained a permanent contact with some production companies from Timisoara, where I coordinated the diploma projects and annual practicing of the students. These companies are: Leman Industry SRL Timisoara, AEM-Luxten Timisoara, ELBA SA Timisoara, ETA- 2u Timisoara, Green Forest Timisoara, Texas Instruments Debrecen Hungary, Lasting System Timisoara, Trident Timisoara, Electrica Alba, Transelectrica Timisoara etc.

Teaching and practical skills training is based on efficient techniques for applying of theoretical principles that include: examples, demonstration case studies (computer-aided, respectively by materials created for engaging students in team work). Rhythm of instruction I adapted according to students' ability.

The didactic approach will be centered on the student, using appropriate methods in the field, and delivering teaching materials to support him / her in developing the skills needed to be able to practice as specialists in business companies.

The didactic activity is based on the three systematized directions, in:

1. **How should it be done?** - which tools, methods, technologies, marketing programs, reporting standards, the most appropriate and up-to-date programming languages used by companies in the business environment
2. **What needs to be done?** – what are the directions to be followed for training future professionals

3. **Why should it be done?** – to increase the employability of students and master students in companies in the field graduated.

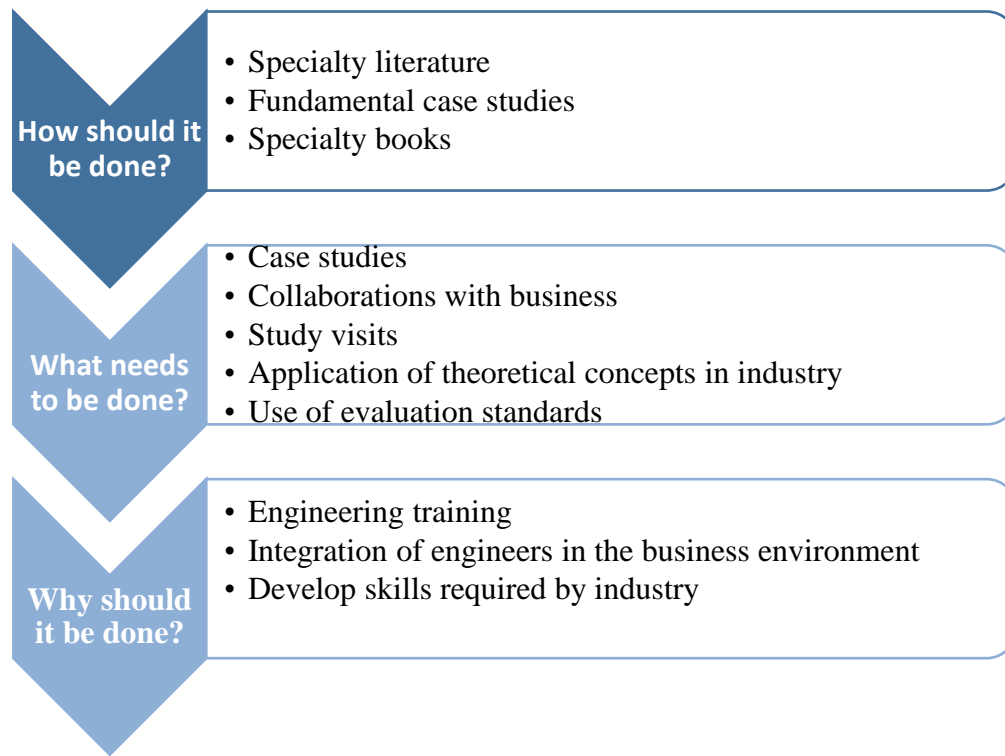


Figure 2.1. Directions concerned with didactic activity

The areas covered so far, that support my research and teaching are presented in figure Figure 2.2.

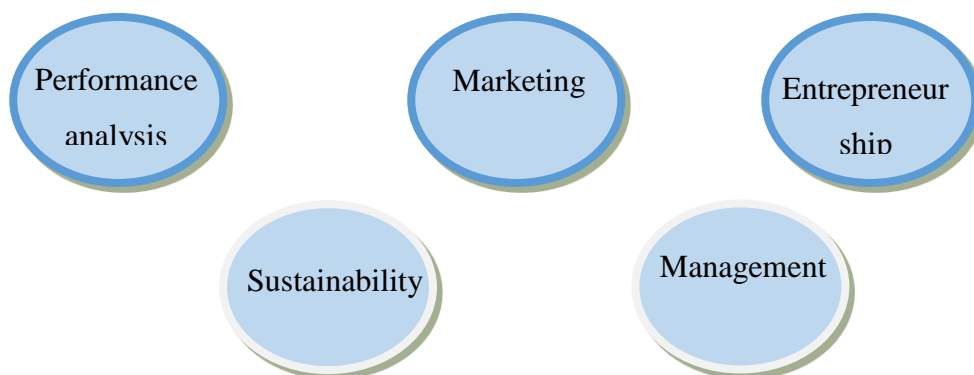


Figure 2.2. Target areas

Both the recognition of professional activity and personal concern for its development believe it is proven in a relevant way by the fact that in recent years I have been co-opted as an expert in professional teams with different occasions, among which I can mention:

- ✓ expert within the **PHARE 2003 Programme - Economic and Social Cohesion Development of Human Resources - Promoting Human Capital**, for the project *"Formative actions for staff decision in SMEs in the context of a dynamic development of the integrated business in the knowledge society"*
- ✓ expert within the **PHARE 2007 Programme - Technical Assistance for the Development of SMEs in Romania for V West Region** for component 4 of the program.
- ✓ expert within the Leonardo international project **"Reference Materials "E-Report"** (Development of reference materials and a set of guidance materials for e-learning), being the author of the material and students tutor for Marketing discipline in e-learning system.
- ✓ expert in international project Tempus 2009-2012 **"Higher Education Learning Partnership"**, being responsible for the training module: Market studies and Market segmentation.
- ✓ expert within the project "CONCORD - National Network for Continuing Education of Teachers in Preuniversity Education", being trainer for the discipline "Educational Marketing".
- ✓ Trainer in Creative Entrepreneurship Project 2018.
- ✓ quality expert in the DTP1-1-454-3.1/2017 - Electric, Electronic and Green Urban Transport Systems.

**Membership** of professional organizations such as: General Association of Engineers in Romania; Association of Managers and Economists Engineers; Association for Multidisciplinary Research from West Region of Romania; Romanian Academic Management Society etc.

I have intensified the professional collaborations outside the university, having the opportunity to work with:

- Prof.univ.dr. Florin Sabin Foltean (Timisoara) - publication of the study "The impact of the educational system on entrepreneurial dynamics", Academiei Publishing House, Bucharest 2012
- Prof.univ.dr. Ion PETRESCU (Brasov) – the appearance of the book "Contributions to shaping a Romanian management model", Expert Publishing House, Bucharest, 2014.
- Assoc.Prof. Daniel PAVLOV (Ruse Bulgaria) – bilateral project 2010-2012 and now the INTERGEN project
- Assoc.prof Dmitri PLETNEV(Rusia) – in order to publish a book on entrepreneurship
- Prof.univ.dr.Nicolae BIBU respectively Conf.univ.dr Valentin MUNTEANU, for organizing the International Management Symposium (last 3 editions).

Specifically, the teaching results obtained so far are:

- ✓ Professor Bologna Award obtained in 2017 following the nomination of the students
- ✓ Publishing teaching materials in accordance with the requirements of education and the economic environment.
- ✓ Maintaining collaboration with teachers from Romania and abroad
- ✓ Training as evaluator on different directions

#### ***A2) Proposals for the development of teaching career***

Regarding the development of teaching career, given that my application will be accepted for the contest for the post of associate professor, will focus my attention on the necessary conditions of employment in the future post of professor and co-fulfillment conditions for obtaining the Ph.D leadership in engineering and management.

As a result, one of my major concerns should be research activity to include support to publish as many papers in prestigious international journals.

The didactic activity present is divided into three major directions: marketing, management and analysis of financial and economic performance at the microeconomic level. So I think I need in the next years to publish books, or specialty manuals that focus on addressing the above listed concepts of entrepreneurial perspective introducing elements and new approaches specific

entrepreneurship education, which I have developed in the international team of Grant research ResEUR - Certified EU Researcher-Entrepreneur.

I would also like one of the pillars in the future development of my teaching and professional career to be coordination and conducting diploma and dissertation diploma closely correlated with business medium from the real world. Also want besides teaching courses and classical seminars to develop extracurricular educational activities in the international master programs taught in English, or postgraduate study programs.

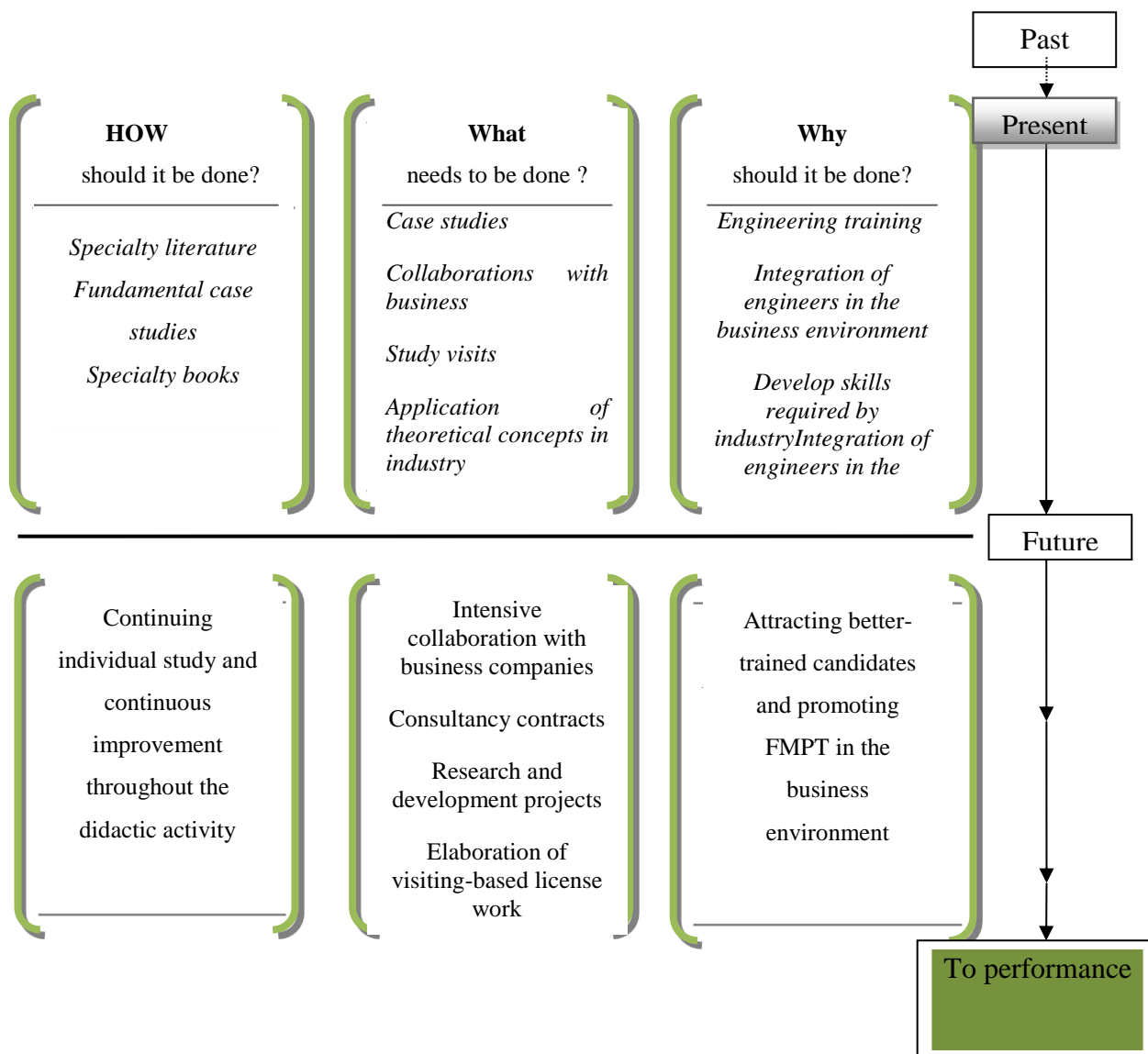


Figure 2.3. Directions for the development of didactic activity



Because personal opinion, teaching is not just about teaching the students the knowledge, as important is their evaluation and dialogue that they have with the teachers, I propose to remove from my future teaching any form of assessment subjective and also believe that dialogue with students, both in courses and seminars and consultations hours should be encouraged and continuously developed.

In terms of international visibility, I want to accumulate more experience in terms of working with students, both through my participation as a trainer in some summer schools and as a visiting professor at various universities abroad.

## **2.2. Research directions**

### ***B1) The results of the research activity until now***

In terms of the undersigned research first important milestone is to develop the thesis entitled "The role of strategic planning in the management of SMEs". Thesis was presented publicly on 22 September 2005 and was confirmed by OMEdC No . 5657/12.12.2005.

The second benchmark is at least as important is the - Graduation Component II - in the School Post-Doctoral Scholar in Economics from the project "Post-Doctoral Studies in Economics: training program for elite researchers" - by developing postdoctoral dissertation "The impact of education system on the dynamics of entrepreneurial - international comparative perspective" and its public support in September 20, 2012, confirmed by the awarding of the Romanian Academy Graduation certificate No.48/27.02.2013.

Permanent concern for development of researcher career in parallel with that of teacher has resulted in the publication of over 40 articles (in the last ten years), almost 20 indexed ISI and participation in numerous international conferences held in the country and abroad.

The research activity focuses on four directions: involvement in the organization of prestigious conferences, involvement in various research and consultancy projects, involvement of students in research activity, publication of personal research in prestigious journals and conferences.

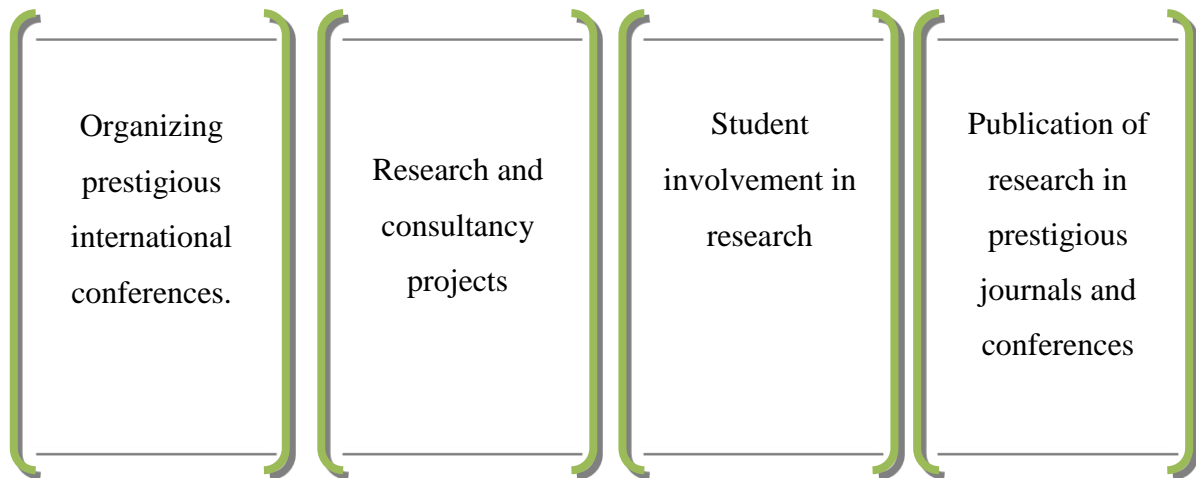


Figure 2.4. Directions of the research activity

Starting with 2013 I organized the International Management Symposium, being General Chair and member of the organizing committee:

1. SIM2013: Challenges and Innovation in Management and Leadership – WOS indexed edition (Clarivate Analytics)
2. SIM2015: Management During and After the Economic Crisis - WOS indexed (Clarivate Analytics)
3. SIM2017 : Challenges and Innovation in Management and Entrepreneurship - indexed Elsevier, under WOS indexing (Clarivate Analytics).

