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# Creating knowledge and entrepreneurial capacity for HE students with digital education methodologies: Differences in the perceptions of students and entrepreneurs

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ABSTRACT

This main paper goal is to propose a model of digital education methodologies and tools to develop knowledge and entrepreneurial capacity in Higher Education (HE) students. Digital education is increasingly influencing both classroom/campus-based teaching, but more import is leading to new models or designs for teaching and learning.

The paper makes a literature review on e-education, start-up stages and e-education methodologies and tools to develop the entrepreneurial capacity and uses quantitative methodology based on an online questionnaire applied to a sample of 75 HE Students and 75 Entrepreneurs in order to identify differences in their perceptions regarding the stages of the start-up process and also the most relevant methodologies to develop the entrepreneurial capacity of a potential entrepreneur.

The paper is structured of the following research questions: RQ1. What are the most important stages of the entrepreneurial start-up process? Moreover, RQ2-Which methods and methodologies can be employed to promote the entrepreneurial activity?

Besides the analysis of the methodologies and the tools of digital education, the research will also propose a model of *E*-Education methodologies for entrepreneur's strategic knowledge and skills development in each stage of the start-up process.

## 1. Introduction

> Academics and policymakers agree that entrepreneurs, and the new businesses they establish, play a critical role in the development and well-being of their societies. As such, there is increased appreciation for, and acknowledgment of the role played by new and small businesses in an economy.
>
> (GEM, 2017).

Entrepreneurship and entrepreneurs have become increasingly important worldwide considering the positive impact in employment, productivity, innovation and economic growth, by analysts, economic theoreticians and researchers (Ahmad & Hoffmann, 2008; Reynolds, Carter, Gartner, & Greene, 2004) and by Policymakers and international organizations. The Global Entrepreneurship Monitor[1] points out, in its 2008 Executive report, that is worldwide consensual that entrepreneurship plays a critical increasingly role in economic development. The Organization for Economic Co-operation and Development (OECD) in its Entrepreneurship at Glance 2012 report quote that the global crisis heightened interest in entrepreneurship as an essential element to foster economic recovery and employment growth (OECD, 2012); Other the European Commission (EC) in the Employment and social situation in Europe - Report 2013 and the International Labour Organization (ILO) throughout the ILO Global employment trends 2014 report and the Global employment trends for youth 2015 report also recognize the potential of entrepreneurship to help regions and countries to overcome socio-economic issues such as

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[1] Global Entrepreneurship Monitor (GEM) is a global consortium that conducts research is on world economies regarding entrepreneurship.

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unemployment, namely youth unemployment, poverty and slow economic growth which are fundamental to promote and support a sustainable development of the economies (local, national and regional), increase competitiveness, creating economic wealth and social equity.

These extended benefits to society have been raising the interest of economic and political decision-makers in the promotion of entrepreneurship being entrepreneurship education (EE) one of the most important tools to foster entrepreneurship and develop an entrepreneurial culture. For example, in Europe, the EC, has been supporting the development of entrepreneurship education and training programs in higher education institutions (HEI) and other training and educational organizations, within the framework of structural funds such as the European Regional Development Fund (ERDF), the European Social Fund (ESF), the European Globalisation Adjustment Fund, and programs like Erasmus+. EC aims to disseminate entrepreneurship and subsequently the emergence of nascent entrepreneurs.

In the last two decades, EE also attracted the attention of researchers with the aim to understand EE phenomenon and the associated factors - the principles, frameworks, programs, pedagogy, agents' characteristics, learning effectiveness and programs effectiveness - to raise more and better entrepreneurs. For example, the first report launched by GEM in 1999 was based on ten economies. Seventeen years later, 2016, the report was based on 65 world economies, and the research team exceeds 400 researchers from all around the world.

To become a successful entrepreneur requires more than an identified set up of competencies or skills (Gonçalves, Sousa, & Cruz, 2017). Even the combination of opportunity, capabilities and resources may not necessarily be sufficient to lead to entrepreneurship if opportunity and start-up costs outweigh the potential benefits (Ahmad & Hoffmann, 2008). A favourable business climate (e.g., tax regime, low inflation, low interest rates, competitive banking system and environment, flexible labour market, savings, etc.) combined with an integrated framework of motivation, skills and opportunity, is therefore relevant for entrepreneurs to be successful in the three stages of an entrepreneurial project - pre-start, the start-up and the post-start up (Stevenson & Lundström, 2001). According to Samuelsson (2004), who is in line with the works of Paul D. Reynolds and his team based on *The panel study of entrepreneurial dynamics*[2] In the United States, much of normative entrepreneurship claims are vague and unspecific. Other studies reflecting EE state of the art reveal the existence of gaps about what EE is and its objectives "considerable conceptual confusion regarding what [entrepreneurship] education is and what it aims to accomplish" (Gibb & Cotton, 1998; Maritz & Brown, 2013) and in what concerns entrepreneurship knowledge base, fragmentation of the research base; lack of consensus regarding definitions, weaknesses in the quality of empirical research, and a lack of longitudinal studies NCGE (2004)[3]. In 2012, OECD still outlined in the *Entrepreneurship at a Glance* 2012 report a lack of definition consensus in the field of entrepreneurship. One of the examples given is the difference between enterprise "creation" and "failure" concepts across countries.

This paper will be focus on the gap identified by the above mentioned studies and also for the research developed along the last ten years, which is focused on the entrepreneur's skills and characteristics and also the contexts, but not on the education and learning process (Henry, Hill, & Leitch, 2005; Roy & Das, 2016), in the opinion of the authors, the consensus gap around entrepreneurship - definitions, comparisons, purposes, and evaluation, among others - may be the basis of differences in the perception of different agents, namely the students and entrepreneurs. The paper to accomplish this goal begins with a literature review on the background and previous research on e-education and on digital learning methodologies (Sousa and Rocha, 2017 & Sousa, Cruz, and Martins, 2017) which could contribute to the development of an entrepreneurial capacity. Then it will be presented the methodology and the results of the data collection through an online questionnaire with HE students and with the young entrepreneurs about those methodologies and tools, and finally, it makes the presentation of a model of *E*-Education methodologies for entrepreneur's strategic knowledge and skills development in each stage of the start-up process.

## 2. Literature review

### 2.1. Entrepreneurship education

The relevance of entrepreneurship education (EE) to foster entrepreneurship culture and activity is widely recognized. Kuratko (2005) deems that the increasing number of entrepreneurship programs and courses, either in the educational or training systems, and the subsequent increasing number of entrepreneurship teachers and trainers is a clear evidence of that recognition, and simultaneously proves that entrepreneurship, or at least certain aspects of it, can be taught. Hindle (2007) agrees with Kuratko and defends that, from a fundamental logic perspective, there is no a priori reason for entrepreneurship not being taught proposing three approaches in EE: Teach it; Teach about it; Teach it in lots of different ways and places. More recent studies in the EE field, as per example Raposo and do Paço (2011), Maritz and Brown (2013), Maritz (2017) and Zeng and Honig (2016) are also based on the premise that entrepreneurship can be taught.

EE is also assuming extraordinary relevance within academic programs all over the world, but there is very little known about it from a research perspective (Alberti, Sciascia, & Poli, 2004). This may explain why the conceptual confusion about what entrepreneurship education is and what it aims to accomplish referred by Gibb & Cotton, 1998 is still perceived by Maritz & Brown, 2013, and according to our belief and experience is still valid in the present days.

Most research on entrepreneurship education has been focused on elements of the entrepreneurship education program (EEP) as the own program, the participants and the effect of the EEP on self-efficacy or entrepreneurial intentions (Matlay, 2008, Lewrick, Omar, & Williams, 2011, O'Connor, 2013). However, the diversity of EEPs with a broad range of short term objectives, target audiences, format and pedagogical approach (Arasti, Falavarjani, & Imanipour, 2012), goals, designs and philosophies that arise in the HEI (Paço, Ferreira, & Raposo, 2016), turn up practically impossible to compare programs, namely regarding the effectiveness of methodologies, resources, achievement of objectives and learning outcomes.

The lack of consensus is extensible to other dimensions of entrepreneurship like entrepreneurship intentions (EI) as highlighted by Liñán and Fayolle (2015) in a systematic literature review over EI. These authors noticed that although EI is being used as a robust theoretical framework, there is a lack of systematization and categorization in the research analyzed (409 papers, published between 2004 and 2013) which leads to researchers to start anew with every study (Liñán & Fayolle, 2015). This hinders the work of researchers, namely in research aiming to validate or evaluate the impact of EE on EI. Maritz and Brown (2013) argue that academic literature calls for more appropriate evaluations of entrepreneurship programs and greater contextualization of the programs to facilitate research into the effectiveness of EEPs.

One of our objectives is that our present work contributes for the creation of knowledge on course designs, namely on the relevance of involving the students in the process, as according to Gerba (2012) it is

[2] The panel study of entrepreneurial dynamics, (PSED) initiated in 1998, is a research program designed to enhance the scientific understanding of how people start businesses. The projects provide valid and reliable data on the process of the business formation based on nationally-representative samples of nascent entrepreneurs, those active in business creation. The study includes a control group of those not involved in firm creation for comparisons. In 2005–2006 was launched PSED II. The study allowed to obtained data on the nature of those active as nascent entrepreneurs, the activities were undertaken during the start-up process and the characteristics of start-up efforts that become new firms.

[3] UK National Council for Graduate Entrepreneurship.

essential to obtain the perception of students.

For the present investigation, the authors decided to use Hindle (2007) entrepreneurship education definition: transfer of knowledge about how, by whom and with what effects opportunities to create future goods and services are discovered, evaluated and exploited, and divided.

Raposo and do Paço (2011), argue that both entrepreneurship education and training should be more centered in attitudes (soft-skills) than in knowledge (technical skills): the effects of students soft-skills on their perceptions on business barriers and their willingness to start the process of business creation can be more relevant comparing to technical skills effects. They also found indications of positive relation between entrepreneurial education and entrepreneurial activity. While Maritz and Brown (2013), Maritz (2017) works are focused on entrepreneurship education programs to contribute to academic literature calls about EEPs. They proposed a conceptual framework to contextually evaluated and developed EEPs and examined and described the relationships between the different EEPs components. They argue that EEPs should be developed, not only with objectives in mind, but in the context within which they operate (Maritz & Brown, 2013). Yet, from our perspective if EEPs should be develop considering the context within which they operate, comparing EE programs and their effectiveness will still be a hard, if not impossible, task. One can only compare what is comparable.

Zeng and Honig (2016), work is focused on students' entrepreneurial experience background. Based on their theoretical research, they argue that students should not be all treated as a homogeneous group as they have different educational needs and content and teaching strategies should be adapt to the different profiles. They have categorized the students into three different groups: students with no experience at all, students with previous experience and, students currently running their own new business. Based on those three profiles, Zeng and Honig proposed three models and suggested that it would be important for EE improvement that, in future research, scholars would examine the effectiveness of each of the three models, as it could also bring some light about if a mismatch of educational need, what is taught, when is taught, to whom is taught might lead to students' demotivation and compromise the learning process's objectives.

In line with Zang and Honig, Nabi and Holden (2008) concluded that graduate entrepreneurship education is a complicated process and remains under-investigated, yet they could validate that the link between education, training, intent and actual career choice to start up a business exists, albeit they remark that there is no universal approach to graduate entrepreneurship that works for all graduates and different contexts, which require tailored approaches to best suit their individual needs.

In a real context, business is dominated by SME's, and (small) entrepreneurs take the initiative towards to start a business due to necessity, only very rarely for intentionality. In Indonesia, this type of entrepreneurs has coined ‘necessity-driven or survival’ entrepreneurs. They are lack of big dream, clear vision, and plan for growing their businesses further. Furthermore, Larso and Saphiranti (2016) outline that necessity-driven entrepreneurs usually have limited access to knowledge resources and technologies, to develop their creativity and innovation capabilities to produce high added value products/services. The authors also commented the presence of creative and innovative entrepreneurs more educated, formally and informally, eager to acquire new knowledge, and more capabilities and access to resources, technologies, and networks to grow their business further. They named them "opportunity-driven" entrepreneurs but represent < 0.2% of the population.

Rasmussen and Sorheim (2006) conducted research, in five Sweden universities[4], on action-based – learning by doing entrepreneurship education programs, which are increasing. Founding's suggests that the regional context and networks are crucial in action-based entrepreneurship programs as the programs depend from local and regional actors (organizations and individuals), in financial terms, network and practical support, for example, pro-bono mentoring or advice, helping the students to foster their entrepreneurial projects. The authors alert that it is not sustainable to rely entrepreneurial programs on voluntary actors, therefore, and considering the cost involved, it is necessary public and private funding's to support the programs. This opens up perspectives for the development of entrepreneurship programs based on digital learning considering that the operational costs are substantially lower.

Bell (2009) made an investigation focus in the change of an Executive MBA program (EMBA)curriculum design. The 18 months coursework included initial overview session to students gain an understanding of the technology assessment process, two intermediate checkpoints sessions to determine progress on the projects and map out future expectations. Students worked in groups of 4–5 students, under the supervision of the faculty and in cooperation with stakeholders and foreseen a straight relationship between students and teachers. The course ended with a Final professionally drafted technology and business assessment presented to all interested parties. This study revealed a mighty potential to create SMEs enterprises around the technologies as a consequence of a real-world application of students' projects.

With the aim to develop entrepreneurs MBA courses for graduates to the School of Business and Management (SBM) of the Bandung Institute of Technology (ITB) Larso and Saphiranti (2016) conducted a research for the design of those courses but they intended to expose students to local cultures and creative treasures, to develop students' mindset of creativity, design thinking, and innovation. Besides the literature review Larso and Saphiranti (2016) argue that benchmarking with other schools and institutions – in their case related to business, creativity, cultural, and entrepreneurship education - have revealed to be a relevant source for different aspects of course design. Benchmarking allowed them to take insights for the entrepreneurial program curriculum (e.g. the need to follow the business/venture cycle), and to define the methodological approach for curricula design – besides business and managerial skills needed to create, run, and develop a business they found that personal skills, such as life planning and self-management are fundamental. The final course design included: Marketing, Operations, Leadership and People Management, Finance, and Business Strategy. Creative-core courses are Design Thinking, Art, Design and Culture, The Contextual Nature of Creativity, creative-core courses; and entrepreneurship-core courses: Entrepreneurial Modelling, Business Initiation, New Venture Management, and Business Growth Management. According to Larso and Saphiranti (2016) exposing students with the richness of the local art and cultural products, and the diversity of courses followed by the students, lead them to develop creative and innovative thinking, and to create high-value products/services to the market.

Lean Startup (LS) methodology was developed by Eric Ries rooted in Toyota manufacturing principles. LS is based on five principles: Entrepreneurs are everywhere, Entrepreneurship is management, Validated learning, Build-Measure-Learn, and Innovation accounting. Ries defines start-up as a human institution designed to create a new product or service under conditions of extreme uncertainty, as the fundamental activity of a start-up is to turn ideas into products, running

[4] In Gothenburg the Chalmers University of Technology and the School of Economics and Commercial Law at Gothenburg University, in Jönköping, the Jönköping International Business School, in Linköping, the Linköping University, and in Västeras/Eskilstuna, the Mälardalen University,
In their research, they found two categories of programs: courses integrated in degrees' curricula where students must participate, and others which are programs outside the curricula, not giving a formal university degree, which are not so attractive neither for student focus in academic titles, neither for students without entrepreneurship intention.

numerous experiments that allow entrepreneurs to test each element of their vision. Measure how customers respond, and then learn whether to pivot or persevere. For this, Ries argues that start-ups require a new kind of management and a new kind of accounting designed for start-ups, specifically geared to its context of extreme uncertainty. Start-ups exist to learn how to build a sustainable business, to improve entrepreneurial outcomes and hold innovators accountable but need people who hold them accountable. (Ries, 2011).

According to Paço et al. (2016), LS methodology, which they have defined as a methodology focusing on agile testing and learning cycle to validate hypotheses in the business idea, is on the base of the success of several United States enterprises, one of the reasons why the authors decided to use in two case studies - projects Erasmus+: ICT Entrepreneur and SCIENT[5] - with the aim to develop pilot training tests, in the European countries of each consortium. Both programs aimed to develop and test a complete pre-accelerator program that could be offered in universities, research and entrepreneurship centers, accelerators and incubators, across Europe, after the project is completed. To build the programs, besides the literature review, the researchers also used interviews and questionnaires, from which they have found some consensus about the inclusion of subjects like: entrepreneurial culture, communication and negotiation techniques, finances, essential management tools, logistics for manufacture/delivery of product, setting prices, selling products, internationalization, business models, marketing and market research, and soft skills in general, in both entrepreneurship programs. Paço et al. (2016) also concluded that Lean Start-up approach, integrating the "build-measure-learn" approach is suitable for the design and development of Entrepreneurship Education Programs (EEP), not only for HEI, as also for other EEP stakeholders. Moreover, LS approach reduces constraints by helping new start-ups launching products the market wants, faster and less expensive than traditional methods and with less risk although, in authors opinion, a business model stands as a vital issue for new ventures creation. Although Paço et al. (2016) specify that the results are valid for the target population, it may be possible to take this study for a possible future comparative study, providing the premises are similar, as well as serve as a source of benchmarking for similar studies, as is the case of the present study.

### 2.2. Entrepreneurial start-up process

Despite the focus and relevant role that entrepreneurship has been gradually assuming in the society and among researchers as result of the economic and social benefits that have been shown to provide, there is a lack of studies regarding the entrepreneurship process itself, having limited information on how new business came into existence (Reynolds et al., 2004).

A more substantial and comprehensive knowledge on the phenomenon could bring improvements in the efficiency of entrepreneurship process for new entrepreneurs and simultaneously enhance the effectiveness of the policies designed to boost the entrepreneurial activity. Hazudin, Kader, Tarmuji, Ishak, and Ali (2015) suggest that entrepreneurship policy and programs design should be proposed attempting different gender perspectives regarding entrepreneurship, which makes sense because, women seem to be more like to start solo-owned business while men tend to be more like to start business in partnership (Reynolds et al., 2004). Being a solo-owned business requires the most significant effort concerning financial resources, acceptance to risk, time and energy of business achievement.