A third point of reference, in terms of research, it is the opportunity by winning a research grant competition, as project manager. It is an bilaterally international research project 451CB/11.10.2010, entitled “*Comparative study regarding the training needs for development of entrepreneurial competences in the context of E.U. post-integration*”. Can I say that was a big challenge both from a scientific perspective but also coordination and synchronization of the two teams of researchers.

Especially regarding the last step I have been particularly useful experience and expertise gained over 10 years as a member of the team of researchers in local and external projects. Besides the work done in recent years include participation as a member of **6 national research grants** awarded by competition, **6 grants** from the **international competition** (3 **Erasmus IP** programs

(2008, 2009 and 2018) and two Leonardo (2005-2007), and 1 cross border cooperation) and many others research and development agreements with third parties as a **member** of the research team, as follows:

- PNII no. 91-069 / 14.09.2007 - "Partnership for research excellence in the development of entrepreneurial skills and competitive human capital in the economy and society based on knowledge and innovation," coordinating Technical University of Iasi, partners "Politehnica" University of Timisoara, Technical University of Cluj and "Lucian Blaga" University of Sibiu.
- CEEX CEx05-D8-77/19.10.2005 - Scenarios forecasting Romanian economy sectors and industries with innovative potential towards 2020 - INOVFOR at that "Politehnica" University of Timisoara is the contractor and the partners are: National Research Institute for Labour and Social Protection Bucharest (INCSMPS), National Institute of Research - Development for Optoelectronics Bucharest (INOE 2000), National Research Institute for Research - Development for Automation Bucharest (IPA), the Center for Urban and Regional Sociology (CURS).
- CEEX CEx05-D8-59/10.10.2005 Social Responsibility in Romanian companies in European context RSE & EU. In this project the contractor is National Research Institute for Labour and Social Protection Bucharest (INCSMPS). The other partners are the "Politehnica" University of Timisoara, National Institute of Research - Development for Optoelectronics Bucharest (INOE 2000), National Research Institute of Research - Development for Automation Bucharest (IPA) and the Center for Urban and Regional Sociology (CURS).
- Grant CNCSIS nr. 27688 /14.03.2005, CNCSIS code 650, Theme 25: Strategies speed in project management. Achieving an expert system for integrated risk in projects
- ResEUr – Certified EU Researcher-Entrepreneur (Leonardo da Vinci – Multilateral project, Development of Innovation Contract nr. 503021-LLP-1-2009-1-BE-LEONARDO-LMP)
- ERASMUS-IPUC-1- 230/12/08, 2009 - ERASMUS IP "Central and South Eastern European Management", beneficiary FACHHOCHSCHULE DES BFI WIEN and UPT.
- 2005 – 2025 / 001 – 001 LE2-51OREF, Reference Materials "E-Report" (Development of reference materials and a set of guidance materials for e-learning), beneficiary Leonardo Agency Italy

- 451CB/11.10.2010-2012 - Comparative study regarding the training needs for development of entrepreneurial competences in the context of E.U. post-integration – Project manager
- BC 116/ 29.11.2016 - Fundamental studies on: Evolution of economic activities, respectively socio-demographic evolution, for Ghiroda Commune, Timis village - formed from Ghiroda and Giarmata-Vii. - Project manager.
- DTP1-1-454-3.1/2017 - Electric, Electronic and Green Urban Transport Systems – Expert quality
- CNFIS-FDI-2017-0310 - Incubation of a student entrepreneurial company within Polytechnic University of Timisoara - Trainer.
- PHARE Project 2003(5.12.2006-5.02.2007) – “Formative actions for SME decision-makers in the context of the dynamic development of integrated business in the knowledge society ”- Expert in the project.
- PN-II-RU-TE-2014-4-1761(2014-2016) - Impact of economic and financial stability on investment, innovation process and entrepreneurial activity in the EU - Researcher

Also, since 2005 I have been **collaborating** in many **research contract** between the "Politehnica" University of Timisoara and companies like Leman Industry SRL Timisoara. (Contract 31/10.03.2008) entitled "*Introduction of 5 S system at Leman Industry SRL Timisoara*"; Green Forest Timisoara (Contract 745/19.09.2007) entitled "*Optimizing management system of production and distribution*"; "CCIA Mehedinti (Contract 484/10.07.2007) entitled "*Study on the preparation of the integration of SMEs from Drobeta Turnu Severin County in the European Union*" respectively "Expert Consulting Timisoara (Contract 225/10.01.2006) entitled "*Study on business consultancy market in Timisoara.* ", or as a project manager for the research contract between the "Politehnica" University of Timisoara and public administration(Contract BC 117/ 29.11.2016) entitled “*Support Studies regarding circulation’s organization, mobility and transport for Ghiroda village*”.

Other results obtained in the research activity are:

- Member of more than 15 doctoral commissions in internship (at Politehnica University of Timisoara and West University)

- Member committee for evaluation and public support of 6 doctoral theses (at Politehnica University of Timisoara and West University)
- Obtaining the "The BEST Paper Award" at the MakeLearn 2018 Conference, Napoli, Italy.

I am a member of the editorial board or reviewer for various scientific events:

- Journal of Entrepreneurship & Innovation, ISSN 1314-0175 – since 2012
- Studies in Higher Education (WOS) – since 2013
- Management Studies (ISSN 2328-2185, USA) – since 2014
- Universal Journal of Management (ISSN 2331-9577)- since 2015
- SIM Conference 2013,
- SIM Conference 2015,
- SIM Conference 2017.

From the perspective of research, I involved students in research. The research was finalized with the publication of the papers in indexed journals in international databases:

1. Larisa Ruxandra Caciulan, Laura Anca Mihart, Denisa Florena Vagner, Miruna Georgiana Vodislav, Larisa Ivascu, **Matei Tamasila**, Evaluating the impact of promotional activity on marketing, Scientific Bulletin of the Polytechnic University of Timisoara (Engineering and Management), volum 3 (1), 2017, ISSN 2392-7364, pp. 7-13
2. Buica Cristina, Stochita Bianca, Selegian Alex Bogdan, Vanjan Alina, Ivascu Larisa, **Tamasila Matei**, Student Centered Education: Directions, Objectives and Motivating Factors, Research Hub Journal (Special Issue on Information Science: Data, Information & Knowledge in Digital World), vol. 4(1), january 2018, ISSN: 2180-0065, pp. 19-30, Malaysia.

The scientific value of the results obtained in the research activity is certified by publishing articles in national and international conferences under the auspices of prestigious professional

organizations, most of them being indexed Clarivate Analytics or other BDI. Among the most important ones:

Studies:

1) Pugna Adrian, Buciuman Cella, Pavlov Daniel, Negru-Strauti Gabriela, Tăucean Ilie Mihai, **Tămășilă Matei**, Todorova Milena, Enimaneva Svetoslava, Ruskova Svilen, Gedinach Viktoriya “*Comparative study regarding the training needs for development of entrepreneurial competences in the context of EU post-integration*”, Primax Ltd. Publishing House, Ruse, Bulgaria 2012, ISBN 978-954-8675-30-7;

2) Post-doctoral dissertation **Tămășilă Matei** “*The impact of education system on the dynamics of entrepreneurial - international comparative perspective*”, Romanian Academy Publishing House, Bucharest, 2013, Vol. 4 - “*Studies and research on the impact of research and innovation on economic progress*”, pg.1039-1096, ISBN 978-973-27-2290-4.

Articles:

1) Ilie Mihai Tăucean, **Matei Tămășilă**, Larisa Ivascu, Șerban Miclea and Mircea Negruț, “*Integrating Sustainability and Lean: SLIM Method and Enterprise Game Proposed*”, SUSTAINABILITY 2019, **Volume: 11 Issue: 7**, Pages: 2103; **factor de impact = 2,075**, <https://doi.org/10.3390/su11072103> (**quartila Q2, zona galbenă**)

2) Albulescu Claudiu, **Tămășilă Matei** “*Exploring the role of FDI in enhancing the entrepreneurial activity in Europe: a panel data analysis*”, INTERNATIONAL ENTREPRENEURSHIP AND MANAGEMENT JOURNAL, **Volume: 12 Issue: 3, Pages: 629-657**, September 2016.(**indexed WOS Clarivate Analytics**)

3) Albulescu Claudiu, **Tămășilă Matei**, Ilie Tăucean “*Shadow economy, tax policies, institutional weakness and financial stability in selected OECD countries*”, ECONOMICS BULLETIN, Volume: 36 Issue: 3 Pages: 1868-+ , 2016.(**indexed WOS Clarivate Analytics**).

4) Albulescu Claudiu, Miclea Șerban, Suciu Simina, **Tămășilă Matei** “*Firm-level investment in the extractive industry from CEE countries: the role of macroeconomic uncertainty*”

and internal conditions”, EURASIAN BUSINESS REVIEW, **Volume: 8 Issue: 2, Pages: 193-208**, June 2018.(**indexed WOS Clarivate Analytics**)

5) **Tămășilă Matei**, Tăucean Ilie Mihai “*The comparative analysis of the innovation level for the entrepreneurial education*”, presented at the conference “SOFA 2012, The 5th International Workshop on Computing Applications Szeged Hungarian” published in proceedings of “The 5th International Workshop on Computing Applications Szeged Hungarian”, Vol. 1, pg.715-725; .(**indexed WOS Clarivate Analytics**).

6) Larisa Ivascu, Lucian Cioca, **Tămășilă Matei**, et al – “*Risk Management and an Approach for Introducing Functional Safety in the Development of Automotive E/E Systems*” - Proceedings of the 29th International-Business-Information-Management-Association Conference, SUSTAINABLE ECONOMIC GROWTH, EDUCATION EXCELLENCE, AND INNOVATION MANAGEMENT THROUGH VISION 2020, VOLS I-VII, Edited by:Soliman, KS, Pages: 2595-2601 Viena, Austria; 3-4 May 2017; (**indexed WOS Clarivate Analytics**).

7) Larisa Ivascu, **Tămășilă Matei**, et al – “*Education For Sustainability: Current Status, Prospects, And Directions*” - Proceedings of the 5th Annual International Conference on Cognitive - Social, and Behavioural Sciences, ICCSBS 2017 - THE ANNUAL INTERNATIONAL CONFERENCE ON COGNITIVE - SOCIAL, AND BEHAVIOURAL SCIENCES, Edited by:[Bekirogullari, Z](#); [Minas, MY](#); [Thambusamy, RX](#), Book Series: European Proceedings of Social and Behavioural Sciences, Volume: 20, Pages: 259-267, Brno, Czech Republic; 9-11 January 2017; (**indexed WOS Clarivate Analytics**).

8) **Tămășilă Matei**, Mocan Marian, Tăucean Ilie - Study Regarding Innovation and Entrepreneurship in Romanian SMEs - Proceedings of The 6th International Conference of DAAAM Baltic Industrial Engineering, Tallinn, Estonia; 24 to 26 April 2008; Organized under the auspices of DAAAM International Vienna; Editor Kyttner R; ISBN 978-9985-59-783-5, pg.369-373 (**indexed WOS Clarivate Analytics**).

9) **Matei Tămășilă**, I. Tăucean, C. Albulescu – “*The road to entrepreneurial success: entrepreneurial characteristics vs. social responsibility*” - Proceedings of 4th Review of Management and Economic Engineering International Management Conference, Cluj Napoca, Romania; 18-20 September 2014; **Book Series:** Review of Management and Economic

Engineering International Management Conference, **Pages: 301-314 (indexed WOS Clarivate Analytics).**

**10) Matei Tămășilă,** Pugna A., I. Tăucean,– “*An Enhanced Model To Study Entrepreneurial Intention In Higher Education*” - Metalurgia International, Volume: 18 Issue: 4, Pages: 159-166, Published: 2013 **(indexed WOS Clarivate Analytics).**

**11)Pascu D., Matei Tămășilă, Diaconescu A., Prostean G.** – “*Performing Multi-Criteria Analysis to Solve Municipal Solid Waste Management Problems*” - 31st International-Business-Information-Management-Association Conference, **Milan, Italy; 25-26 April 2018; Innovation Management And Education Excellence Through Vision 2020, VOLS IV –VI**, Edited by:Soliman, KS, Pages: 2289-2298. **(indexed WOS Clarivate Analytics).**

### ***B2) Proposals for future***

Regarding future research, it will run along two main axes. Firstly it is targeting areas: marketing and business management and means for analyzing and diagnosing sustainable performance of company, in which were within my homework: diploma (to obtain the title of engineer), license (for obtaining the economist title) and PhD.

And the second direction, which in fact due to my professional training I want to develop interdisciplinary priority, entrepreneurial approach to business management and marketing, a first step in this direction was made by the subject matter under the postdoctoral program, "Post-doctoral Studies in Economics: training program for elite researchers - SPODE", coordinated by the Romanian Academy.

In this area I want to be a scientist devoted to participation in interdisciplinary, international research teams that help me finishing my researcher profile.

My permanently concern will be to get involve permanent in fundamental or applied research contracts, as well as dissemination activities of research results.

Specifically, I propose the following next years of research: finishing my research on finding financing requirements to continue - expand my research on tandem entrepreneurship - educational system through a new grants as director and also to disseminate results of research conducted in scientific meetings and journals as rated / positioned internationally.



More specifically, in order to increase the relevance and impact of my scientific research in the future, I propose the following:

- Organizing the SIM conference every two years by attracting participants from different countries.
- Publishing two (2) articles per year in Thomson Reuters indexed scientific journals in Engineering and Management.
- Publish a minimum of five (10) articles per year indexed by Thomson Reuters or other databases.
- Presentation of research in relevant scientific events.
- Publishing a Guide for Entrepreneurship and Sustainability.
- Participation in national and international research networks.
- Increasing interest in researches aimed at registering citations
- Participation as a member of 4 research grants with international funding
- Applying for 1 international research grant as project director.
- Continue to collaborate with various companies in the business environment to apply developed concepts and approaches.
- Involvement in the organization of national and international scientific events
- Intensifying the collaboration with Assoc. Prof. Daniel PAVLOV and Assoc. Prof. Dmitri PLETNEV (Russia) for the development and promotion of the concept of "intergenerational family business" as a stress management tool for entrepreneurs.
- Continue research in the following areas: Entrepreneurship, Education and Sustainable Development.