For Lundstrom and Stevenson entrepreneurial process is the process whereby individuals become aware of business ownership as an option or viable alternative, develop ideas for business, learn the processes of becoming an entrepreneur and undertake the initiation and development of business (Lundstrom & Stevenson, 2005, p. 42).

The process of starting a new venture comprise three phases (Fielden, Davidson, & Makin, 2000; Lundstrom & Stevenson, 2005; Stevenson & Lundström, 2001): the pre-start-up stage period, which has no pre-defined time duration, is the phase where individuals decide to implement a business idea, usually after the perception or the identification of an opportunity, and decide to start a new business; and, the start-up process or business operation, which is commonly defined as the first year of the new business after the formal entry in the market, yet. as for them the two semesters are distinctive, they consider them as two distinct phases. Reynolds et al. (2004) also conceptualize the entrepreneurial process in three stages, but the first two stages Stock of Possibilities and Gestation precede the creation of the new firm which corresponds to the third stage, to which they call Infancy. They also identify two transition points: the first, named, Conception, reflects the transition from Stock of Possibilities to Gestation and corresponds to the period when individuals decide to start a new business; the second, named, Firm Birth, reflects the transition from Gestation to Infancy when the firm/business is legally created.

Most of HE students do not have work experience and evidence more challenging to develop a business idea (Robertson, Collins, Medeira, & Slater, 2003). Inappropriate entrepreneurial skills and knowledge can inhibit entrepreneurial motivation. Aside from entrepreneurship education, the presence of role models is a crucial factor to support potential and nascent entrepreneurs developing the business idea and further implementation. The role models are relevant and can make a difference just by sharing their experiences, whether by training or mentoring schemes, for pointing out new business creation benefits, encouraging to overcome barriers and to reduce the stigma around failure (Krueger & Brazeal, 1994; Martins, Couchi, Parat, Federico, & Doneddu, 2004; Samuelsson, 2004).

Fielden et al. (2000) findings reveal that the lack of information and thus knowledge, on how to structure and achieve sustainability of an entrepreneurial idea and run the business has been noticed among potential and nascent entrepreneurs. New business owners tend to evidence lack of adequate and appropriate guidance and training. Notwithstanding corporate managers may appear to have all the requisite skills and knowledge to start and run a new venture, they may not believe that they possess those skills (Krueger & Brazeal, 1994). In fact, one's perceptions are critical in all over the new venture process. What perspective (and existing) entrepreneurs perceive is often more critical than seemingly objective reality (Krueger & Brazeal, 1994). One can then assume that, due to their experience, entrepreneurs might have different perspectives and perceptions from potential and nascent entrepreneurs regarding what is required, regarding resources and knowledge, to start and manage a new business. Thus, business enterprise training programs have been reported as important source of business advice by providing a broad understanding of business procedures (Fielden et al., 2000).

A better perception about competition enhances probability to new entrepreneurs make better decisions in their nascent venturing process

[5] The design of both programs involved several phases. 1. Make a diagnosis aiming to evaluate the national entrepreneurship ecosystem and the relevance of the existing entrepreneurship courses in each country of the consortium; 2. An intensive search for the courses/seminars/lessons related to entrepreneurship education was carried out, and several organizations were selected to be visited and interviewed. Data collected helped in gaps identification, as well as strengths and weaknesses in the current EE. That analysis helped to identify specific entrepreneurial training needs for both programs. Finally, a questionnaire was applied to the students (instrument included skills, motivations, support from the HEI, barriers, difficulties and sociodemographic traits as variables). Data collected was analyzed. Two different programs, with different modules, sorted out from the research: SCIENT training – it is a 40 h training program to give a framework on how to transform a business idea into a business plan; ICT Entrepreneur training – is a 50 h training program for ICT students/graduates helping them to create new professional paths.
To complement the theoretical training, the program curricula also includes: job shadowing, working in interdisciplinary teams under the guidance of academics, managers, investors and entrepreneurs, internships and visits to companies, as well as the presence of guest speakers in the training sessions, mentoring and coaching activities (Paço et al., 2016).

(Samuelsson, 2004). Preliminary knowledge and analysis of market and product/services through formal or informal training, or throughout mentoring schemes, is therefore highly recommended and can make the difference between the success or failure of the new venture.

Following the gap identified during the literature review process, and focusing on entrepreneur's skills and characteristics and also the contexts, the first research question of this research is:

**RQ1.** *What are the most critical stages of the entrepreneurial start-up process?*

This question will help us to create the model which will associate the stages of the start-up process to the proposed methodologies to develop the entrepreneur's knowledge and skills.

### *2.3. Methods and methodologies for digital learning of the entrepreneurial activity*

The use of technology in entrepreneurship education is increasing (Solomon, 2007) and information technology skills are viewed as a critical factor in determining new business success in a global market (Fielden et al., 2000). New approaches like inviting guest speakers and promoting class debates are increasing and becoming more frequent and widespread than the traditional lecture classes approach that is falling into disuse; however, the traditional Business plan is still a favourite method in EE (Solomon, 2007), and the availability of mentors is considered to be a significant value resource for many potential and new business owners (Fielden et al., 2000).

Family support and needs are influence factors to start a new business and business achievements, however gender differences have been found: among other differences in what concerns to motivations, factors and barriers between men and women entrepreneurs, women are more likely influenced by family support and needs, especially when they are schoolchildren parents, whereby, for the same reason women can drop out of own entrepreneurial business if they perceive that the family wellbeing may be compromised (Fielden et al., 2000; Hazudin et al., 2015).

Family and friends are in fact one of the essential supportive factors as they can play different roles: be role models in case they have experienced has entrepreneurs, play a financial sponsor role, play a supportive role by sharing their knowledge or working for free while business is being developed. Considering the close relationship between students and universities, these have been assuming a critical supportive role either in the form of financial support, throughout allowances or scholarships, or by providing business facilities free of charge with initiatives such as Company Incubator, network spaces par excellence (Edwards & Muir, 2005).

Empirical evidence was found regarding the positive impact of instrumental social network giving their social support for an innovative venture opportunity, during the nascent venturing process and subsequent performance (Samuelsson, 2004); thus entrepreneurship courses classes should be formed by students from many different subjects to generate dynamic and multi-cultural groups of people. Samuelsson also argues that the current entrepreneurial courses do not give the opportunity to students to train or simulate the experience of going through an entrepreneurial process, recognizing and exploiting new venture opportunities.

Given that start-up experience and performing gestation behaviours are reliable predictors of progress in the nascent venturing process, survival and subsequent venture profit, Samuelsson (2004) recommend that entrepreneurial courses should include, whenever possible, a minimum of one semester training allowing students to perform gestation behaviours. Behavioural background in product/service idea or concept development; getting information of competition/opportunity; defining and developing a business plan; application for funding; be funding successful and unsuccessful; save money to invest and invest own money; purchased resources; define marketing and/or promotion strategy; established credit with suppliers and customers; application for permits, licenses and patents; prototype, test product/services on customers and sale; received business income; revenues exceeded expenses; deal with tax; be full time devoted to the business, hire a team (Reynolds et al., 2004; Samuelsson, 2004) can have a positive effect in a new venture project.

Building a business plan either in a competitive academic context or implementation perspective has proven to be an excellent mean of promoting entrepreneurship among Higher Education (HE) Edwards and Muir (2005). This practice, supported in business counselling workshops allows students to experience, in simulation context, the circumstances, specificities and requirements regarding business knowledge that the design of a business plan requires in “real-live company” context. Get experienced entrepreneurs involved in such practices either as a sponsor, competition judge, supervision and mentoring or as a lecturer in a course or workshops where they can share their experience dealing with deceptions and joys, success and failure have also been proved to develop/reinforce entrepreneurship HE students' intentions.

In the context of this previous research, we think that the constructivist framework approach encourages an inherent disposition from student's awareness through real-case scenarios and encourages curiosity and discussions that support their autonomy (Brooks, 1999). Likewise, the term participatory pedagogy (Siemens, 2008) represents a shift in educational paradigm that combines instruction with a networked and connected education. The results mentioned above ends in a promotion of the student's engagement and their enthusiasm to focus on enhancing theoretical transmission of knowledge (Dooley, Ellison, Welch, Allen, & Bauer, 2016).

ICT supports the learning process by using of text, images, and audio, and by that, each person can create their story and engage in an in-depth learning (Pounsford, 2007). Digital Storytelling which Robin (2008) describes as technology application that one can use to become a creative storyteller. The process is the same as the traditional storytelling, after selecting a topic and based in some research, the user writes a story script, which can then be combined with different types of multimedia: computer-based graphics, computer-generated text, music, recorded audio, video clips. The material produced can then be played on computers, be burned on DVDs or uploaded on a website. Due to its characteristics, digital storytelling stands as one technology application that is well positioned to take advantage of user-directed content and to help instructors use technology productively in their classes (Robin, 2008). Nonetheless, the use of innovative ICTs alone does not guarantee sufficient learning processes, and outcomes and the role of the teacher and the facilitator are fundamental to the success of the learning process.

To what regards digital problem-based learning (PBL) research (Gülbahar & Tinmaz, 2006; David, 2008; Koh, Herring, & Hew, 2010; Hung, Hwang, & Huang, 2012), concludes that this learning approach provides students with more significant autonomy when they receive structural directives, clear expectations, guidance and procedures and contributes to the success of the learning process.

To do a review and identify the more recent digital learning methodologies we used the content analysis methodology of papers present on b-on, which is a research resource that allows access to thousands of scientific texts included in places such as Elsevier, ISI, Sage, and Springer, among others.

The methodology followed for the content analyses started on papers segmentation: the terminology "Digital learning methodologies" was used as the initial filter, obtaining a total of 228,474 publications. Subsequently, new segmentations were used, limiting the number of articles: independent research of peer-reviewed scientific articles in academic publications (170,851 articles). With the introduction of the keywords higher education (2123) and teaching methods (96), we obtain a smaller number of publications, which will set a total of 64 when the time horizon of research for the last three years is reduced

(2014–2017). It also happens that the total viewing screen is configured for 30 items per page and, when changing pages to continue the analysis, the system ends up eliminating articles that may be repeated, setting the total number of articles to 54. After analysis, one of the articles had little relation to the keywords and was eliminated. The final analysis focuses on 53 articles.

The goal was to extract and analyze the article's title, abstract and keywords to extract expressions related to digital learning methodologies and we classify them into four main categories which emerged from the literature analysis. As a result, the expressions identified were grouped thematically. It was possible to identify 46 expressions considered valuable as presented in Table 1, extracted from 33 articles that reveal them in the analyzed texts:

Digital learning context with 13 expressions in 10 publications and Tools and simulators also with 14 expressions in 12 publications seems to take the lead in the investigations trend.

This fact, together with the influential presence of recent publications, seems to highlight the validity of Harasim (2012) ideas since the context and its support is the two inseparable faces of collaborative learning as well as learning facilitators which can mean elements of success or failure in a digital learning experience.

Matching this literature review and our research goal, the second research question was designed as follows:

**RQ2.** *Which methods and methodologies can be employed to promote the entrepreneurial activity?*

## 3. Research methodologies

The empirical research methodology was quantitative, based on an online questionnaire applied to a sample of 75 HE Students and 75 Entrepreneurs, at Universidade Europeia, IPAM (Instituto Português de Administração e Marketing) and IADE (Instituto de Arte, Design e Empresa), in order to identify differences in their perceptions regarding the stages of the start-up process and also the most relevant methodologies to develop the entrepreneurial capacity of a potential entrepreneur. The sample of the 75 HE Students is made up of 18 male (24%) and 57 female (76%). The mean age is 27,1 years old (28,9 in the

**Table 1**
Digital learning methodologies, tools and contexts.

| Descriptor | Expressions | Authors |
|---|---|---|
| Digital learning methodologies | Project based-learning; problem based-learning; digital stories; online learning environments; digital moments; technology integrated teaching methods; digital storytelling; educational games; authentic learning | Barber, W.; King, S.; Buchanan, S. (2015)<br>Epure and Mihăeș (2017)<br>Kocaman-Karoglu (2016)<br>Abdulmajed, Hind; Park, Yoon Soo; Tekian, Ara (2015)<br>Mantri, Archana (2014)<br>Amory (2014) |
| Digital learning contexts | Collaborative communities; cooperative learning; digital combinational system; collaborative learning; flipped classroom using digital media; moving from fixing to online space; experiential online development; open educational practice; network participation. | Barber, W.; King, S.; Buchanan, S. (2015)<br>Chen, Liwen; Chen, Tung-Liang; Chen, Nian-Shing (2015)<br>Trotskovsky, E.; Sabag, N. (2015)<br>Muñoz, Rubio, Cruz, and Ivanovna (2015)<br>Sohrabi, Babak; Iraj, Hamideh (2016)<br>Liwen Chen; Tung-Liang Chen; Nian-Shing Chen (2015)<br>Thibaut, Curwood, Carvalho, and Simpson (2015)<br>Salmon, Gilly; Gregory, Janet; Lokuge Dona, Kulari; Ross, Bella (2015)<br>Masterman, Elizabeth (2016)<br>Stewart, Bonnie (2015)<br>Liyanagunawardena, Tharindu Rekha; Lundqvist, Karsten Øster; Williams, Shirley Ann (2015) |
| Tools and Simulators | Web-based video; computerised environments; spatial science technology; slow-motion: narrated stop-motion animation; generic modelling language; digital video; augmented reality; design-based research; gamification; learning manager; simulation; computer-based teaching; library webinars | Moorefield-Lang and Hall (2015)<br>Alhajri, S (2016);<br>Joshua Rudow & M. Anwar Sounny-Slitine (2015);<br>Unger, Daniel R.; Kulhavy, David L.; Busch-Petersen, Kai; Hung, I.-Kuai (2016)<br>Wendy Nielsen and Garry Hoban (2015)<br>Kosonen, K., Ilomäki, L. & Lakkala, M. (2015)<br>Friend, Jennifer; Militello, Matthew (2014)<br>Sungkur, Roopesh Kevin; Panchoo, Akshay; Bhoyroo, Nitisha Kirtee (2016)<br>Wood, Denise; Bilsborow, Carolyn (2014)<br>Stansbury, Jessica A.; Earnest, David R. (2017)<br>Wendy, Guerra, and Pírez (2014)<br>Rai, S. S.; Gaikwad, Anil T.; Kulkarni, R. V. (2014)<br>Lau, K H Vincent (2014) |
| Support Systems for Digital Learning | eLearning; mobile learning; learning object repository; blended learning; blackboard; moodle learning manager; twitter; videoconferencing; MOOC – massive open online courses. | Tena, Rosalía Romero; Almenara, Julio Cabero; Osuna, Julio Barroso (2016)<br>Sungkur, Roopesh Kevin; Panchoo, Akshay; Bhoyroo, Nitisha Kirtee (2016)<br>Xu, Hong (2016)<br>Martin-Garcia, Antonio V.; Hernández Serrano, Mª José; Sánchez Gómez, Mª Cruz (2014)<br>Salmon, Gilly; Gregory, Janet; Lokuge Dona, Kulari; Ross, Bella (2015)<br>Wendy et al. (2014)<br>Stewart, Bonnie (2015)<br>McNaughton, Susan M; Westberry, Nicola C; Billot, Jennie M; Gaeta, Helen (2014) |

Source: Sousa, Cruz, et al. (2017).

male and 26,5 in the female), but 56 (74,7%) are between 18 and 27 years old. In general, 37 (49,3%) have a Bachelor (11 male and 26 female), 33 (44,0%) have a High School (6 male and 27 female), and 5 (6,7%) have a Master (1 male and four female). The sample characterization of the 75 Entrepreneurs is composed for 43 male (57,3%) and 32 female (42,7%) with a mean age of 40,75 years old (40,8 in the male and 40,7 in the female). The majority has between 32 and 51 years old (30 (40%) between 32 and 41 and 23 (30,7%) between 42 and 51). In general, 37 (49,3%) have a Bachelor (22 male and 15 female), 10 (13,3%) have a High School (7 male and 3 female), 24 (32,0%) have a Master (11 male and 13 female) and 4 (5,3%) have another course (MBA/Post Graduation/Technological Secondary).

Considering the typology of the questionnaires designed, an structured questionnaire applied with a non-probability sampling, as a scale with questions classified in *Likert* scale of importance (ordinal measures of 1-nothing until 5-much), questions with high numbers of items under evaluation and without variables that could be considered as dependent, we consider the following methodology, in order to answer the research questions, in general: 1 - Socioeconomic descriptive statistical analysis; and, in particular, for each of the research questions: 2- Exploratory Factor Analysis (EFA); 3 - Analysis of the general coherence of the responses and, in particular, to each of the factors obtained in each of the EFA (through *Cronbach's* alpha); 4 - Analysis of clusters in two stages, technique that allows to obtain the degree of importance of the predictors.

The first statistical technique (1) is justified by the proper characterization of the sample under study as well as its contextualization. The second statistical technique (2) is justified for the high number of items evaluated in each question (variable). According to Maroco (2014), EFA allows us to discover and analyze the structure of a set of interrelated variables to construct a measurement scale for (intrinsic) factors that somehow (more or less explicitly) control the variables. Thus, the scores attributed to "constructs" can be interpreted, not immediately linearly, as indicators of the importance of the "construct." In our case, the relational structure of each research question was evaluated by the EFA on the correlation matrix, with factor extraction by the principal components method, followed by a *Varimax* rotation. The retained common factors are those with an eigenvalue > 1, consistent with *Scree Plot* and the percentage of retained variance. To evaluate the validity of the EFA, we used the *KMO* criterion with the classification criteria defined in Maroco (2014) and the scores of each subject were obtained by the regression method implemented in SPSS Statistics v.22.

It should also be noted that the EFA assumes that the variables under study have a regular or at least symmetrical distribution. Due to the scale used, from 1 to 5, these assumptions are rarely achieved. One of the recommendations made for these situations (Maroco, 2014) is to work with rank variables or, even more efficiently, with *Z-scores*. In this case, and for all the research questions, we studied the normality and symmetry of *Ranks* and *Z-scores*, but the results obtained were practically the same as those obtained with the original variables. Thus, we chose to consider the original variables to perform the EFA.

To complement the EFA, the use of cluster analysis is justified in two steps, since it allows obtaining the importance of the predictor ("*construct*" or item) in a consequent regression analysis, not requiring being defined a dependent variable.