### **2.3. Administrative responsibilities**

For more than 7 years I am the Director of the Management Department at the The Faculty of Management in Production and Transport, Politehnica University of Timisoara, having the responsibilities of coordinating and controlling the functioning of all the departments' structures, elaborating the mission, objectives, strategies and policies, departmental functions, resource management: financial, material, human.

The department I manage, coordinates in the field of "Engineering and Management" four study programs / bachelor's degree: Industrial Economic Engineering, Economic Engineering in Chemical Industry and Materials, Economic Engineering in Construction, Economic Engineering in Electrical, Electronic and Power Engineering; as well as three study / master programs: Entrepreneurial Management in Business Administration, Engineering and Management of Logistic Systems, respectively Engineering and Competitiveness Management, and I have analyzed and participated as chairman of the boards of these study programs, in producing self-evaluation reports for the accreditation for the bachelor cycle, respectively for a new master program in the field - Engineering and Quality and Competitiveness Management (in English), proposed in collaboration with Continental Timisoara.

The Management Department manages the managerial, economic and legal disciplines for all study programs at the Polytechnic University of Timisoara, and is therefore indirectly involved in all the diligence involved in evaluating and ensuring the quality of these programs.

The management activity also includes the following:

- Chairman of the Quality Evaluation and Quality Assurance Commission at the level of the department, supervising the development of the necessary care to ensure the quality of educational processes, research and support.
- Member of two Advisory Committees (Budget and Financial Resources Commission and Student and Alumni Problems Commission) of the Administration Council of the Polytechnic University of Timisoara.
- Member of the Senate of the Polytechnic University of Timisoara, as well as representative of the Management Department.
- Member of two committees of the Senate of the Polytechnic University of Timișoara (Education Commission and Financial Resources Commission).
- Member of the Board of Faculty of Management in Production and Transport, as well as in its specialized commissions (Commission for Strategies and Policies, Education Education Committee and Curriculum Committee and Syllabus)
- Member of the Bachelor's Degree Program: Communication and Public Relations at the Faculty of Communication Sciences, Polytechnic University of Timișoara

- Chairman of the Bachelor's Degree Program: Industrial Economic Engineering
- Chairman of the Master's Programs: Entrepreneurial Management in Business Administration, Engineering and Management of Logistic Systems respectively Engineering and Competitiveness Management.
- Member of the Student Entrepreneurial Society Council of the Politehnica University of Timisoara.
- Member of the graduation commissions (license and dissertation) starting with the June 2012 session until now.
- Vice President of the faculty admissions committee for the Bachelor's and Master's degree courses from July 2012 until now.

I am certified since January 2013 by the Europea Certification & Qualification Association (ECQA) as a trainer for entrepreneurial researchers. (Annex 5 Graduation Certificate\_ECQA).

My training as an expert evaluator ARACIS led to the following activities:

- I have completed all the specific stages of the "Methodology for the registration of the candidates for the acquisition of the quality of ARACIS evaluator expert, compilation and updating of the National Register of ARACIS Evaluators" and thus I was confirmed as ARACIS Evaluator by ARACIS Council Decision No. 53 / 27.10.2016 and included in National Register of Evaluators (RNE) / C11 Commission - Engineering Sciences (II) / Engineering and Management
- As an ARACIS evaluator, I participated in several training actions for evaluating experts, among which I mention: Training within the "Training session of expert evaluators registered in the National Register of ARACIS Evaluators" organized by the "National Agency for Quality Assurance in Higher Education "at Transilvania University in Brasov, February 2017; Graduate courses online, of which I mention "European Standards and Guidelines for Quality Assurance in Higher Education Module I, II and III" 2017; "External Evaluation of Master's Degree Programs" in 2017; "Periodic External Evaluation of Master's Degree Fields" in 2018; " Superior Education Supply vs. High school graduates "in 2018; "External Evaluation Methodology, Standards, Reference Standards and List of Performance Indicators ARACIS" organized by "National Agency

- As an ARACIS evaluator from 2016 until now, I have participated in several missions to periodically evaluate study programs for their accreditation, of which I mention: The Bachelor's Program: Economic Engineering in Mechanical Engineering, Faculty of Managerial Engineering and Technology, University of Oradea, May 2017; Master Program: Engineering and Management of Complex Technical Systems, Faculty of Engineering, Aurel Vlaicu University Arad, May 2017; License Program: Engineering and Environmental Protection in Industry, Faculty of Naval Electromechanics, Maritime University of Constanta, November 2017; Bachelor Program: Industrial Economic Engineering, Faculty of Machine Building, Technical University of Cluj Napoca, April 2018.

I was involved in a series of volunteer activities targeting associations, students, society and education in rural areas. These include:

- As a member of the Steering Committee of the Timișoara Polytechnic Foundation, I was one of the promoters of the "Scholarships for a Future in Polytechnics" project for the period 2010-2014, which aimed at supporting high-school students with perspective and who are facing a material and social problem .
- Member of the team coordinating the charity activity, which takes place annually starting with 2017, entitled "This year, be also Santa Claus".
- Member of the team coordinating the charity activity „A book for the future” - for rural students (2019).
- In May 2011 I was a member of the team that organized the event "Politehnica Foundation Scholars Day"
- Member of the censors committee of the Politehnica Foundation Timisoara.
- Member of the Board of the University Sports Association (ASU)
- Vice President of the Polytechnic Sports Association

In the future I propose:

- Involvement as active as possible, as a result of the experience and expertise gained in university management activities at the level of: department, faculty or university.

- Professional development as an ARACIS evaluator by involving as many evaluations as possible, namely by submitting the application for becoming a permanent member of the ARACIS specialized commissions
- Preoccupation with activities that address the current society, by initiating, supporting and coordinating campaigns to support especially vulnerable young people in order to facilitate their integration and to prevent school dropout.
- Counseling and encouraging students within the Student Entrepreneurship Society, within the Politehnica University of Timișoara, to shape and initiate their own entrepreneurial experiences.
- Continuing and enhancing the involvement in the various bodies and actions for supporting and coordinating the sport activities, which the university promotes.

### 3. References

1. Abel, A. B., 1983. Optimal investment under uncertainty. *American Economic Review*, 73, 228–233.
2. Achillas, C., Moussiopoulos, N., Karagiannidis, A., 2013. The use of multi-criteria decision analysis to tackle waste management problems: A literature review. *Waste Manage. Res.* 31, 115–129. doi: 10.1177/0734242X12470203.
3. Achillas, C., Moussiopoulos, N., Karagiannidis, A., 2013. The use of multi-criteria decision analysis to tackle waste management problems: A literature review. *Waste Manage. Res.* 31, 115–129. doi: 10.1177/0734242X12470203.
4. Adebajo, D.; Laosirihongthong, T.; Samaranayake, P. Prioritizing lean supply chain management initiatives in healthcare service operations, 2016. A fuzzy AHP approach. *Prod. Plan. Control*, 27, 953–966, doi:10.1080/09537287.2016.1164909.
5. ADR Vest, 2009. Stadiul implementarii Programului Operational Regional 2007-2013 Regiunea Vest, [www.adrvest.ro](http://www.adrvest.ro).
6. Afuah, A., C. L. Tucci, 2013. Studying the Origins of Social Entrepreneurship: Compassion and the Role of Embedded Agency, *Academy of Management Review*, 38: 460-463. Ahmad, N., Hoffmann, A., 2012. A Framework for Addressing and Measuring Entrepreneurship. In *Entrepreneurship determinants: culture and capabilities*, Eurostat statistical yearbook.
7. Aivazian, V., Ge, Y. , Qiu, J., 2005. The impact of leverage on firm investment: Canadian evidence. *Journal of Corporate Finance*, 11, 277–291.
8. Albulescu, C. T., Aubin, C. , Goyeau, D., 2017. Stock prices, inflation and inflation uncertainty in the U.S.: Testing the long-run relationship considering Dow Jones sector indexes. *Applied Economics*, 49, 1794–1807.
9. Albulescu, C.T., Tămășilă, M., 2014. The impact of FDI on entrepreneurship in the European Countries. *Procedia - Social and Behavioral Sciences*, 124, 219–228.
10. Aleixo, A.M., Leal, S., Azeiteiro, U.M., 2016. Conceptualization of Sustainable Higher Education Institutions, Roles, Barriers, and Challenges for Sustainability: An exploratory study in Portugal, *Journal of Cleaner Production*, <http://dx.doi.org/10.1016/j.jclepro.2016.11.010>

11. Allesch, A., Brunner, P.H., 2014. Assessment methods for solid waste management: A literature review. *Waste Manage. Res.* 32, 461–473. doi.org/10.1177/0734242X14535653
12. Allingham, M. G., Sandmo, A., 1972. Income tax evasion: a theoretical analysis. *Journal of Public Economics*, 1, 323–338.
13. Allison, P.D., Waterma, R.P., 2002. Fixed–Effects Negative Binomial Regression Models. *Sociological Methodology*, 32(1), 247–265.
14. Al-Samarraie, H., Hurmuzan, S., 2018. A review of brainstorming techniques in higher education, *Journal of Thinking Skills and Creativity*, vol. 27, pp. 78-91. <https://doi.org/10.1016/j.tsc.2017.12.002>
15. Alstete J. W., 2002. On becoming an entrepreneur: an envolving typology. *International Journal of Entrepreneurial Behaviour & Research*, 8, no. 4: 222-234.
16. Alstete J.W., 2002. On becoming an entrepreneur: an envolving typology, *International Journal of Entrepreneurial Behaviour & Research*, Vol 8, Nr.4: 222-234.
17. Altshuller, G., 1999. *The Innovation Algorithm: TRIZ, Systematic Innovation and Technical Creativity*, Technical Innovation Ctr, Worcester.
18. Altshuller, G., 1999. *The Innovation Algorithm: TRIZ, Systematic Innovation and Technical Creativity*. Technical Innovation Ctr, Worcester.
19. Amaral, L.P., Martins, N., Gouveia, J.B., 2015. Quest for a Sustainable University: A Review. *Int. J. Sustain. High. Educ.* 16, 155-172, Available at <http://dx.doi.org/10.1108/IJSHE-02-2013-0017>.
20. Anokhin, S., Schulze, W. S., 2009. Entrepreneurship, innovation, and corruption. *Journal of Business Venturing*, 24, 465–476.
21. Antonopoulos, I.S., Perkoulidis, G., Logothetis, D., 2014. Ranking municipal solid waste treatment alternatives considering sustainability criteria using the analytical hierarchical process tool. *Resour Conserv Recy* 86, 149–159. doi.org/10.1016/j.resconrec.2014.03.002
22. Anwar, S., Sun, S., 2012. FDI and market entry/exit: Evidence from China. *Journal of Asian Economics*, 23(5), 487–498.
23. Arellano, M., Bond, S.R., 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies*, 58, 277–297.

24. Asoni, A., Sanandaji, T., 2014. Taxation and the quality of entrepreneurship, *Journal of Economics*, 113, 101–123.
25. Athayde, R., 2009. Measuring Enterprise Potential in Young People, *Entrepreneurship Theory and Practice*, 31(3), 387-406.
26. Awasthi, R., Bayraktar, N., 2015. Can tax simplification help lower tax corruption? *Eurasian Economic Review*, 5, 297–330.
27. Ayyagari, M., Kosová, R., 2010. Does FDI facilitate domestic entry? Evidence from the Czech Republic. *Review of International Economics*, 18, 14–29.
28. Azjen I., 1991. Theory and planned behaviour, *Organizational Behavior and Human Decision Processes*, 50, no. 2: 179-211.
29. Azmat, F., R. Samaratunge, 2009. Responsible Entrepreneurship in Developing Countries: Understanding the Realities and Complexities, *Journal of Business Ethics*, 90:437-452.
30. Bachmann, R., Elstner, S. , Sims, E. R., 2013. Uncertainty and economic activity: Evidence from business survey data. *American Economic Journal: Macroeconomics*, 5, 217–249.
31. Bagheri, A., Z. A. L. Pihie, 2011. Entrepreneurial leadership: towards a model for learning and Development, *Human Resource Development International*, 14:447-463.
32. Baldwin, R., Taglioni, D., 2006. Gravity for Dummies and Dummies for Gravity Equations. NBER Working Paper no. 12516.
33. Baleanu, V, Irimie, S., Irimie S., 2014. Corporate Social Responsibility in Romania: From Conceptual Frameworks to Concrete Actions, 4th Review of Management and Economic Engineering International Management Conference, 150-157.
34. Baleanu, V., Irimie, S., Ionica, A.C., Irimie, S.I., 2010. Student Support Services Enabling Quality and Sustainability in Higher Education: Academic Advising, 6th International Seminar on the Quality Management in Higher Education, 39-42.
35. Balamoune-Lutz, M., Garelo, P., 2014. Tax structure and entrepreneurship, *Small Business Economics*, 42, 165–190.
36. Barbosa, N., Eiriz, V., 2009. Linking corporate productivity to foreign direct investment: An empirical assessment. *International Business Review*, 18, 1–13.



37. Barr, S., Ford, N.J., Gilg, A.W., 2010. Waste in Exeter, Devon: quantitative and qualitative approaches attitudes towards recycling household waste in exeter, devon: quantitative and qualitative approaches. *Local Environ* 8, 37-41. doi.org/10.1080/1354983032000118561
38. Barrena, R., Font, X., Gabarrell, X., Sanchez, A., 2014. Home composting versus industrial composting: influence of composting system on compost quality with focus on compost stability. *Waste Manag* 34, 1109-1116. doi.org/10.1016/j.wasman.2014.02.008.
39. Barth, M., Rieckmann, M., 2012. Academic staff development as a catalyst for curriculum change towards education for sustainable development: an output perspective, *Cleaner Production Journal*, Vol. 26, 28-36.
40. Barz C, Deaconu S I, Latinovic T, Berdie A, Pop-Vadean A and Horgos M, 2015. PLCs used in smart home control, *IOP Conf. Ser.: Mater. Sci. Eng.* 106 012036
41. Baum, C. F., Caglayan, M. , Talavera, O., 2010. On the investment sensitivity of debt under uncertainty. *Economics Letters*, 106, 25–27.
42. Baum, C. F., Schaffer, M. E. , Stillman, S., 2007. Enhanced routines for instrumental variables/generalized method of moments estimation and testing. *The Stata Journal*, 7, 465–506.
43. Baum, C. F., Schaffer, M. E., Stillman, S., 2003. Instrumental variables and GMM: estimation and testing. *The Stata Journal*, 3, 1–31.
44. Baumann-Pauly, D., C. Wickert, L. J. Spence, A. G. Scherer, 2013. Organizing Corporate Social Responsibility in Small and Large Firms: Size Matters, *Journal of Business Ethics*, 115:693-705.
45. Beer, C., Clark, K. , Jones, D., 2010. Indicators of engagement. *Proceedings of Ascilite Sydney*, 75–86, Sydney: Ascilite.
46. Bejarano, Romero, J. C., 2013. Resolution collaborative de problemes au sein des chaines logistiques: cadre conceptuel, processus et methodologie, *Institut National Polytechnique de Toulouse (INP Toulouse)*.
47. Ben Ruben, R.; Vinodh, S.; Asokan, P. Implementation of Lean Six Sigma Framework with Environmental Considerations in an Indian Automotive Component Manufacturing Firm: A Case Study. *Prod. Plan. Control* 2017, 28, 1193–1211, doi:10.1080/09537287.2017.1357215.