Traditional clustering methods are efficient and rigorous when applied to small datasets. When the data set is more extended, as it is this case, to apply the traditional methods, it is necessary, previously, to reduce the size of the database, and the grouping is carried out in two steps as BIRCH (Zhang, Ramakrishnon, & Livny, 1996). The *TwoStep Cluster* method uses this procedure, allowing response to large data sets (particularly well suited to the structural approach of multiple indicators) and the use of continuous, categorical variables or the two variable types simultaneously. The method consisted of the following steps:

Step 1: formation of a series of pre-clusters, aiming to reduce the matrix size of distances between all possible pairs of cases. At this stage, the data are traversed one by one, and the algorithm decides whether a given individual should migrate to a preformed pre-cluster or start a new pre-cluster. At the end of this procedure, all individuals belonging to the same pre-cluster are treated as a single entity. Thus, the distance matrix is smaller because its size depends on the number of pre-clusters.

Step 2: grouping the pre-clusters. In the second step, the hierarchical grouping (of the pre-clusters formed in the previous stage) according to the number of clusters desired.

In this method, the log-likelihood function is used in the calculation of the distance measures, and because we work only with categorical variables, the distance between two clusters is expressed by the decrease of the log-likelihood function. In this case, the algorithm provides better results when the multinomial distribution is verified.

Main advantages: the use of categorical variables (this is our case); grouping in two steps, increasing the efficiency of the method; the algorithm itself finds an optimal number of clusters, and it is also possible to specify the desired number of clusters (we did not); (Tkaczynski, 2017). In this paper, we present information about the importance of each variable in the formation of each cluster and a measure of statistical significance called *Average Silhouette* (*Chi-square* for categorical variables).

The *Average Silhouette* (*silhouette measure of cohesion and separation)*, proposed for Kaufman and Rousseeuw (1990), is a measure of the clustering solution's overall goodness-of-fit. For the observation *(i)*, let us consider the average of the distances of this point to the other points of this cluster and *b(i)* the average of the distances to the points of the nearest cluster. In this way, the *Silhouette* statistic is defined by.

$$s(i) = \frac{b(i) - a(i)}{\max(a(i), b(i))}$$

One point is well classified if *s(i)* is large. The authors proposed the choice of the optimal value of some clusters *k*, as the value that maximizes the average of the whole dataset, not being *s(i)* defined when $k = 1$. It is mostly based on the average distances between the objects and can vary between $-1$ and $+1$, specifically a silhouette measure of < 0,20 indicates a poor solution quality, a measure between 0,20 and 0,50 a fair solution, whereas values of > 0,50 indicate an acceptable solution (Mooi & Sarstedt, 2011).

For the automatic determination of the number of clusters, SPSS developed the *TwoStep* procedure, compatible with the hierarchical cluster analysis, which is the first step uses the *Bayes information criterion* (BIC) or the *Akaike information criterion* (AIC). In the second step, the initial estimate is improved when the maximum distance between the two closest clusters is found at each step of the hierarchical cluster. In our case, we used BIC in the first step.

## 4. Data analysis and results

### 4.1. Stages of the entrepreneurial start-up process

Regarding our first research question (RQ1), which inquiry an essential stage of the entrepreneurial start-up process, we can observe Table 1 and Table 2. From the Table 2, we can conclude that the retained factor (obtained by the principal component analysis (PCA) method followed by a *Varimax rotation*) has high factor weights of all items (more significant than 0,60) and explains 64,51% of that total variance (which we can consider satisfactory (Maroco, 2014)). All communalities are high (higher than 0,5), except Evaluation of entrepreneurial skills and characteristics, and values of the *KMO* (0,809) *and Bartlett* (171,32, Sig. = 0,001 < 0.05) statistics showing that the retained factor is appropriate to describe the latent correlational structure between the items that is also corroborated by the *Cronbach's*

**Table 2**
What are the most critical stages of the entrepreneurial start-up process for entrepreneurs?

| RQ1 - entrepreneurs | Factor | Communalities |
|---|---|---|
| | 1 - Idea | |
| Choice and structuring of the idea for the enterprise | 0,81 | 0,66 |
| Business plan | 0,80 | 0,64 |
| Achieving sustainability of entrepreneurial idea | 0,78 | 0,61 |
| Pilot project of the entrepreneurial idea | 0,73 | 0,54 |
| Market and product analysis | 0,72 | 0,52 |
| Evaluation of entrepreneurial skills and characteristics | 0,61 | 0,38 |
| Eigenvalue | *3,39* | |
| Variance explicated | *64,51* | |
| KMO | 0,809 | |
| Sphericities de Bartlett | $\chi^2$ (15) = 171,32; Sig. = 0,001 < 0,05 | |
| General Alfa Cronbach | 0,837 | |
| Alfa Cronbach per factors | 0,837 | |

Eigenvalue - Extracted variance of the factors; Variance explicated - variation explained by the solution.

*Alpha* (0,837). Due to the characteristics of items being evaluated, this factor can be classified as "*Idea*."

In response to RQ1, the most critical steps in the business creation process, according to the Entrepreneurs, were obtained two optimal clusters with *Silhouette* statistic equal to 0,5, the best of all, indicating the existence of a reasonable separation distance between the *Clusters*, considering that all items within them are statistically significant (*p*-value < 0,05). By the criterion of the importance of the predictor, the most critical steps of the business creation process in RQ1, and for the entrepreneurs, were ordered as follows: Business plan (77,8% in the cluster-1, 95 and 1% in the cluster-2), Market and product analysis (94,4% in the cluster-1 and 80,5% in the cluster-2), Choice and structuring of the idea for the enterprise (100,0% in the cluster-1 and 58,5% in the cluster-2), achieving sustainability of entrepreneurial idea (73,2% in the cluster-1 and 83,3% in the cluster-2) as can be seen in the Graph 1 below, from the most important to the least important.

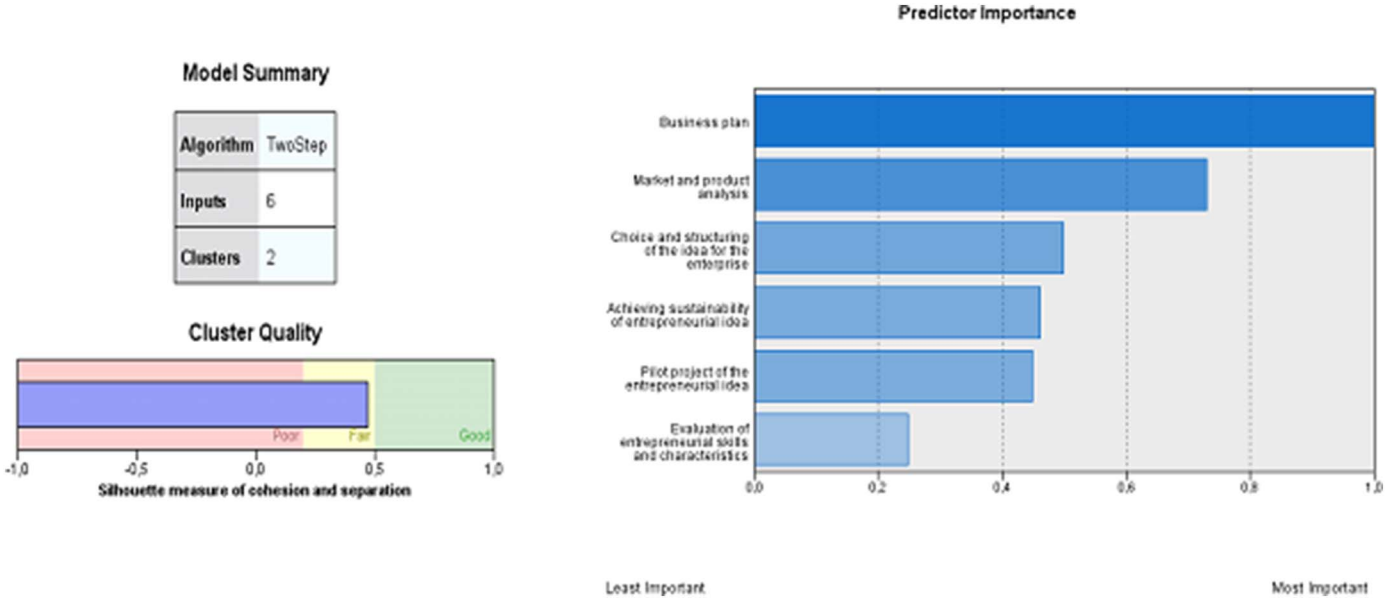
From the Table 3, we can conclude that the retained factor (obtained by PCA and *Varimax rotation*) has high factor weights of all items (more significant than 0,60) and explains 63,35% of that total variance

**Table 3**
What are the most critical stages of the entrepreneurial start-up process for HE students?

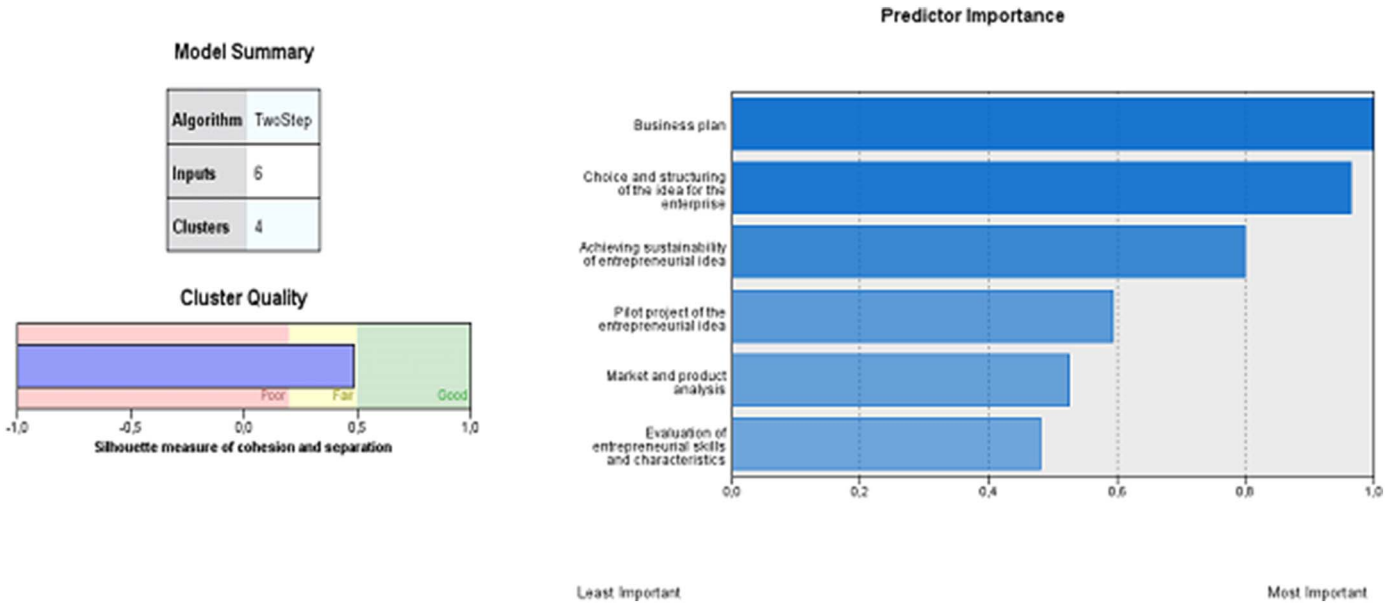
| RQ1 – HE students | Factor | Commonalities |
|---|---|---|
| | 1 - Idea | |
| Business plan | 0,89 | 0,79 |
| Choice and structuring of the idea for the enterprise | 0,86 | 0,73 |
| Pilot project of the entrepreneurial idea | 0,82 | 0,67 |
| Market and product analysis | 0,80 | 0,64 |
| Achieving sustainability of entrepreneurial idea | 0,77 | 0,59 |
| Evaluation of entrepreneurial skills and characteristics | 0,62 | 0,38 |
| Eigenvalue | 3,80 | |
| Variance explicated | 63,35 | |
| KMO | 0,811 | |
| Sphericities de Bartlett | $\chi$2 (15) = 242,61; Sig. = 0,001 < 0,05 | |
| General Alfa Cronbach | 0,879 | |
| Alfa Cronbach per factors | 0,879 | |

(we consider satisfactory). All communalities are high (higher than 0,5), except Evaluation of entrepreneurial skills and characteristics, and values of the *KMO* (0,811) *and Bartlett* (242,61, Sig. = 0,001 < 0.05) statistics showing that the retained factor is appropriate to describe the latent correlational structure between the items that is also corroborated by the *Cronbach's Alpha* (0,879). Due to the characteristics of items being evaluated, this factor can be classified as "*Idea*."

In relation to RQ1, the most important steps in the business creation process, according to the HE Students, were obtained four optimal clusters with *Silhouette* statistic equal to 0,5, as the previous best of all, indicating the existence of a distance of reasonable separation between clusters, considering that all items within them are statistically significant (*p*-value < 0,05). By the criterion of the importance of the predictor, the most important steps of the business creation process in RQ1, and for the HE Students, were ordered as follows: Business plan (95,7% in the cluster-1, 89,5% in the cluster-2, 100,0% in the cluster-3 and 95,0% in the cluster-4), Choice and structuring of the idea for the enterprise (100,0% in the cluster-1, 94,7% in the cluster-2, 100,0% in the cluster-3 and 90,0% in the cluster-4), Achieving sustainability of entrepreneurial idea (60,9% in the cluster-1, 84,2% in the cluster-2, 100,0% in the cluster-3 and 95,0% in the cluster-4), Pilot The entrepreneurial idea (60,9% in the cluster-1, 68,4% in the cluster-2,




**Graph 1.** Cluster analysis – most important stages of the start-up process-entrepreneurs.




**Graph 2.** Cluster analysis – most important stages of the start-up process- HE students.

100,0% in the cluster-3 and 90,0% in the cluster-4), the market and product analysis (91,3% in the cluster-1, 73,7% in the cluster-2, 71,4% in the cluster-3 and 80,0% in the cluster-4) and the evaluation of entrepreneurial skills and characteristics (69,6% in the cluster-1, 89,5% in the cluster-2, 100% in the cluster-3 and 70,0% in the cluster-4) as can be seen in the Graph 2 below, from the most important to the least important.

Considering the criterion of the importance of the predictor, we verified that there is only one difference, regarding prioritization, in the most critical stages of the business creation process, according to the two groups under study. This difference occurs in the importance of Market and product analysis, in the group of Entrepreneurs appears in second place in the importance of predictors and the group of HE Students appears in fifth place.

### *4.2. Methods and methodologies for the promotion of the entrepreneurial activity*

Regarding our second research question (RQ2), which inquiry the methods and methodologies can be employed to promote the entrepreneurial activity, we can observe Table 3 and Table 4. From the Table 4 we can conclude that the four retained factor (by PCA and *Varimax rotation*) present high factor weights in Self-directed experienced learning, Co-operative education, Economical/Financial facilities and Example of success (1-Benchmarketing), Networking, Education, Training, Social media & advertisement and Family support (2-Education), Mentoring, Business counselling and Follow-up support (3-Mentoring), Incubation/office facilities, Subsistence allowance, and Seed capital (4-Networking), more significant than 0,50, and explains 72,94% of that total variance (we consider reasonable). All communalities are high (higher than 0,5) and values of the *KMO* (0,863) *and Bartlett* (670,32 Sig. = 0,001 < 0,05) statistics showing that the retained factors are appropriate to describe the latent correlational structure between the items that is also corroborated by the *Cronbach's Alpha* (0,918).

In relation to RQ2, which methods and methodologies can be used to promote entrepreneurial activity, in the case of Entrepreneurs, two optimal clusters with *Silhouette* statistics equal to 0,4 were obtained, again indicating that there is a distance of reasonable separation between clusters, considering that all items within them are statistically significant (*p*-value < 0,05). By the criterion of the importance of the predictor, the ten methods and methodologies that can be used to promote the entrepreneurial activity in RQ2, in the entrepreneurs, are: Networking opportunities (84,0% in the cluster-1, 86,4% in the cluster-2), Social media & advertisement (88,0% in the cluster-1, 81,8% in the cluster-2), Follow-up support (68,0% in the cluster-1, 95,5% in the cluster-2), Education (76,0% in the cluster-1, 81,8% in the cluster-2), Mentoring (76,0% in the cluster-1, 81,8% in the cluster-2), Business counselling (80,0% in the cluster-1, 81,8% in the cluster-2), Economical / Financial facilities (52,0% in the cluster-1, 86,4% in the cluster-2), Subsistence allowance (56,0% in the cluster-1, 90,9% in the cluster-2), Family support (72,0% in the cluster-1, 81,8% in the cluster-2) and Co-operative education (56,0% in the cluster-1, 86,4% in the cluster-2), as can be seen in the Graph 3 below, from most to least important.

From the Table 5 we can conclude that the three retained factor (by PCA and *Varimax rotation*) present high factor weights in Business counselling, Incubation/office facilities, Subsistence allowance, Seed capital and Networking opportunities (1-Networking), Mentoring, Follow-up support, Self-directed experienced learning, Co-operative education and Social media & advertisement (2-Mentoring), Education, Example of success and Training (3-Education), higher than 0,50, and explains 60,73% of that total variance (we consider satisfactory). All communalities are high (higher than 0,5) and values of the *KMO* (0,811) *and Bartlett* (528,80 Sig. = 0,001 < 0,05) statistics showing that the retained factors are appropriate to describe the latent correlational structure between the items that is also corroborated by the *Cronbach's Alpha* (0,897).