48. Bernanke, B. S., 1983. Irreversibility, uncertainty, and cyclical investment. *The Quarterly Journal of Economics*, 98, 85–106.
49. Bertola, G. , Caballero, R. J., 1994. Irreversibility and aggregate investment. *Review of Economic Studies* 61, 223–246.
50. Besser, T. L., 2012. The consequences of social responsibility for small business owners in small towns, *Business Ethics: A European Review*, 21:129-139.
51. Bin Mansur, D.M.,2002. Entrepreneurship and Innovation Towards the Application. In Liang, T.W. (Ed.), *Entrepreneurship and Innovation in the Knowledge-based Economy: Challenges and Strategies* (pp. 31-38). Tokyo: Asian Productivity Organization.
52. Binding, G. , Dibiasi, A., 2017. Exchange rate uncertainty and firm investment plans evidence from Swiss survey data. *Journal of Macroeconomics*, 51, 1–27.
53. Bird B.J., 1988. Implementing entrepreneurial ideas: the case for intention. *Academy of Management Review* 13, no. 3, 442-453.
54. Biswas, A.K., Farzanegan, M.R., Thum, M., 2012. Pollution, shadow economy and corruption: Theory and evidence. *Ecological Economics*, 75, 114–125.
55. Bititci, U. Mokadam, M., 2010. Development of a collaborative supply chain model, 17th International Conference of the European Operations Management Association, 2009-06-06 - 2009-06-09. (Unpublished)
56. Bitzenis, A., 2006. Determinants of Greek FDI Outflows in the Balkan Region. The Case of Greek entrepreneurs in Bulgaria. *Eastern European Economics*, 44(3), 79–96.
57. Blackburn, K., Bose, N., Capasso, S., 2012. Tax evasion, the underground economy and financial development. *Journal of Economic Behavior & Organization*, 83, 243– 253.
58. Blake, R.B., McCanse, A.A., 1991. *Leadership Dilemmas and Solutions*, Gulf Publishing, Houston.
59. Blomström, M., Kokko, A., 1998. Multinational corporations and spillovers, *Journal of Economic Surveys*, 12(3), 247–277.
60. Blomström, M., Kokko, A., Zejan, M., 2000. *Foreign direct investment: Firm and host country strategies*. London: Palgrave Macmillan.
61. Blundell, R.W., Bond, S.R., 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115–143.

62. Bo, H. , Sterken, E., 2002. Volatility of the interest rate, debt and firm investment: Dutch evidence. *Journal of Corporate Finance*, 8, 179–193.
63. Boldea I, Topor M, Marignetti F, Deaconu S I and Tutelea L., 2010. A Novel Single Stator Dual PM Rotor, Synchronous Machine: topology, circuit model, controlled dynamics simulation and 3D FEM Analysis of Torque Production, 12th International Conference on Optimization of Electrical and Electronic Equipment OPTIM 2010, Brasov, Romania, May 20-22, pp 343-351
64. Bonchiș, E., 2004. Chapter Learning, Child Psychology, Oradea University Publisher
65. Bontempi, M. E., Golinelli, R. , Parigi, G., 2010. Why demand uncertainty curbs investment: evidence from a panel of Italian manufacturing firms, *Journal of Macroeconomics*, 32, 218–238.
66. Bosman, N., Acs, Z.J., Autio, E., Codura, A, Levie, J., 2008. GEM - Global Entrepreneurship Monitor, Executive Report, Babson College, Universidad del Desarrollo.
67. Boutou, A., 2013. Sustainability in Higher Education, Benefits and Career Prospects with an Interdisciplinary Higher Education Degree. Master Thesis in Environmental Studies and Sustainability Science. LUCSUS, Lund University, Sweden.
68. Bowen, H. R., 1953. Social responsibilities of the businessman. New York, NY: Harper & Row.
69. Boyd, J., De Nicoló, G., Jalal, A., 2006. Bank risk-taking and competition revisited: new theory and new evidence, IMF Working Paper 06/297.
70. Boyd, J.H., Graham, S.L., 1986. Risk, regulation, and bank holding company expansion into nonbanking. *Quarterly Review – Federal Reserve Bank of Minneapolis*, 10, 2–17.
71. Boyle, G. W. , Guthrie, G. A., 2003. Investment, Uncertainty, and Liquidity, *The Journal of Finance*, 58, 2143–2166.
72. Brammer, S., A. Millington, 2006. Firm size, organizational visibility and corporate philanthropy: an empirical analysis.” *Business Ethics: A European Review*, 15:6-18.
73. Brauchman, S. and Pashiaridis, P., 2011. A validation study of the leadership styles of a holistic leadership theoretical framework, *International Journal of Education Management*, Vol. 25, No.1, 11-32.

74. Brophy D.J., Shulman J.M., 1992. A finance perspective of entrepreneurship research, *Entrepreneurship Theory and Practice*, Spring: 61-71.
75. Bruce, D., Gurley, T., 2004. Taxes and entrepreneurial entry: an empirical investigation using longitudinal tax return data, *Proceedings of the 97th annual conference on taxation*, National Tax Association, 336–343.
76. Bruce, D., 2000. Effects of the United States tax system on transitions into self-employment. *Labour Economics*, 7, 545–574.
77. Bruckner, M., 2010. Financial determinants of firm dynamics: Evidence from a European panel. *Economics Letters*, 107, 63–65.
78. Calcagnini, G. , Iacobucci, D., 1997. Small Firm Investment and Financing Decisions: An Option Value Approach, *Small Business Economics*, 9, 491–502.
79. Campopiano, G., A. De Massis, and C. Lucio, 2012. Corporate Social Responsibility: A Survey among SMEs in Bergamo, *Procedia - Social and Behavioral Sciences*, 62:325-341.
80. Camuffo, A.; de Stefano, F.; Paolino, C. Safety Reloaded: Lean Operations and High Involvement Work Practices for Sustainable Workplaces. *J. Bus. Ethics* 2015, 143, 245-259. doi: 10.1007/s10551-015-2590-8.
81. Carrol, D., 1991. The Pyramid of Corporate Social Responsibility: Toward the Moral Management of Organisational Stakeholders, *Business Horizons*, 34:39-48.
82. Castka, P., M. A. Balzarova, C. J. Bamber, J. M. Sharp, 2004. How can SMEs effectively implement the CSR agenda? A UK case study perspective, *Corporate Social Responsibility and Environmental Management*, 11:140-149.
83. Caves, R.E., 1996. *Multinational Enterprises and Economic Analysis*. Cambridge Surveys of Economic Literature, (2nd Ed.). Cambridge: Cambridge University Press.
84. Chaiwichit, C., 2016. Developing of the Measurement Model of Self-Directed Learning Characteristics, 4th Annual International Conference on Cognitive - Social, and Behavioural Sciences, Vol. 8, 7-17.
85. Chen, M., Jeon, B.N., Wang, R., Wu, J., 2015. Corruption and bank risk-taking: Evidence from emerging economies, *Emerging Markets Review*, 24, 122–148.
86. Chen, Y.T., Yang, F.-C., Yu, S.-H., 2018. The Diffusion Effect of MSW Recycling, *Sustainability* 10, 40.

87. Cherrafi, A.; Elfezazi, S.; Govindan, K.; Garza-Reyes, J.A.; Benhida, K.; Mokhlis, A. A Framework for the Integration of Green and Lean Six Sigma for Superior Sustainability Performance. *Int. J. Prod. Res.* 2017, 55, 4481–4515, doi:10.1080/00207543.2016.1266406.
88. Chi, N.-W., Wu, C.-Y., Lin, C.Y.-Y., 2008. Does training facilitate SME's performance? *The International Journal of Human Resource Management*, 19(10), 1962–1975.
89. Chichernea, V. Interactive methods used in graduate programs. *Reliab. Qual. Control Pract. Exp. J.* 2007, 2, 171–178.
90. Chirinko, S., 1993. Business fixed investment spending: modelling strategies, empirical results and policy implications. *Journal of Economic Literature*, 31, 1875–1911.
91. Choo S., M. Wong, 2006. Entrepreneurial intentions: triggers and barriers to new ventures creations in Singapore. *Singapore Management Review* 28, 2: 47-64.
92. Christiansen, H. , Ogutcu, M., 2002. Foreign direct investment for development – Maximizing benefits, minimizing costs. OCDE, Global forum on international investment. Attracting foreign direct investment for development, Shanghai, 5-6 December.
93. Cioca, L.-I., Ivascu, L., Rada, E.C., Torretta, V., Ionescu, G., 2015. Sustainable Development and Technological Impact on CO2 Reducing Conditions in Romania. *Sustainability* 7, 1637-1650.
94. Coban, A., Ertis, I.F., Cavdaroglu, N.A., 2018. Municipal solid waste management via multi-criteria decision making methods: A case study in Istanbul, Turkey. *J Clean Prod.* 180, 159-167. doi.org/10.1016/j.jclepro.2018.01.130
95. Condurache, G.; Daianu, D.C.; Taucean, I. Aspects regarding the competences of teacher/trainers in a practice enterprise. In *Proceedings of the International Seminar on Quality Management in Higher Education Location, Quality Management in Higher Education*, Iasi, Romania, 8–10 July 2006; pp. 55–59.
96. Coppa, M. and K. Sriramesh, 2013. Corporate social responsibility among SMEs in Italy, *Public Relations Review*, 39:30-39.
97. Couth, R., Trois, C., 2010. Carbon emissions reduction strategies in Africa from improved waste management: a review. *Waste Manag* 30, 2336-2346. doi.org/10.1016/j.wasman.2010.04.013.

98. Covin J., D. Slevin, 1989. Strategic Management of Small Firms in Hostile and Benign Environments. *Strategic Management Journal*, 10: 75-87.
99. Crow, G.M., 2006. Complexity and the beginning principal in the United States: perspective on socialization”, *Journal of Educational Administration*, Vol.4, No.44, 310-325.
100. Cuciureanu M., Alecu G., Badea D., Catană L., Gheorghe O., Măntăluță O., Mircea A., Tarău I., Țăranu A. M., Voinea L. , Negreanu E., 2015. Institute of Sciences Education, Laboratory of Theory Education.
101. Çule, M., Fulton, M., 2009. Business culture and tax evasion: Why corruption and the unofficial economy can persist. *Journal of Economic Behavior & Organization*, 72, 811–822.
102. Cullen, J. B., Gordon, R. H., 2007. Taxes and entrepreneurial risk-taking: Theory and evidence for the U.S., *Journal of Public Economics*, 91, 1479–1505.
103. Currall, S.C. and Inkpen, A.C., 2002. A multilevel approach to trust in joint ventures. *Journal of International Business Studies* 33, pp 479–495. (Print), 1818-0523 (Online).
104. Czarnitzki, D. , Toole, A. A., 2011. Patent protection, market uncertainty, and R&D investment. *The Review of Economics and Statistics*, 93, 147–159.
105. Da Rin, M., Di Giacomo, M., Sembenelli, A., 2011. Entrepreneurship, firm entry, and the taxation of corporate income: Evidence from Europe, *Journal of Public Economics*, 95, 1048–1066.
106. Da Rin, M., Di Giacomo, M., Sembenelli, A., 2011. Entrepreneurship, firm entry, and the taxation of corporate income: Evidence from Europe. *Journal of Public Economics*, 95, 1048–1066.
107. Dahlbo, H., Poliakova, V., Mylläri, V., Sahimaa, O., Anderson, R., 2018. Recycling potential of post-consumer plastic packaging waste in Finland. *Waste Manage.* 71, 52-61. doi.org/10.1016/j.wasman.2017.10.033
108. Das, D. Development and Validation of a Scale for Measuring Sustainable Supply Chain Management Practices and Performance. *J. Clean. Prod.* 2017, 164, 1344–1362, doi:10.1016/j.jclepro.2017.07.006.
109. De Backer, K., Sleuwaegen, L., 2003. Does foreign direct investment crowd out domestic entrepreneurship?. *Review of Industrial Organization*, 22, 67–84.

110. De Clercq, D., Jolanda, H., Van Stel, A., 2007. Knowledge spillovers through FDI and trade and entrepreneurs' export orientation. Academy of Management Annual Meeting Proceedings, p1.
111. De Maeseneire, W., Claeys, T., 2012. SMEs, foreign direct investment and financial constraints: The case of Belgium. *International Business Review*, 21, 408–424.
112. Dell'Anno, R., Teobaldelli, D., 2015. Keeping Both Corruption and the Shadow Economy in Check: The Role of Decentralization. *International Tax and Public Finance*, 22, 1–40.
113. DeMarzo, P., Fishman, M., He, Z. , Wang, N., 2012. Dynamic agency and the q theory of investment. *Journal of Finance*, 67, 2295–2340.
114. Devonish D., et al., 2010. Explaining entrepreneurial intentions in the Caraibbean. *International Journal of Entrepreneurial Behavior & Research*, 16, no. 2: 149-171.
115. Dixit, A. , Pindyck, R., 1994. *Investment under Uncertainty*. Princeton University Press: Princeton.
116. Djankov, S., Hoekman. B., 2000. Foreign Investment and Productivity Growth in Czech Enterprises. *World Bank Economic Review*, 14, 49–64.
117. Dove, J. A., 2015. The effect of judicial independence on entrepreneurship in the US states. *Economic Systems*, 9, 72–96.
118. Doytch, N., Epperson, N., 2012. FDI and Entrepreneurship in Developing Countries. *Global Science and Technology Forum Business Review*, 1(3), 120–132.
119. Draghici, A. , Ivascu, L., 2016. Students Perception on Higher Education Opportunities, 13th International conference on Efficiency and Responsibility in Education, ISBN 978-80-213-2646-0, 80-86.
120. Draghici, A., Baban, C.F., Ivascu, L.V., Sarca, I., 2015. Key Success Factors for University - Industry Collaboration in Open Innovation, 8th annual International Conference of Education, Research and Innovation (ICERI 2015), pp. 7357-7365
121. Draghici, A., Draghici, G. and Tamasila, M., 2012. Research approaches for entrepreneurship development in high education. 7th International Conference on Quality Management in Higher Education (QMHE 2012), Iasi, 16-17 November.
122. DuBrin, A.J., 1995. *Leadership - Reserch Findings, Practice and Skills*, Houghton Mifflin Company, Boston.

123. Dües, C.M.; Tan, K.H.; Lim, M. Green as the new Lean: How to use Lean practices as a catalyst to greening your supply chain. *J. Clean. Prod.* 2013, 40, 93–100, doi:10.1016/j.jclepro.2011.12.023.
124. Eastham J F, Profumo F, Tenconi A, Hill-Cottingham R J, Coles P C and Gianolio G, 2002. Novel Axial flux Machine for aircraft drive: design and modeling, *IEEE Transactions on Magnetism* 38(5) 3003-3005
125. Egbue, O.; Wang, E.; Eseonu, C. A Lean Life Cycle Framework for Assessing Product Sustainability. In *Proceedings of the IIE Annual Conference and Expo, Montréal, QC, Canada, 31 May–3 June 2014*; pp. 2069–2074.
126. Entriaglo et al., 2000. Characteristics of managers as determinants of entrepreneurial orientation: some Spanish evidence. *Enterprise and Innovation Management Studies*, 1, no. 2: 187-205.
127. Ericson, R., Pakes, A., 1995. Markov-Perfect Industry Dynamics: A Framework for Empirical Work. *Review of Economic Studies*, 62, 53–82.
128. Estay-Ossandon, C., Mena-Nieto, A., Harsch, N., 2018. Using a fuzzy TOPSIS-based scenario analysis to improve municipal solid waste planning and forecasting: A case study of Canary archipelago (1999–2030). *J Clean Prod.* 176, 1198-1212. doi.org/10.1016/j.jclepro.2017.10.324
129. Estrin, S., Mickiewicz, T., 2012. Shadow Economy and Entrepreneurial Entry. *Review of Development Economics*, 16, 559–578.
130. European Commission, 2012. Report on the results of public consultation on The Entrepreneurship 2020 Action Plan. DG Enterprise and Industry.
131. European Commission, 2013. Entrepreneurship 2020 Action Plan. Reigniting the entrepreneurial spirit in Europe. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions.
132. European Commission. Europe 2020: Commission Proposes New Economic Strategy. Available online: <https://ec.europa.eu/social/main.jsp?catId=89&langId=en&newsId=724&furtherNews=yes> (accessed on 30.12.2018).



133. European Commission. Sustainable development in the European Union - monitoring report on progress towards the SDGS in an EU context (2017 edition). Available online: <http://ec.europa.eu/eurostat/documents/3217494/8461633/KS-04-17-780-EN-N.pdf/f7694981-6190-46fb-99d6-d092ce04083f> (accessed 03 February 2018)
134. European Environment Agency. Municipal waste management in Romania. Available online: <https://www.eea.europa.eu/publications/managing-municipal-solid-waste/romania-municipal-waste-management> (accessed 03 February 2018)
135. European Higher Education Area, [Online], Available: <http://www.ehea.info/> [Dec 2017]
136. Faculty of Management in Production and Transportation, [Online], Available: <http://www.mpt.upt.ro> [Jan 2018]
137. Fadahunsi, A., Rosa, P., 2002. Entrepreneurship and Illegality: Insights from the Nigerian cross-border Trade. *Journal of Business Venturing*, 17, 397–429.
138. Faiz T I, 2014. Minimization of Transportation, Installation and Maintenance Operations Costs for Offshore Wind Turbines B.Sc.Eng., Bangladesh University of Engineering and Technology.
139. Farla, K., 2014. Determinants of firms' investment behaviour: a multilevel approach. *Applied Economics*, 46, 4231–4241.
140. Fassin, Y., 2008. SMEs and the fallacy of formalising CSR.” *Business Ethics: A European Review*, 17:364-378.
141. Faulkner, W.; Badurdeen, F. Sustainable Value Stream Mapping (Sus-VSM): Methodology to Visualize and Assess Manufacturing Sustainability Performance. *J. Clean. Prod.* 2014, 85, 8–18, doi:10.1016/j.jclepro.2014.05.042.
142. Fazzari, S., Hubbard, G., Petersen, B., 1988. Financing Constraints and Corporate Investment. *Brookings Papers on Economics Activity*, 1, 141–195.
143. Feniser, C., Burz, G., Mocan, M., Ivascu, L., Gherhes, V., Otel, C.C., 2017. The Evaluation and Application of the TRIZ Method for Increasing Eco-Innovative Levels in SMEs. *Sustainability* 9, 1125.
144. Ferede, E., 2013. Tax progressivity and self-employment: evidence from Canadian provinces. *Small Business Economics*, 40, 141–153.

145. Fernandez-Villaverde, J., Guerron-Quintana, P., Kuester, K. & Rubio-Ramirez, J., 2015. Fiscal volatility shocks and economic activity. *American Economic Review*, 105, 3352–3384.
146. Folster, S., 2002. Do lower taxes stimulate self-employment? *Small Business Economics*, 19, 135–145.
147. Forman, Ernest H., Gass, Saul I, 2001. The Analytic Hierarchy Process – An Exposition, *Operations Research*, vol.49, no. 4, July-Aug, pp. 469-486
148. Frank H., et al., 2005. Entrepreneurial orientation and education in Austrian secondary schools. *Journal of Small Business and Enterprise Development*, 12, no. 2: 259-273.
149. Frees, E.W., 1995. Assessing cross-sectional correlation in panel data. *Journal of Econometrics*, 69, 393–414.
150. Friedman, M., 1937. The use of ranks to avoid the assumption of normality implicit in the analysis of variance. *Journal of the American Statistical Association*, 32, 675–701.
151. Fu, X., 2012. Foreign direct investment and managerial knowledge spillovers through the diffusion of management practices. *Journal of Management Studies*, 49, 970–999.
152. Fuchs, K., Werner, A., Wallau, F., 2008. Entrepreneurship education in Germany and Sweden: what role do different school systems play?. *Journal of Small Business and Enterprise Development*, 15(2), 365-381.
153. Fuller, T., Y. Tian, 2006. Social and Symbolic Capital and Responsible Entrepreneurship: An Empirical Investigation of SME Narratives, *Journal of Business Ethics*, 67:287-304.
154. Fuss, C., Vermeulen, P., 2008. Firms' investment decisions in response to demand and price uncertainty. *Applied Economics*, 40, 2337–2351.
155. Fuss, M., Vasconcelos Barros, R.T., Poganietz, W.-R., 2018. Designing a framework for municipal solid waste management towards sustainability in emerging economy countries - An application to a case study in Belo Horizonte (Brazil). *J Clean Prod.* 178, 655-664.
156. Galio C.M., 2004. The role of mental simulation and counterfactual thinking in the opportunity identification process. *Entrepreneurship Theory and Practice*, 28, no. 6: 533-552.
157. Gallardo-Vázquez, D., and M. I. Sanchez-Hernandez, 2014. Measuring Corporate Social Responsibility for competitive success at a regional level, *Journal of Cleaner Production*, 72:14-22.

158. Gartner W.B., 1985. A conceptual framework for describing the phenomenon of new venture creation, *Academic of Management Review*, October: 702.
159. Gedera, D. S. P, Williams, P. J., 2013, Using Activity Theory to understand contradictions in an online university course facilitated by Moodle. *International Journal of Information Technology and Computer Science (IJITCS)*, 10(1), 32–40.
160. Gellert, F. J., De Graaf, 2012. Corporate social responsibility and aging workforces: an explorative study of corporate social responsibility implementation in small- and medium-sized enterprises, *Business Ethics: A European Review*, 21:353-363.
161. GEM, 2011. The Global Entrepreneurship Monitor. Global Entrepreneurship Research Association.
162. GEM, 2013. Global Entrepreneurship Monitor. 2013 Global Report.
163. Gertler, M. , Gilchrist, S., 1994. Monetary policy, business cycles, and the behaviour of small manufacturing firms. *Quarterly Journal of Economics*, 109, 309–340.
164. Giannetti, M. , Laeven, L. 2016. Local Ownership, Crises, and Asset Prices: Evidence from US Mutual Funds. *Review of Finance*, 20, 947–978.
165. Gibb A., 1993. Small business development in Central and Eastern Europe – opportunity for a rethink?. *Journal of Business Venturing*, 8: 461-486.
166. Gibb A., 2005. Toward the entrepreneurial university: entrepreneurial education as a lever for change, Birmingham, NCGE, disponibil la: [www.ncge.com/files/biblio593.pdf](http://www.ncge.com/files/biblio593.pdf)
167. Gibb A.A., 2002. In pursuit of a new „enterprise” and „entrepreneurship” paradigm for learning:creative destruction, new values, new ways of doing things and new combinations of knowledge, *International Journal and Management Review*, Vol 4, Nr.3 : 233-269.
168. Gieras J F, Wang R J and Kamper M J, 2008. *Axial Flux Permanent Brushless Machines*, Second Edition, Springer Science, Boston, MS USA
169. Gilchrist, S., Himmelberg, C., Huberman, G., 2005. Do stock price bubbles influence corporate investment? *Journal of Monetary Economics*, 52, 805–827.
170. Gilchrist, S., Sim, J. W. , Zakrajšek, E., 2014. Uncertainty, financial frictions, and investment dynamics. NBER Working Paper, no. 20038.
171. Global Report Initiatives – GRI G4 (2016). Available at

172. Glover, B. , Levine, O., 2015. Uncertainty, investment, and managerial incentives. *Journal of Monetary Economics*, 69, 121–137.
173. Godemann, J., Bebbington, J., Herzig, C., Moon, J., 2014. Higher education and sustainable development: exploring possibilities for organisational change. *Account. Auditing Account. Journal*, Vol. 27, 218-233. <http://dx.doi.org/10.1108/AAAJ-12- 2013-1553>.
174. Goedhuys, M., Mohnen, P., Taha, T., 2016. Corruption, innovation and firm growth: firm-level evidence from Egypt and Tunisia. *Eurasian Business Review*, 6, 299–322.
175. Goldratt, E.M., Cox, J., 1992, *The Goal: A Process of Ongoing Improvement*, North River Press, Croton-on-Hudson, NY.
176. González-Fernández, M., González-Velasco, C., 2014. Shadow economy, corruption and public debt in Spain. *Journal of Policy Modeling*, 36, 1101–1117.
177. Görg, H., Strobl, E., 2002. Multinational Companies and Indigenous Development: An Empirical Analysis. *European Economic Review*, 46, 1305–1322.
178. Gorodnichenko, Y., Shapiro, M. D., 2007. Monetary policy when potential output is uncertain: Understanding the growth gamble of the 1990s. *Journal of Monetary Economics*, 54, 1132–1162.
179. Govindan, K.; Azevedo, S.G.; Carvalho, H.; Cruz-Machado, V. Lean, Green and Resilient Practices Influence on Supply Chain Performance: Interpretive Structural Modeling Approach. *Int. J. Environ. Sci. Technol.* 2015, 12, 15–34, doi:10.1007/s13762-013-0409-7.
180. Green R., et al., 1996. The Russian entrepreneur: a study of psychological characteristics. *International Journal of Entrepreneurial Behavior & Research*, 2, no. 1: 49-58.
181. Guerrero, L.A., Maas, G., Hogland, W., 2013. Solid waste management challenges for cities in developing countries. *Waste Manage.* 33(1), 220-232. doi.org/10.1016/j.wasman.2012.09.008
182. Gumus, A.T., 2009. Evaluation of hazardous waste transportation firms by using a two step fuzzy-AHP and TOPSIS methodology. *Expert Syst Appl* 36(2), 4067-4074. doi.org/10.1016/j.eswa.2008.03.013
183. Hall, R. , Jorgenson, D., 1967. Tax policy and investment behaviour. *American Economic Review*, 57, 391–414.

184. Hamalainen R. P. , Seppalainen T., 1986, The analytic network process in energy policy planning. *Socio-econ. Plum. Sci.* 20(6), 399-405.
185. Hannon P., 2004. Making the journey from student to entrepreneur: a review of the existing research into graduate entrepreneurship , National Concile for Graduate Entrepreneurship, Birmingham.
186. Hannon P., 2005. Philosophies of enterprise and entrepreneurship education and challenges for higher education in U.K, *International Journal of Entrepreneurship and Innovation* Vol 6, No.2: 105-114.
187. Harijani, A.M., Mansour, S., Karimi, B., Lee, C.G., 2017. Multi-period sustainable and integrated recycling network for municipal solid waste – A case study in Tehran. *J. Clean. Prod.* 151, 96-108. doi.org/10.1016/j.jclepro.2017.03.030
188. Hartman, R., 1972. The effects of price and cost uncertainty on investment. *Journal of Economic Theory*, 5, 258–266.
189. Haskova, A., Dvorjakova, S., 2016. Analysis of Technology Education Development at Schools in Slovakia, 4th Annual International Conference on Cognitive - Social, and Behavioural Sciences, Vol.8, 236-245.
190. Hausman, J., Hall, B.H., Griliches, Z., 1984. Econometric Models for Count Data with an Application to the Patents-R&D Relationship. *Econometrica*, 52(4), 909–938.
191. Heinonen, J., Poikkijoki, S.A., 2006. An entrepreneurial-directed approach to entrepreneurship education: mission impossible. *Journal of Management Development*, Volume 25, No. 1, pp.80-94.
192. Hejazi, W., Safarian, A.E., 1999. Trade, foreign direct investment, and R&D spillovers. *Journal of International Business Studies*, 30, 491–511.
193. Helm-Stevens R., O. Griego, 2009. A path analysis model for intrinsic and extrinsic academic motivation engagement in service learning. *Review of Business Research*, 9, no. 1: 99-103.
194. Henrekson, M., Johansson, D., Stenkula, M., 2010. Taxation, Labor Market Policy and High-Impact Entrepreneurship. *Journal of Industry, Competition and Trade*, 10, 275–296.

195. Herrera-Echeverri, H., Haar, J., Estévez-Bretón, J.B., 2014. Foreign direct investment, institutional quality, economic freedom and entrepreneurship in emerging markets. *Journal of Business Research*, 67(9), 1921–1932.
196. Hesse, H., Čihák, M., 2007. Cooperative banks and financial stability. IMF Working Paper 07/02.
197. Holley, J., 2005. Building a Regional Entrepreneurship Network: A Guide to Action, ACEnet Institute, [www.networkweaving.com/june\\_files/HowToREN.pdf](http://www.networkweaving.com/june_files/HowToREN.pdf).
198. Hsu, J. - L., and M. - C. Cheng, 2012, “What Prompts Small and Medium Enterprises to Engage in Corporate Social Responsibility? A Study from Taiwan.” *Corporate Social Responsibility and Environmental Management*, 19:288-305.
199. [http://www.unep.org/training/programmes/Instructor%20Version/Part\\_1/readings/Principles\\_%20of\\_Sustainable\\_Development.pdf](http://www.unep.org/training/programmes/Instructor%20Version/Part_1/readings/Principles_%20of_Sustainable_Development.pdf)
200. Huarng, C. - H., 2013. A two-tier business model and its realization for entrepreneurship.” *Journal of Business Research*, 66:2102-2105.
201. Hugos, M. *Enterprise Games: Using Game Mechanics to Build a Better Business*, 1st ed.; O'Reilly Media: Newton, MA, USA, 2012.
202. Husted, L., Rogers, J., Sun, B., 2016. Measuring Monetary Policy Uncertainty: The Federal Reserve, January 1985-January 2016. *International Finance Discussion Papers, IFDP Notes*, April 11.
203. Hytti U., Stenholm P., Heinonen J., 2010. Percieved learning outcomes in entrepreneurship education , *Education + Training*, Vol 52, Nr.8/9: 587-606.
204. Hytti, U., Stenholm, P., Heinonen J., 2010. Perceived learning outcomes in entrepreneurship education. *Education + Training*, Volume 52, No.8/9, pp.587-606.
205. Iftimescu, A. *Business Games. Management of Simulated Enterprises*. Available online: <http://www.scribd.com/doc/121772636/Managementul-intreprinderilor> (accessed on 1 October 2018).
206. Im, K. S., Pesaran, M. H., Shin, Y., 2003. Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115, 53–74.
207. Interactiv Network 2003, “Entrepreneurship in Europe”, <http://www.euractiv.com/en/innovation/entrepreneurship-europe/article-117477>.