Also in relation to RQ2, which methods and methodologies can be used to promote entrepreneurial activity, in the case of the HE Students, two optimal clusters were also obtained but with Silhouette statistic equal to 0,3, indicating also the existence of a reasonable separation distance between clusters, considering that all items within them are statistically significant (*p*-value < 0,05). By the criterion of the importance of the predictor, the methods and methodologies that can be used to promote the entrepreneurial activity in RQ2 at HE Students are: Self-directed experienced learning (51,4% in the cluster-1, 66,7% in the cluster-2), Education (56,8% in the cluster-1, 75,8% in the cluster-2), Subsistence allowance (62,2% in the cluster-1, 57,6% in the cluster-2), Co-operative education (48,6% in the cluster-1, 54,5% in the cluster-2), Example of success (56,8% in the cluster-1, 63,6% in the cluster-2), Training (59,5% in the cluster-1, 84,8% in the cluster-2), Business counselling (75,7% in the cluster-1, 66,7% in the cluster-2), Family

**Table 4**
Which are the methods and methodologies that can be employed to promote the entrepreneurial activity, according to the entrepreneurs?

| RQ2 - entrepreneurs | Factors | | | | Communalities |
|---|---|---|---|---|---|
| | 1 - benchmarking | 2 - education | 3 - mentoring | 4 - networking | |
| Mentoring | 0,11 | 0,18 | 0,87 | 0,15 | 0,81 |
| Business counselling | 0,21 | 0,09 | 0,76 | 0,26 | 0,69 |
| Incubation/office facilities | 0,29 | −0.15 | 0,40 | 0,72 | 0,78 |
| Subsistence allowance | 0,54 | 0,29 | 0,12 | 0,60 | 0,75 |
| Seed capital | 0,04 | 0,30 | 0,22 | 0,78 | 0,75 |
| Networking opportunities | 0,10 | 0,60 | 0,57 | 0,19 | 0,74 |
| Follow-up support | 0,36 | 0,34 | 0,70 | 0,11 | 0,74 |
| Self-directed experienced learning | 0,71 | 0,16 | 0,28 | 0,05 | 0,62 |
| Co-operative education | 0,70 | 0,26 | 0,10 | 0,31 | 0,67 |
| Economical/Financial facilities | 0,84 | 0,16 | 0,24 | 0,08 | 0,80 |
| Education | 0,20 | 0,71 | 0,00 | 0,50 | 0,80 |
| Example of success | 0,63 | 0,52 | 0,04 | 0,20 | 0,71 |
| Training | 0,26 | 0,78 | 0,21 | −0,05 | 0,72 |
| Social media & advertisement | 0,28 | 0,76 | 0,31 | 0,11 | 0,76 |
| Family support | 0,47 | 0,53 | 0,18 | 0,28 | 0,60 |
| Eigenvalue | 7,15 | 1,48 | 1,23 | 1,07 | |
| Variance explicated | 47,67 | 9,89 | 8,23 | 7,15 | |
| KMO | 0,863 | | | | |
| Sphericities de Bartlett | $\chi 2$ (105) = 670,32; Sig. = 0,001 < 0,05 | | | | |
| General Alfa Cronbach | 0,918 | | | | |
| Alfa Cronbach per factors | 0,966 | 0,829 | 0,858 | 0,82 | |

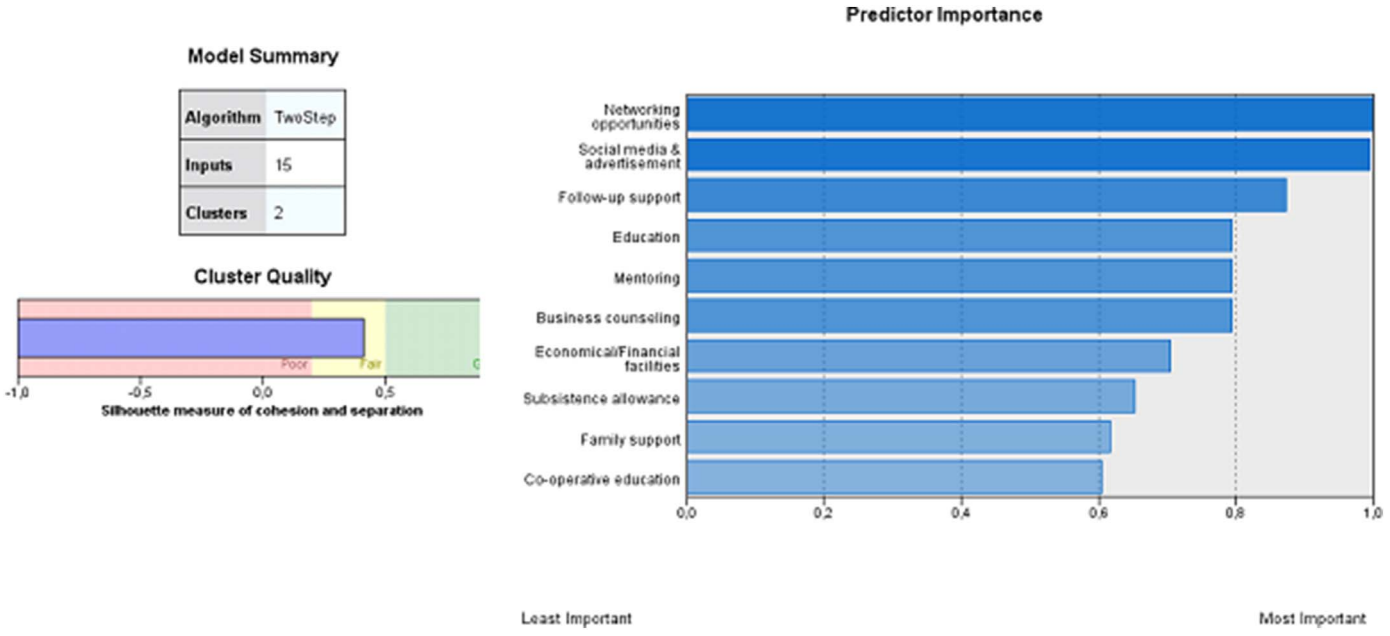
support (54,1% in the cluster-1, 54,5% in the cluster-2), Networking opportunities (54,1% in the cluster-1, 66,7% in the cluster-2) and Economical/Financial facilities (67,6% in the cluster-1, 57,6% in the cluster-2), as can be seen in the Graph 4 below, from most to least important.

Considering the criterion of the importance of the predictor, we verified that there are few differences between the methods and methodologies that can be used to promote the entrepreneurial activity, according to the two groups under study, despite the different degrees (orders) of importance. In this question, the similarities between the groups are given to the level of Networking opportunities, Education, Business counselling, Economic/Financial facilities, Subsistence allowance, Family support and Co-operative education.

## 5. Proposal of *E*-education methodologies for entrepreneurs strategic knowledge and skills development in each stage of the start-up process

The following Table (Table 6) is a proposal of E-Education methodologies for entrepreneurs' strategic knowledge and skills development in each stage of the Start-up process, based on an in-depth literature review about the most analyzed e-education methodologies and the results from the survey to the entrepreneurs and the students.

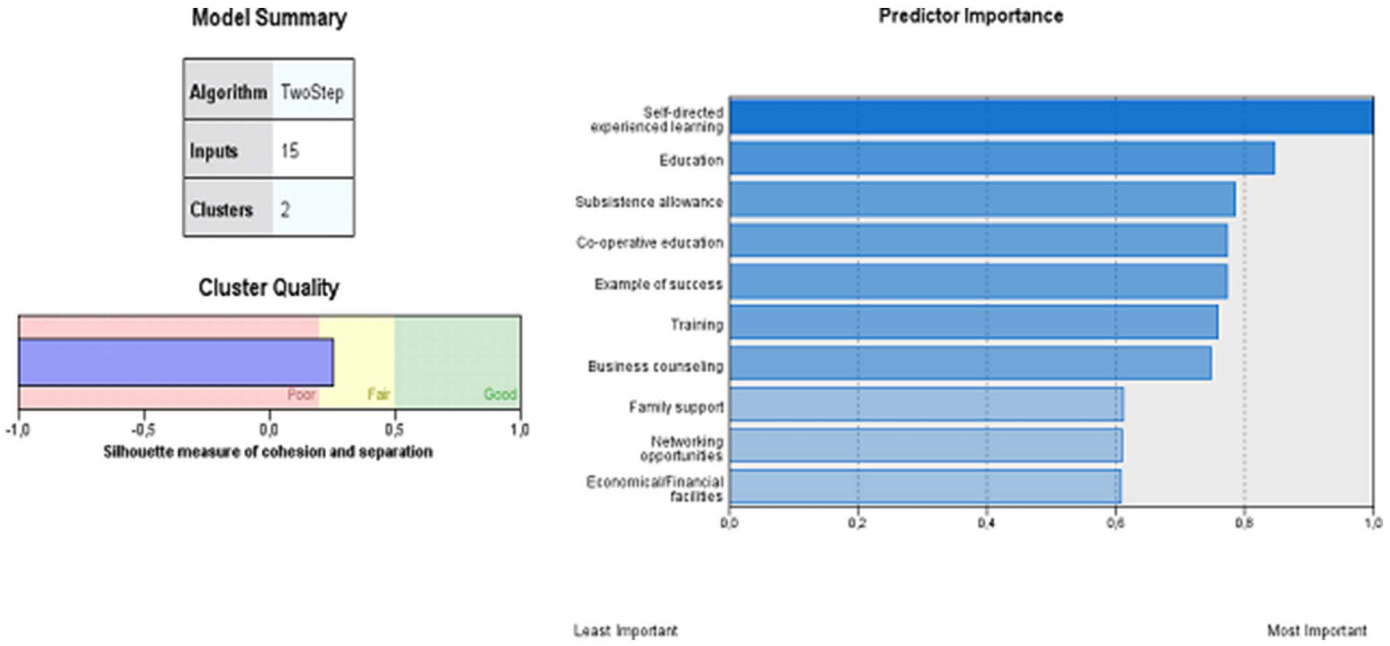
Digital learning methodologies are new methods of teaching using technology with the purpose to improve the quality of education and involve students in the educational process, and our findings lead us to the following methodologies: Project based-learning; Problem based-learning; Digital stories; Online learning environments; Digital Moments; Technology integrated teaching methods; Digital storytelling; Educational games; Active learning.




**Graph 3.** Cluster analysis – most important methods and methodologies that can be employed to promote the entrepreneurial activity, according to the entrepreneurs.

**Table 5**
Which are the methods and methodologies that can be employed to promote the entrepreneurial activity, according to the HE Students?

| RQ2 – HE students | Factors | | | Commonalities |
|---|---|---|---|---|
| | 1 - networking | 2 - mentoring | 3 - education | |
| Mentoring | 0,38 | 0,58 | 0,03 | 0,49 |
| Business counselling | 0,63 | 0,55 | 0,03 | 0,69 |
| Incubation/office facilities | 0,73 | −0,07 | 0,34 | 0,65 |
| Subsistence allowance | 0,78 | 0,12 | 0,28 | 0,70 |
| Seed capital | 0,76 | 0,21 | 0,19 | 0,66 |
| Networking opportunities | 0,59 | 0,29 | 0,31 | 0,53 |
| Follow-up support | 0,48 | 0,56 | −0,02 | 0,54 |
| Self-directed experienced learning | 0,04 | 0,80 | 0,36 | 0,77 |
| Co-operative education | 0,01 | 0,81 | 0,27 | 0,74 |
| Economical/Financial facilities | 0,55 | 0,43 | 0,21 | 0,53 |
| Education | 0,15 | 0,22 | 0,82 | 0,75 |
| Example of success | 0,24 | 0,26 | 0,61 | 0,49 |
| Training | 0,23 | 0,25 | 0,62 | 0,51 |
| Social media & advertisement | 0,29 | 0,51 | 0,32 | 0,44 |
| Family support | 0,20 | 0,01 | 0,77 | 0,63 |
| Eigenvalue | 6,28 | 1,43 | 1,40 | |
| Variance explained | 41,86 | 9,54 | 9,33 | |
| KMO | 0,811 | | | |
| Sphericities of Bartlett | $\chi 2$ (105) = 528,80; Sig. = 0,001 < 0,05 | | | |
| General Alfa Cronbach | 0,897 | | | |
| Alfa Cronbach per factors | 0,851 | 0,794 | 0,770 | |




**Graph 4.** Cluster analysis – most important methods and methodologies that can be employed to promote the entrepreneurial activity, according to the HE students.

These methods of learning when integrated into digital learning contexts, which are spaces, facts or situations of learning that supports innovative pedagogical models, can empower learners, facilitating and promoting the learning process. In our research, we have found: Collaborative Communities; Cooperative learning; Digital combinational system; Collaborative learning; Flipped classroom using digital media; Moving from fixing to online space; Experiential online development; Open educational practice; Network participation.

To implement these methodologies, we need to use several tools and simulators that use technology or the Internet to facilitate the learning process, such as computers, mobile phones, tablet PCs, projectors or electronic books. Our findings lead us to the following tools: Web-based video; Computerised environments; Spatial science technology; Slow-motion: Narrated stop-motion animation; Generic modelling language; Digital video; Augmented reality; Design-based research; Gamification; Learning manager; Simulation; Computer-based teaching; Library webinars.

Finally, for the massive implementation of the *E*-Education, we need support systems for digital learning, which are systems that help to manage the learning process and have the infrastructure to use interactive features such as threaded discussions, video conferencing, and discussion forums to potentiate students learning outcomes. In our research, we have found: eLearning systems; Mobile learning; Learning object repository; Blended learning; Blackboard; Moodle Learning Manager; Twitter; Videoconferencing; MOOC – massive open online courses.

**Table 6**
Proposal of *E*-education methodologies for entrepreneurs.

| Start-up stages | *E*-education methodologies | Entrepreneurs and HE students methodologies identification |
|---|---|---|
| Business plan | Project based-learning; problem based-learning; digital stories; online learning environments; technology integrated teaching methods; digital storytelling; educational games; active learning. | Mentoring<br>Business counselling<br>Self-directed experienced learning<br>Education |
| Choice and structuring of the idea for the enterprise | Collaborative communities; cooperative learning; collaborative learning; network participation. | Networking opportunities<br>Example of success |
| Pilot project of the entrepreneurial idea | Augmented reality; web-based video; gamification; simulation. | Incubation/office facilities<br>Subsistence allowance<br>Seed capital<br>Social media & advertisement |
| Market and product analysis | Web-based video; narrated stop-motion animation; generic modelling language; digital video; augmented reality; gamification; simulation; webinars | Example of success<br>Training<br>Social media & advertisement |
| Achieving sustainability of entrepreneurial idea | Collaborative communities; cooperative learning; collaborative learning; network participation. | Education<br>Economic/Financial facilities<br>Family support |
| Evaluation of entrepreneurial skills and characteristics | Flipped classroom using digital media; cooperative learning; collaborative learning; moving from fixing to online space; experiential online development; open educational practice; online learning environments; technology integrated teaching methods; digital storytelling; educational games; active learning. | Follow-up support<br>Co-operative education |

## 6. Conclusions

The political and economic environment plays a vital role in entrepreneurship development. For entrepreneurship to assume the strategic economic role, actions must be exerted. Decision-makers, both in regional or national levels, must move from mere subjective intentions policies for the promotion of entrepreneurship to an unyielding commitment to entrepreneurship development by drawing accurate and ecological policies, actions and avoid those that might intimidate potential entrepreneurs. In this context, this research on digital learning methodologies to develop entrepreneurial capacity on the HE Students assumes a position of critical strategic importance.

The enrichment of this paper is to fill up some of the lack of understanding about e-education methodologies, which promote the development of knowledge and skills that will benefit potential entrepreneurs. Moreover, our focus was on higher education students and young entrepreneurs.

In summary, the results of the present research show that the use of digital methodologies is increasing in education, as we can see in all the study's made in the last three years and that these technologies can enhance the students learning the process with innovations such as mobile technologies, tablets, and smartphones applications.

As the leading methodologies, tools, systems and contexts in e-education, our findings denote out for a need to increase the mix of those methodologies in education with the goal to prepare students to think critically and solve complex problems, work collaboratively, communicate efficiently and have more autonomy an independence in the learning process and become autonomous and independents, giving them tools to create their own business or to be intrapreneurs in their professional life's.

Emerging from the results of the questionnaire it's possible to say that there are few differences between the methods and methodologies that can be used to promote the entrepreneurial activity, according to the two groups under study, despite the different degrees (orders) of importance. In this question, the similarities between the groups are given to the level of Networking opportunities, Education, Business counselling, Economic/Financial facilities, Subsistence allowance, Family support and Co-operative education.

More specifically for the development of the entrepreneurial capacity, we propose a model that combines the stages of the start-up process with the e-education methodologies which emerged from the literature review, and the methodologies identified by the HE students and the young entrepreneurs.

The analysis of the data from the questionnaire allows us to conclude that regarding the most critical stages of the business creation process, the differences only occur in the importance of Market and Product Analysis: in the group of Entrepreneurs it appears in second place, and the group of HE Students appears in fifth place.

For the Business plan creation, the e-education methodologies more adequate are Project based-learning; Problem based-learning; Digital stories; Online learning environments; Technology integrated teaching methods; Digital storytelling; Educational games; Active learning; and the students and the entrepreneurs identified: Mentoring, Business counselling, Self-directed experienced learning, and Education.

For the Choice and structuring of the idea for the enterprise the e-education methodologies more adequate are: Collaborative Communities; Cooperative learning; Collaborative learning; Network participation; and the students and the entrepreneurs identified: Networking opportunities and Examples of success.

Regarding the Pilot project of the entrepreneurial idea, the e-education methodologies more adequate are: Augmented reality; Web-based video; Gamification; Simulation; and the students and the entrepreneurs identified: Incubation/office facilities, Subsistence allowance, Seed Capital, and Social media & advertisement.

In respect to Market and product analysis, the e-education methodologies more adequate are: Web-based video; Narrated stop-motion animation; Generic modelling language; Digital video; Augmented reality; Gamification; Simulation; Webinars; and the students and the entrepreneurs identified: Example of success, Training, Social media & advertisement.

For Achieving sustainability of entrepreneurial idea, the e-education methodologies more adequate are: Collaborative Communities; Cooperative learning; Collaborative learning; Network participation; and the students and the entrepreneurs identified: Education; Economic/Financial facilities, and Family Support.

Finally, for Evaluation of entrepreneurial skills and characteristics, the e-education methodologies more adequate are: Flipped classroom using digital media; Cooperative learning; Collaborative learning; Moving from fixing to online space; Experiential online development; Open educational practice; Online learning environments; Technology integrated teaching methods; Digital storytelling; Educational games; Active learning; and the students and the entrepreneurs identified: Follow-up support, Co-operative education.

The proposed model of *E*-Education methodologies for

entrepreneur's strategic knowledge and skills development in each stage of the start-up process intends to be a practical model to be used not only by the HEI but also by the practitioners to create a potential for the competitivity of the markets.

## Competing interests

The authors declare that they have no competing interests.

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