208. Ionescu M. , Radu I., 2001. Modern teaching, Dacia Publisher, Cluj-Napoca.
209. Ionita, F.; Cochina, I.; Shuleski. D. Never Stop Playing: Management Games as Valuable Training Tools. In Proceedings of the International Management Conference, Bucharest, Romania, 5–6 November 2015; Volume 9, pp. 266–277.
210. Ito, B., Yashiro, N., Xu, Z., Chen, X.H., Wakasug, R., 2012. How do Chinese industries benefit from FDI spillovers? *China Economic Review*, 23 (2), 342–356.
211. Ivascu, L.; Cioca, L.-I. Occupational Accidents Assessment by Field of Activity and Investigation Model for Prevention and Control. *Safety* 2019, 5, 12.
212. Jackson, E.A., 2015. Competitiveness in Higher Education Practices in Sierra Leone: A model for Sustainable Growth', *Economic Insights Trends and Challenges*, vol. IV, no. 4, pp.15-25
213. Jain, R. K., 2011. Entrepreneurial Competencies: A Meta-analysis and Comprehensive Conceptualization for Future Research, *Vision*, 15:127-152.
214. Javorcik, B.S., 2004. Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. *American Economic Review*, 94, 605–627.
215. Jenkins H. M., 2004. A critique of conventional CSR theory: An SME perspective, *Journal of General Management*, 29:37-57.
216. Jeswani, H.K., Azapagic, A., 2016. Assessing the environmental sustainability of energy recovery from municipal solid waste in the UK. *Waste Manage.* 50, 346-363. doi.org/10.1016/j.wasman.2016.02.010
217. Johnson, B.R., 1990. Toward a Multidimensional Model of Entrepreneurship: The case of Achievement Motivation and the Entrepreneur. *Entrepreneurship: Theory and Practice* (spring), pp.39-54.
218. Jouhara, H., Czajczyńska, D., Ghazal, H., Krzyżyńska, R., Anguilano, L., Reynolds, A.J., Spencer, N., 2017. Municipal waste management systems for domestic use. *Energy* 139, 485-506. doi.org/10.1016/j.energy.2017.07.162
219. Jovanovic, B. , MacDonald, G.M., 1994. The Life Cycle of a Competitive Industry. *Journal of Political Economy*, 102, 322–347.

220. Jovanovic, B., MacDonald, G.M., 1994. The Life Cycle of a Competitive Industry. *Journal of Political Economy*, 102, 322–347.
221. Jovanovic, B., 1982. Selection and the Evolution of Industry. *Econometrica*, 50, 649–670.
222. Kabok, J., Radisic, S., and Kuzmanovic, B., 2017. Cluster analysis of higher-education competitiveness in selected European countries', *Journal of Economic Research*, vol. 30, no.1, pp. 845-857. <https://doi.org/10.1080/1331677X.2017.1305783>
223. Kaiser M.J, Snyder B 2010 Offshore Wind Energy Installation and Decommissioning Cost Estimation on the U.S. Outer Continental Shelf, Energy Research Group, LLC, Baton Rouge, LA, USA.
224. Kalecki, M., 1937. The principle of increasing risk. *Economica*, 4, 440–447.
225. Kang, W., Lee, K. , Ratti, R. A., 2014. Economic policy uncertainty and firm-level investment. *Journal of Macroeconomics*, 39, 42–53.
226. Kano, N., 1984. Attractive quality and must-be quality. *Journal of the Japanese Society for Quality Control*, April, pp.39-48.
227. Kano, N., 1984. Attractive quality and must-be quality", *The Journal of the Japanese Society for Quality Control*, April, 39-48.
228. Kao, C., 1999. Spurious Regression and Residual-Based Tests for Cointegration in Panel Data. *Journal of Econometrics*, 90, 1–44.
229. Kao, C., Chiang, M. -H., 2000. On the estimation and inference of a cointegrated regression in panel data. In B. H. Baltagi, & C. Kao (eds.), *Advances in Econometrics: Nonstationary Panels, Panel Cointegration and Dynamic Panels*, 15 (pp. 179–222), Amsterdam: Elsevier.
230. Karak T., Bhagat, R.M., Bhattacharyya P., 2012. Municipal Solid Waste Generation, Composition, and Management: the world scenario. *Crit Rev Environ Sci Technol* 42, 1509-1630. <http://dx.doi.org/10.1080/10643389.2011.569.871>.
231. Katz J., W. Gartner, 1988. Properties of emerging organizations. *Academy of Management Review*.13, no. 3: 429-441.
232. Kawai, K., Tasaki, T., 2016. Revisiting estimates of municipal solid waste generation per capita and their reliability. *J. Mater. Cycles Waste Manage.* 18, 1–13. [doi.org/10.1007/s10163-015-0355-1](https://doi.org/10.1007/s10163-015-0355-1)



233. Kaya, T., Kahraman, C., 2011. Multicriteria decision making in energy planning using a modified fuzzy TOPSIS methodology. *Expert Syst. Appl.* 38, 6577–6585. doi.org/10.1016/j.eswa.2010.11.081
234. Kayakutlu, G., Daim, T., Kunt, M., Altay, A., Suharto, Y., 2017. Scenarios for regional waste management. *Renew Sust. Energ. Rev.* 74, 1323-1335. doi.org/10.1016/j.rser.2016.11.147.
235. Kazemi, R.M. , Madandar, S., 2012. Identifying the Factors Affecting Entrepreneurial Attitude of Athlete & Non-athlete University Students. *Information Management and Business Review*, 4(6), 352-361.
236. Kelley, D.J., et al., 2012. GEM 2011 Global Report. Babson College, Universidad del Desarrollo (2012)
237. Keuschnigg, C., Nielsen, S. B., 2002. Tax policy, venture capital, and entrepreneurship. *Journal of Public Economics*, 87, 175–203.
238. Kim, M., Jang, Y.-C., Lee, S., 2013. Application of Delphi-AHP methods to select the priorities of WEEE for recycling in a waste management decision-making tool. *J. Environ. Manage.* 128, 941-948. doi.org/10.1016/j.jenvman.2013.06.049
239. Kim, M-K., 2002. A Knowledge Management Model for SMEs in the Knowledge-based Economy. In Liang, T.W. (Ed.), *Entrepreneurship and Innovation in the Knowledge-based Economy: Challenges and Strategies* (pp. 15-30). Tokyo: Asian Productivity Organization.
240. Kim, P.H. , Li, M., 2012. Injecting demand through spillovers: Foreign direct investment, domestic socio-political conditions, and host-country entrepreneurial activity. *Journal of Business Venturing*, [http://dx.doi.org/ 10.1016/j.jbusvent.2012.10.004](http://dx.doi.org/10.1016/j.jbusvent.2012.10.004), forthcoming.
241. Klement M., 2015. Teachers for the knowledge society, Education and psychology challenges- International Conference.
242. Kodila-Tedika, O., Mutascu, M., 2014. Tax Revenues and Intelligence: A Cross-Sectional Evidence. *Economics Bulletin*, 34(1), 469–479.
243. Kohn H.C., 1996. Testing hypotheses of entrepreneurial characteristics. *Journal of Managerial Psychology*, 11, no. 3: 12-25.
244. Konings, J., 2001. The Effects of Foreign Direct Investment on Domestic Firms: Evidence from Firm Panel Data in Emerging Economies. *Economics of Transition*, 9, 619–633.

245. Kraft, H., Schwartz, E. S. , Weiss, F., 2013. Growth options and firm valuation. NBER Working Paper, no 18836.
246. Krueger N., 1993. The impact of prior entrepreneurial exposure on perception of new ventures feasibility and desirability. *Entrepreneurship Theory and Practice*, 18, no. 1: 5-21, 1993
247. Krueger N., 2010. The cognitive infrastructure of opportunity emergence. *Entrepreneurship Theory and Practice*, 24, no. 3: 5-24.
248. Kuratko D. F., and R. M. Hodgetts, 2004. *Entrepreneurship: theory, process, practice*, Ohio, SUA: Thomson South – Western.
249. Kuratko D.F., Hodgetts R.M., 2004. *Entrepreneurship: theory, process, practice*, Thomson South – Western, Ohio, SUA.
250. Laforest, V., Raymond, G., Piatyszek, E., 2013. Choosing cleaner and safer production practices through a multi-criteria approach. *J. Clean. Prod.* 47, 490-503. doi.org/10.1016/j.jclepro.2012.10.031
251. Lang, L., Ofek, E. , Stulz, R. M., 1996. Leverage, investment, and firm growth. *Journal of Financial Economics*, 40, 3–29.
252. Leitão, J., Baptista, R., 2011. ICT and FDI: Are They Neglected Determinants of Entrepreneurship? *International Journal of Technology Transfer and Commercialization*, 10(3/4), 268–288.
253. Lepetit, L., Strobel, F., 2013. Bank insolvency risk and time-varying Z-score measures. *Journal of International Financial Markets, Institutions & Money*, 25, 73–87.
254. Lepoutre, J., A. Heene, 2006. Investigating the impact of firm size on small business social responsibility: a critical review.” *Journal of Business Ethics*, 67:257-273.
255. Levin, A., Lin, C.A345 F., Chu, C. S. J., 2002. Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties. *Journal of Econometrics*, 108, 1–24.
256. Liang, T.W., 2002. *Entrepreneurship and Innovation in the Knowledge-based Economy: Challenges and Strategies*. Tokyo: Asian Productivity Organization.
257. Lippert, O., Walker, M., 1997. *The Underground Economy: Global Evidence of its Size and Impact*. Vancouver: The Fraser Institute.

258. Lisi, G., Pugno, M., 2011. Tax Morale, Entrepreneurship, and the Irregular Economy. *AUCO Czech Economic Review*, 5, 116–131.
259. Liu, Q, Lu, R., Zhang, C., 2014. Entrepreneurship and spillovers from multinationals: Evidence from Chinese private firms. *China Economic Review*, 29, 95–106.
260. Liu, X., Siler, P., Wang, C., Wei, Y., 2000. Productivity spillovers from foreign direct investment: evidence from UK industry level panel data. *Journal of International Business Studies*, 31, 407–425.
261. Lumpkin, G. and Dess, G. 1996. Clarifying the Entrepreneurial Orientation Construct and Linking it to Performance, *Academy of Management Review*, Vol1, No.21, 135-172
262. Ma, J. 2012. A Study on the Models for Corporate Social Responsibility of Small and Medium Enterprises, *Physics Procedia*, 25:435-442.
263. Maças Nunes, P., Mendes, S. Serrasqueiro, Z., 2012. SMEs' investment determinants: empirical evidence using quantile approach. *Journal of Business Economics and Management*, 13, 866–894.
264. Majocchi, A., Presutti, M., 2009. Industrial clusters, entrepreneurial culture and the social environment: The effects on FDI distribution. *International Business Review*, 18, 76–88.
265. Malhotra A., Gosain S., El Sawy O. A., 2005. Absorptive Capacity Configurations in Supply Chains: Gearing for Partner-Enabled Market Knowledge Creation, Vol. 29, No. 1, Special Issue on Information Technologies and Knowledge Management, pp. 145-187
266. Mardani, A., Jusoh, A., Zavadskas, E.K., Cavallaro, F., Khalifah, Z., 2015. Sustainable and Renewable Energy: An Overview of the Application of Multiple Criteria Decision Making Techniques and Approaches. *Sustainability* 7, 13947-13984.
267. Mariasole, B., Varum, C.A., Pisicello, L., 2014. The Impact of Public Support on SMEs' Outward FDI: Evidence from Italy. *Journal of Small Business Management*, 52(1), 22–38.
268. Martínez-Jurado, P.J.; Moyano-Fuentes, J. Lean management, supply chain management and sustainability: A literature review. *J. Clean. Prod.* 2014, 85, 134–150, doi:10.1016/j.jom.2005.04.001.
269. Martini, M., 2014. Approaches to curbing corruption in tax administration in Africa. Transparency International, U4 Anti-Corruption Resource Center, no. 11.

270. Matten, D., and J. Moon, 2008. Implicit' and 'Explicit' CSR: A conceptual framework for a comparative understanding of corporate social responsibility, *Academy of Management Review*, 33:404-424.
271. Mavruk, T., Carlsson, E., 2015. How long is a long-term-firm investment in the presence of governance mechanisms? *Eurasian Business Review*, 5, 117–149.
272. McDonald, R., Siegel, D., 1986. The value of waiting to invest. *Quarterly Journal of Economics*, 101, 707–728.
273. McDougall, G.D.A., 1960. The benefits and costs of private investment from abroad: a theoretical approach. *The Economic Record*, 36, 13–35.
274. Mendes, S., Serrasqueiro, Z. Maças Nunes, P., 2014. Investment determinants of young and old Portuguese SMEs: A quantile approach. *Business Research Quarterly*, 17, 279–291.
275. Merriam Webster, 2013. Available online at <http://www.merriam-webster.com/dictionary/motivation>. Accessed on April 25, 2017
276. Meyer, K.E., 2004. Perspectives on multinational enterprises in emerging economies. *Journal of International Business Studies*, 35, 259–276.
277. Meyer, K.E., Sinani, E., 2009. When and where does foreign direct investment generate positive spillovers? A meta-analysis. *Journal of International Business Studies*, 40, 1075–1094.
278. Mickiewicz, T., Rebmann, A., Sauka, A., 2012. To pay or not to pay: entrepreneur's attitudes towards tax evasion (summary). *Frontiers of Entrepreneurship Research*, 32, Article 10.
279. Mihajlović, V., Vujić, G., Stanisavljević, N., Batinić, B., 2016. Financial implications of compliance with EU waste management goals: Feasibility and consequences in a transition country. *Waste Manage. Res.* 34(9), 923-932. doi.org/10.1177/0734242X16652962
280. Miller, D., 1983. The correlates of entrepreneurship in three types of firms, *Management Science*, 29:770-791.
281. Ministry of Environment and Climate Change. National Waste Management Strategy. Available online: <http://www.mmediu.ro/beta/wp-content/uploads/2013/04/2013-04-23-DGDSP-SNGD.pdf> (accessed 03 February 2018)
282. Mitchell R. et al., 2002. Are entrepreneurial cognition universal? Assessing entrepreneurial cognition across cultures. *Entrepreneurship Theory and Practice*, 26, no. 4: 9-32.

283. Mitchell R., et al., 2007. The central questions in entrepreneurial cognition research 2007. *Entrepreneurship Theory and Practice*, 31, no. 1: 1-27.
284. Mitchell R., S. Chesteen, 1995. Enhancing entrepreneurial expertise: experiential pedagogy and the new venture script. *Simulation and Gaming*, 26, no. 3: 288-306.
285. Mitchelmore, S., and J. Rowely, 2010, "Entrepreneurial competences: a literature review and development agenda." *International Journal of Entrepreneurial Behavior & Research*, 16:92-111.
286. Mocan, M., Ivascu, L., Turi, A., Feniser, C., 2017. Smartphones Influence on Students: Case Study on Romania, *Management, Knowledge and Learning & Technology, Innovation and Industrial Management International Conference*.
287. Mocan, M., Rus, S., Draghici, A., Ivascu L., Turi, A., 2015. Impact of Corporate Social Responsibility Practices on The Banking Industry in Romania, *2nd Global Conference on Business, Economics, Management and Tourism*, Vol. 23, 712-716.
288. Mocofan, M. Learning by games; a study case of the coffe project implementation in Romania. In *Proceeding of the International Scientific Conference eLearning and Software for Education*, Bucharest, Romania, 21–22 April 2016; Volume 1, 529.
289. Moody, P., 1993. *Breakthrough Partnering: Creating a Collective Enterprise Advantage*, Oliver Wight Publ., Essex Junction VT (USA).
290. Moraru, R.I., Babut, G.B., Cioca, L.I., 2014. Rationale and Criteria Development for Risk Assessment Tool Selection in Work Environments. *Environmental Engineering and Management Journal*, Vol. 13(6), 1371-1376.
291. Morikawa, M., 2016. Business uncertainty and investment: Evidence from Japanese companies. *Journal of Macroeconomics*, 49, 224–236.
292. Morris M.H., Lewis P., Sexton D.L., 1994. Reconceptualizing Entrepreneurship: An Input-Output Perspective, *SAM Advanced Management Journal*, Vol 59, Nr.1: 21-31.
293. Moyeen, A., J. Courvisanos, 2012. Corporate Social Responsibility in Regional Small and Medium-sized Enterprises in Australia, *Australasian Journal of Regional Studies*, 18:364-391.
294. Mueller, S. L., A. S. Thomas, 2000. Culture and entrepreneurial potential: a nine country study of locus of control and innovativeness, *Journal of Business Venturing*, 16:51-75.

295. Murillo, D., J. M. Lozano, 2006. SME and CSR: An Approach to CSR on Their Own Words, *Journal of Business Ethics* 67:227-240.
296. Nabi G., Holden R., Walmsley A., 2006. Graduate career making and business start up: a literature review , *Education + Training*, Vol 48, Nr.5: 373-385.
297. National Institute of Statistics. Available online: <http://statistici.insse.ro/> (accessed 03 February 2018)
298. Nawaz, F., 2010. Exploring the Relationships between Corruption and Tax Revenue. Transparency International, U4 Anti-Corruption Resource Center, no. 228.
299. Nga, J. K. H., G. Shamuganathan, 2010. The Influence of Personality Traits and Demographic Factors on Social Entrepreneurship Start Up Intentions, *Journal of Business Ethics*, 95:259-282.
300. Nugaras, J., Ginevičius, R., 2015. The strategic of networking of a higher education institution', *Journal of Economic Research*, vol. 28, pp. 31–44. <https://doi.org/10.1080/1331677X.2014.995963>
301. OECD, Promoting Entrepreneurship and Innovative SMEs in a Global Economy: Towards a More Responsible and Inclusive Globalisation, 2nd OECD Conference of Ministers Responsible for Small and Medium-Sized Enterprises (SMEs), Istanbul, Turkey.
302. Olson, P.D., Bosserman, D.A., 1984. Attributes of the entrepreneurial type. *Business Horizons*, 3, 53-56.
303. Omet, G., Yaseen, H., Abukhadijeh, T., 2015. The Determinant of Firm Investment: The Case of Listed Jordanian Industrial Companies. *International Journal of Business and Management*, 10, 53–58.
304. Oxford Dictionary, 2013. Oxford Advanced Learners' Dictionary. Oxford University Press. Available online at
305. Pache, A. - C., I. Chowdhury, 2012. Social Entrepreneurs as Institutionally Embedded Entrepreneurs: Toward a New Model of Social Entrepreneurship Education, *Academy of Management Learning & Education*, 11, 494-510.
306. Packham G. et. al., 2010. Attitudes towards entrepreneurship education: a comparative analysis, *Education and Training*, Vol 52, Nr.8/9: 568-586;

307. Panousi, V., Papanikolaou, D., 2012. Investment, Idiosyncratic Risk, and Ownership. *Journal of Finance*, 67, 1113–1148.
308. Parker, S. C., 2003. Does Tax Evasion Affect Occupational Choice? *Oxford Bulletin of Economics and Statistics*, 65, 379–394.
309. Parviainen A 2005 Design of AFPM low-speed Machines and Performance Comparison between Radial-Flux and Axial-Flux Machines, Lappeenranta University of Technology, Finland, Doctoral Thesis
310. Pathak, S., Xavier-Oliveira, E., Laplume, A.O., 2013. Influence of intellectual property, foreign investment, and technological adoption on technology entrepreneurship. *Journal of Business Research*, 66, 2090–2101.
311. Păunescu C., Shahrazad H., Cantaragiu R., Găucă O., Pascu A., 2014. Quality Review in Higher Education Institutions, 1(1).
312. Pavaloiu, I.B. Games as student groundwork for business management training. In *Proceedings of the International Conference, European Proceedings of Social and Behavioural Sciences*, Pitesti, Romania, 4–5 November 2016; pp. 1016–1024, doi:10.15405/epsbs.2017.05.02.125.
313. Pavlov, D., Tamasila, M., 2011. Methodological approach for questionnaires development in Bulgarian-Romanian scientific project. In: *Annual Scientific Conference of Ruse University*, Volume 50, book 5.2, pp. 34-41.
314. Pedroni, P., 1999. Critical Values for Cointegration Tests in Heterogenous Panels with Multiple Regressors. *Oxford Bulletin of Economics and Statistics*, 61, 653–670.
315. Pedroni, P., 2000. Fully modified OLS for heterogeneous cointegrated panels. *Advanced in Econometrics*, 15, 93–130.
316. Pedroni, P., 2001. Purchasing power parity tests in cointegrated panels. *Revue of Economics and Statistics*, 83, 727–731.
317. Perić, M., Đurkin, J., 2015. Determinants of investment decisions in a crisis: perspective of Croatian small firms. *Management*, 20, 115–133.
318. Perrini, F., 2006. SMEs and CSR theory: Evidence and implications from an Italian perspective, *Journal of Business Ethics*, 67:305-316.

319. Pesaran, M.H., 2004. General Diagnostic Tests for Cross Section Dependence in Panels. Cambridge Working Papers in Economics, 0435.
320. Pesaran, M.H., 2007. A Simple Panel Unit Root Test in the Presence of Cross-Section Dependence. *Journal of Applied Econometrics*, 22, 265–312.
321. Peterman, P.E., J. Kennedy, 2003. Enterprise education: influencing students' perceptions of entrepreneurship. *Entrepreneurship Theory and Practice*, 28, no. 3: 129-144.
322. Pichtel J., 2014. Municipal, Hazardous, and Industrial. Waste management practices. Second ed. 2014, Boca Raton: Taylor and Francis Group.
323. Piercy, N.; Rich, N. The relationship between lean operations and sustainable operations. *Int. J. Oper. Prod. Manag.* 2015, 35, 282–315, doi:10.1108/IJOPM-03-2014-0143.
324. Pindyck, R. S., 1988. Irreversible investment, capacity choice, and the value of the firm. *American Economic Review*, 78, 969–985.
325. Pitelis, C.N., Teece, D.J., 2010. Cross-border market co-creation, dynamic capabilities and the entrepreneurial theory of the multinational enterprise. *Industrial and Corporate Change*, 19, 1247–1270.
326. Planul de Dezvoltare a RET perioada 2016- 2025  
<http://www.transelectrica.ro/documents/10179/25146/Planul+de+dezvoltare+a+RET+2016-2025.pdf/0d1d070f-75c5-43d6-8833-6563dd9e7c58>
327. Politehnica University of Timisoara, [Online], Research yearbooks, Available: <http://www.upt.ro/> [Febr 2018]
328. Popa, F., Guillermin, M., Dedeurwaerdere, T., 2015. A Pragmatist Approach to Transdisciplinarity in Sustainability Research: From Complex Systems Theory to Reflexive Science. *Futures Journal*, Vol. 65, 45-56.
329. Popa, V., 2009. Supply chain management in consumer goods industry and retail, Valahia University Press, Targoviste.
330. Proștean, G. and Badea, A., 2014. Supply Chain collaboration model based on Drum-Buffer-Rope philosophy, 6th International Workshop on Soft Computing Applications SOFA 2014, ISSN: 1867 – 5662.



331. Pugna A.P., et al., 2012. Comparative study regarding the training needs for development of entrepreneurial competences in the context of E.U. post-integration, ISBN 9789548675307 Ruse: Primax Ltd.
332. Rae D., 2005. Entrepreneurial learning: a narrative-based conceptual model, *Journal of Small Business and Enterprise Development*, Vol 12, Nr. 3: 323-335;
333. Rae D., Draycott M., 2009. Enterprise education in schools and the role of competency framework, Institute for small business affaires entrepreneurship Conference, Liverpool, Noiembrie;
334. Rae, D., 2010. Universities and enterprise education: responding to the challenges of the new era. *Journal of Small Business and Enterprise Development*, Volume 7, No. 4, pp. 591-606.
335. Reifschneider, D., Tulip, P., 2007. Gauging the Uncertainty of the Economic Outlook from Historical Forecasting Errors. Board of Governors of the Federal Reserve, Finance and Economics Discussion Series 2007-60 (November).
336. REN21, 2016. Renewables 2016 Global Status Report, (Paris: REN21 Secretariat), ISBN 978-3-9818107-0-7
337. Richardson, C., Mishra, P., 2018. Learning environments that support student creativity: Developing the SCALE, *Journal of Thinking Skills and Creativity*, vol. 27, pp. 45-54. <https://doi.org/10.1016/j.tsc.2017.11.004>
338. Robinson P.B., et al., 1991. An attitude approach to the prediction of entrepreneurship. *Entrepreneurship Theory and Practice*, 15, no .4: 13-32.
339. Robson, M. T., Wren, C., 1999. Marginal and average tax rates and the incentive for self-employment. *Southern Economic Journal*, 65, 757–773.
340. Rodriguez-Clare, A., 1996. Multinationals, linkages, and economic development. *American Economic Review*, 86, 852–873.
341. Roffe I., 2010. Sustainability of curriculum development for enterprise education. *Education – Training*, 52, no. 2: 140-164.
342. Romer, P. M., 1990. Endogenous technical change. *Journal of Political Economy*, 94, 71-103.
343. Ronstandt R.C., (1984), *Entrepreneurship*, Lord Publishing Co, Dover, SUA, 39.

344. Roodman, D., 2009. How to do xtabond: An introduction to difference and system GMM in Stata. *The Stata Journal*, 9(1), 86–136.
345. Rose-Ackerman, S., 2001. Trust, honesty, and corruption: reflection of the state-building process. *European Journal of Sociology*, 42, 27–71.
346. Ruset, V. et al., 2010. Training opportunities in Central and Eastern Europe – Summary results of the HELP training needs analysis. Publishing House Politehnica, Timisoara.
347. Saaty T L, 1980. *The Analytic Hierarchy Process*, McGraw-Hill Book Co., N.Y.
348. Saaty, T. L., 1986. Axiomatic Foundation of the Analytic Hierarchy Process, *Management Science*, 32, 841-855.
349. Sabirianova Peter, K., Svejnar, J., Terrell, K., 2005. FDI Spillovers and Distance of Firms to the Frontier. *Journal of the European Economic Association Papers and Proceedings*, 3, 576–586.
350. Sabirianova Peter, K., Svejnar, J., Terrell, K., 2005. FDI Spillovers and Distance of Firms to the Frontier. *Journal of the European Economic Association Papers and Proceedings*, 3, 576–586.
351. Schmiemann, M., 2012. Measuring Entrepreneurship in Europe. In *Entrepreneurship determinants: culture and capabilities*, Eurostat statistical yearbook.
352. Schneider, F., Buehn, A., 2012. Size and Development of Tax Evasion in 38 OECD countries: What do we (not) know? CESifo Working Paper, no. 4004.
353. Schneider, F., Raczkowski, K., Mróz, B., 2015. Shadow economy and tax evasion in the EU", *Journal of Money Laundering Control*, 18, 34–51.
354. Schwarz, E.J., Wdowiak, M.A., Almer-Jarz, D.A., Breitenacker, R.J., 2009. The effects of attitudes and perceived environment conditions on students' entrepreneurial intent. *Education + Training*, 51(4), 272-291.
355. Shapero, A., L. Sokol, 1982. *Some social dimensions of entrepreneurship*. Englewood Cliffs: Prentice Hall.
356. Sharholly, M., Ahmad, K., Mahmood, G., Trivedi, R.C., 2008. Municipal solid waste management in Indian cities – A review. *Waste Manage.* 28(2), 459-467. doi.org/10.1016/j.wasman.2007.02.008

357. Shou, W.; Wang, J.; Wu, P.; Wang, X.; Chong, H.Y. A Cross-Sector Review on the Use of Value Stream Mapping. *Int. J. Prod. Res.* 2017, 55, 3906–3928, doi:10.1080/00207543.2017.1311031.
358. Simatupang T. M., 2004. Supply Chain Collaboration, Massey University.
359. Simatupang T. M., Wright A. C., Sridharan R., 2004. Applying the Theory of Constraints to Supply Chain Collaboration, *Supply Chain Management: An International Journal*, Vol. 9 No. 1.
360. Siraj S, Mikhailov L and Keane J A, 2015. PriEsT: an interactive decision support tool to estimate priorities from pairwise comparison judgments, *International Transactions in Operational Research*. 22: 217–235. doi:10.1111/itor.12054
361. Song, B., Sun, Q., Li, Y., Que, C., 2016. Evaluating the Sustainability of Community-Based Long-Term Care Programmes: A Hybrid Multi-Criteria Decision Making Approach. *Sustainability* 8, 657.
362. Sowmya D.V., Majumdar S., 2010. Relevance of education for potential entrepreneurs: an international investigation, *Journal of Small Business and Enterprise Development*, Vol 17, Nr. 4: 626-640.
363. Spencer, M.S., Cox III, J.F., 1995. Optimum production technology (OPT) and the theory of constraints (TOC): analysis and genealogy, *International Journal of Production Research* 33, 1495–1504.
364. Stenkula, M., 2012. Taxation and entrepreneurship in a welfare state. *Small Business Economics*, 39, 77–97.
365. Stewart W.H., et al., 1998. A proclivity for entrepreneurship: a comparison of entrepreneurs, small business owners, and corporate managers. *Journal of Business Venturing*, 14: 189-214.
366. Strehl, F., Reisinger, S., Kalatschan, M., 2007. Funding systems and their effects on higher education systems, Paris: OECD Publishing. <https://doi.org/10.1787/19939019>
367. Svensson, L. O. E., Woodford, M., 2003. Indicator variables for optimal policy. *Journal of Monetary Economics*, 50, 691–720.

368. Swedberg, R., 2006. Social entrepreneurship: the view of the young Schumpeter. In C. Steyart and D. Hjorth (eds.), *Entrepreneurship as Social Change: A Third Movements in Entrepreneurship Book*: 21-33. Cheltenham, UK: Edward Elgar.
369. Tabellini, G., Wyplosz, C., 2006. Supply-side Reforms in Europe: Can the Lisbon Strategy be Repaired?. *Swedish Economic Policy Review*, 13(1), 101-56.
370. Tamasila, M., Foltean, F.S., 2011. The analysis of the innovation level for the entrepreneurial education in the west region of Romania. In: 8th International Conference MTC-Management of Technological Changes, Volume 2, pp.445-448, Alexandroupolis
371. Tartavulea, R.I.; Belu, M.G.; Paraschiv, D.M. Using Business Simulation as a Complementary Educational Method in Universities. *Ovidius Univ. Ann.* 2012, XII, 138–142.
372. Tasdemir, C.; Gazo, R. A Systematic Literature Review for Better Understanding of Lean Driven Sustainability. *Sustainability* 2018, 10, 2544.
373. Taucean, I.; Ivascu, L.; Miclea, S.; Negrut, M. Synergies between Lean and Sustainability: A Literature Review of Concepts and Tools. *Qual. Access Success J.* 2018, 20, 559–570.
374. Taucean, I.M.; Ivascu, L.; Negrut, M.; Miclea, S. Assessment of Lean Manufacturing and Sustainability Relationship in Production Processes. In *Proceedings of the 32nd IBIMA Conference*, Seville, Spain, 15–16 November 2018; pp. 255–262, ISBN 978-0-9998551-1-9,
375. Taucean, I.M.; Matei, T. Research challenges for eLearning support in engineering and management training. *Procedia-Soc. Behav. Sci.* 2014, 210-218.
376. The Bologna Process, 2009. Communiqué of the Conference of European Ministers Responsible for Higher Education, Leuven and Louvain-la-Neuve.
377. The Law of National Education, [Online], Available: [http://istorie-edu.ro/istoriee/resurse\\_profesori/legislatie/legea\\_educatiei3.html](http://istorie-edu.ro/istoriee/resurse_profesori/legislatie/legea_educatiei3.html) [Febr 2018]
378. Thompson, J. K., H. L. Smith, 1991. Social responsibility and small business: suggestions for research, *Journal of Small Business Management*, 29:30-44.
379. Thornton, J. C., J. T. Byrd, 2013. Social responsibility and the small business, *Academy of Entrepreneurship Journal*, 19:41-75.
380. Timmons, J.F., Garfias, F., 2015. Revealed Corruption, Taxation, and Fiscal Accountability: Evidence from Brazil. *World Development*, 70, 13–27.

381. Todorova, M.S., Ruskova S., Gedinach V., Buciuman C., Taucean I., 2011. Willingness and readiness of students to become entrepreneurs. In: Annual Scientific Conference of Rousse University, Volume 50, book 5.1, pp. 150-155.
382. Tracona, A., 2009. Entrepreneurship Development – Key Issues and Challenges”, CEEMAN Forum on Executive Education Executive Education and Entrepreneurship Development, Trieste, November 26-27, <http://www.vlnmedia.net/ceeman>.
383. Trifan, L.; Mustata, C. Inducing entrepreneurial behaviour by business management simulation games. In Proceedings of the 7th International Conference on Education and New Learning Technologies (Edulearn15), Barcelona, Spain, 7–8 July 2015, 6426–6433.
384. Turi, A., Mocan, M., Ivascu, L., 2017. The Role of Experiences in Maintaining High Standards in Higher Education, Proceedings of the 14th International Conference Efficiency and Responsibility in Education 2017 (ERIE), pp. 469-481.
385. United Nations Environment Programme, 2016. Principles of Sustainable Development, Available at
386. Urata, S., Kawai, H., 2000. The determinants of the location of foreign direct investment by Japanese small and medium-sized enterprises. *Small Business Economics*, 15, 79–103.
387. Van den Ven A.H., 1993. The development of an infrastructure for entrepreneurship, *Journal of Business Venturing*, Vol 8, Nr. 3: 311-321.
388. Van Eygen, E., Laner, D., Fellner, J., 2018. Circular economy of plastic packaging: Current practice and perspectives in Austria. *Waste Manage.* 72, 55-64. [doi.org/10.1016/j.wasman.2017.11.040](https://doi.org/10.1016/j.wasman.2017.11.040)
389. Vassigh, S., Spiegelhalter, T., 2014. Integrated Design Pedagogy for Energy Efficient Design Tools for Teaching Carbon Neutral Building Design. *Energy Procedia*, Vol. 57, 2062-2069.
390. Vaykarnam S., 2008. Practitioner-led Enterprise Education : A reflective note, Centre for Entrepreneurial Learning, Cambridge, disponibil la : [s.vyakarnam@jbs.ac.uk](mailto:s.vyakarnam@jbs.ac.uk).
391. Vermeulen, P., 2002. Business fixed investment: evidence of a financial accelerator in Europe. *Oxford Bulletin of Economics and Statistics*, 64, 213–231.

392. Vermoesen, V., Deloof, M., Laveren, E., 2013. Long-term debt maturity and financing constraints of SMEs during the Global Financial Crisis. *Small Business Economics*, 41, 433–448.
393. Viegas, C.V., Bond, A.J., Vaz R.C., Borchardt, M., Medeiros Pereira, G., Selig, P.M., Varvakis, G., 2016. Critical attributes of Sustainability in Higher Education: A Categorisation from Literature Review. *Journal of Cleaner Production*, Vol. 126, 260-276.
394. Vinodh, S.; Arvind, K.R.; Somanaathan, M. Tools and Techniques for Enabling Sustainability through Lean Initiatives. *Clean Technol. Environ. Policy* 2011, 13, 469–479, doi:10.1007%2Fs10098-010-0329-x.
395. Vyakarnam, S., A. Bailey, A. Myers, and D. Burnett, 1997. Towards an Understanding of Ethical Behavior in Small Firms, *Journal of Business Ethics*, 16:1625-1636.
396. Wang, Y., Wu, L., Yang, Y., 2009. Does the stock market affect firm investment in China? A price perspective. *Journal of Banking and Finance*, 33, 53–62.
397. Wang, Z., Ren, J., Evan Goodsite, M., Xu, G., 2018. Waste-to-energy, municipal solid waste treatment, and best available technology: Comprehensive evaluation by an interval-valued fuzzy multi-criteria decision making method. *J. Clean. Prod.* 172, 887-899. doi.org/10.1016/j.jclepro.2017.10.184
398. Weber, M., 2008. The business case for corporate social responsibility: A company-level measurement approach for CSR, *European Management Journal*, 26:247-261.
399. Wells, R.A. Management Games and Simulations in Management Development: An Introduction. *J. of Manag. Dev.* 1990, 9, 4–6, doi:10.1108/02621719010002108.
400. Westernen, K.I., 2008. How to Define and Measure Knowledge for the Analysis of Competitiveness. *The journal of Regional Analysis & Policy*, 38(2), 138-144.
401. Whited, T., 1992. Debt, liquidity constraints, and corporate investment: Evidence from panel data. *Journal of Finance*, 47, 1415–1461.
402. Wiklund, J., Davidsson, P., Delmar, F., 2003. What do they think and feel about growth? An expectancy-value approach to small business managers' attitudes towards growth. *Entrepreneurship Theory and Practice*, 27, 247–269.
403. Williamson, D., G. Lynch-Wood, J. Ramsay, 2006. Drivers of Environmental Behaviour in Manufacturing SMEs and the Implications for CSR, *Journal of Business Ethics*, 67:317-330.

404. Wilson, E., 1980. Social responsibility of business: What are the small business perspectives, *Journal of Small Business Management*, 18:17-24.
405. Wu, H.-Y., Tzeng, G.-H., Chen, Y.-H., 2009. A fuzzy MCDM approach for evaluating banking performance based on Balanced Scorecard. *Expert Syst. Appl.* 36, 10135–10147. doi.org/10.1016/j.eswa.2009.01.005
406. Wyplosz, C., 2010. The failure of the Lisbon strategy. Available at: <http://www.voxeu.org/article/failure-lisbon-strategy>.
407. Yeyati, E.L., Micco, A., 2007. Concentration and foreign penetration in Latin American banking sectors: impact on competition and risk. *Journal of Banking & Finance*, 31, 1633–1647.
408. Yitzhaki, S., 1974. A note on income tax evasion: a theoretical analysis. *Journal of Public Economics*, 3, 201–202.
409. Zadeh, A., 2015. Fuzzy logic—a personal perspective. *Fuzzy Sets and Systems* 281, 4-20. doi.org/10.1016/j.fss.2015.05.009
410. Zadek, S., 2004. The path to corporate social responsibility, *Harvard Business Review*, 82:125-132.
411. Zahra, S. A., L. R. Newey, Y. Li, 2014. On the Frontiers: The Implications of Social Entrepreneurship for International Entrepreneurship, *Entrepreneurship Theory and Practice*, 38:137-158.
412. Zamfir AI, 2011. Management of renewable energy and regional development: European experiences and steps forward, *Theoretical and Empirical Researches in Urban Management*, 6 (3) pp. 35–42
413. Zamfir, A.; Plumb, I.; Dobrin, C.; Popa, I. Using computers and simulations in business education. In *Proceedings of the 10th WSEAS international conference on Mathematics and computers in business and economics*, Prague, Czech Republic, 23–25 March 2009; 147–152.
414. Zhang, Y., Li, H., Li, Y., Zhou, L.-A., 2010. FDI spillovers in an emerging market: the role of foreign firms' country origin diversity and domestic firms' absorptive capacity. *Strategic Management Journal*, 31, 969–989.
415. Zhao, H., Li, N., 2015. Evaluating the performance of thermal power enterprises using sustainability balanced scorecard, fuzzy Delphic and hybrid multi-criteria decision making

approaches for sustainability. *J. Clean. Prod.* 108, 569–582.  
doi.org/10.1016/j.jclepro.2015.07.141

416. \*\*\*World Economic Forum. The Global Competitiveness Report 2010 – 2011, 4.

417. Website, <https://www.globalreporting.org/resourcelibrary/GRIG4-Part1-Reporting-Principles-and-Standard-Disclosures.pdf>

418. Website,  
[http://oald8.oxfordlearnersdictionaries.com/dictionary/motivation#motivate\\_\\_43](http://oald8.oxfordlearnersdictionaries.com/dictionary/motivation#motivate__43). Accessed  
on April 25, 2017



## **Appendix – 10 Papers considered by the candidate to be the most relevant (Anexa – 10 lucrări considerate de către candidat ca fiind relevante)**

The 10 selected papers (publications), considered to be relevant to the professional, scientific and academic achievements supporting the activities presented in the habilitation thesis, are as follows:

1. Ilie Mihai Tăucean, **Matei Tămășilă**, Larisa Ivascu, Șerban Miclea and Mircea Negruț, “*Integrating Sustainability and Lean: SLIM Method and Enterprise Game Proposed*”, SUSTAINABILITY JOURNAL 2019, **Volume: 11 Issue: 7**, Pages: 2103; **factor de impact = 2,075**, <https://doi.org/10.3390/su11072103> (**quartila Q2, zona galbenă**)
2. Albulescu Claudiu, **Tămășilă Matei** “*Exploring the role of FDI in enhancing the entrepreneurial activity in Europe: a panel data analysis*”, INTERNATIONAL ENTREPRENEURSHIP AND MANAGEMENT JOURNAL, **Volume: 12 Issue: 3**, **Pages: 629-657**, September 2016.(**indexed WOS Clarivate Analytics**)
3. Albulescu Claudiu, **Tămășilă Matei**, Ilie Tăucean “*Shadow economy, tax policies, institutional weakness and financial stability in selected OECD countries*”, ECONOMICS BULLETIN, Volume: 36 Issue: 3 Pages: 1868-+ , 2016.(**indexed WOS Clarivate Analytics**).
4. Albulescu Claudiu, Miclea Șerban, Suciu Simina, **Tămășilă Matei** “*Firm-level investment in the extractive industry from CEE countries: the role of macroeconomic uncertainty and internal conditions*”, EURASIAN BUSINESS REVIEW, **Volume: 8 Issue: 2**, **Pages: 193-208**, June 2018.(**indexed WOS Clarivate Analytics**)
5. **Tămășilă Matei**, Tăucean Ilie Mihai “*The comparative analysis of the innovation level for the entrepreneurial education*”, presented at the conference “SOFA 2012, The 5th International Workshop on Computing Applications Szeged Hungarian” published in proceedings of “The 5th International Workshop on Computing Applications Szeged Hungarian”, Vol. 1, pg.715-725; .(**indexed WOS Clarivate Analytics**).
6. Larisa Ivascu, Lucian Cioca, **Tămășilă Matei**, et al – “*Risk Management and an Approach for Introducing Functional Safety in the Development of Automotive E/E Systems*” - Proceedings of the 29th International-Business-Information-Management-Association Conference, SUSTAINABLE ECONOMIC GROWTH, EDUCATION EXCELLENCE, AND INNOVATION MANAGEMENT THROUGH VISION 2020, VOLS I-VII, Edited

by:Soliman, KS, Pages: 2595-2601 Viena, Austria; 3-4 May 2017; (**indexed WOS Clarivate Analytics**).

7. Larisa Ivascu, **Tămășilă Matei**, et al – “*Education For Sustainability: Current Status, Prospects, And Directions*” - Proceedings of the 5th Annual International Conference on Cognitive - Social, and Behavioural Sciences, ICCSBS 2017 - THE ANNUAL INTERNATIONAL CONFERENCE ON COGNITIVE - SOCIAL, AND BEHAVIOURAL SCIENCES, Edited by:Bekirogullari, Z; Minas, MY; Thambusamy, RX, Book Series: European Proceedings of Social and Behavioural Sciences, Volume: 20, Pages: 259-267, Brno, Czech Republic; 9-11 January 2017; (**indexed WOS Clarivate Analytics**).

8. **Tămășilă Matei**, Mocan Marian, Tăucean Ilie - Study Regarding Innovation and Entrepreneurship in Romanian SMEs - Proceedings of The 6th International Conference of DAAAM Baltic Industrial Engineering, Tallinn, Estonia; 24 to 26 April 2008; Organized under the auspices of DAAAM International Vienna; Editor Kyttner R; ISBN 978-9985-59-783-5, pg.369-373 (**indexed WOS Clarivate Analytics**).

9. **Matei Tămășilă**, I. Tăucean, C. Albulescu – “*The road to entrepreneurial success: entrepreneurial characteristics vs. social responsibility*” - Proceedings of 4th Review of Management and Economic Engineering International Management Conference, Cluj Napoca, Romania; 18-20 September 2014; **Book Series:** Review of Management and Economic Engineering International Management Conference, **Pages:** 301-314 (**indexed WOS Clarivate Analytics**).

10. **Matei Tămășilă**, Pugna A., I. Tăucean,– “*An Enhanced Model To Study Entrepreneurial Intention In Higher Education*” - Metalurgia International, Volume: 18 Issue: 4, Pages: 159-166, Published: 2013 (**indexed WOS Clarivate Analytics**).