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# Digital Entrepreneurship Education: a challenge for competency-based training in universities

## *Educación en emprendimiento digital: un reto para la formación por competencias en las universidades*

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## ABSTRACT

This article focuses on the analysis of digital entrepreneurship as a transversal competence for university students. We take as a starting point the EmDigital (Digital Entrepreneurship) model that includes four areas of competence. The aim of the study was to analyse the digital entrepreneurship competence of final-year university students. It is a mixed research that includes a survey of university students (representative cluster sampling) and interviews with successful digital entrepreneurs (non-probabilistic convenience sampling). Two ad hoc instruments have been used and previously validated. The sample of final year undergraduate students who participated in the survey was 1108 and the sample of successful entrepreneurs interviewed was 20. Our main results show that although students perceive themselves as having average competences for digital entrepreneurship, there are significant differences depending on the branch of knowledge of their university studies. Moreover, there are some differences in terms of gender. The interviewees agree on the importance of training university students for digital entrepreneurship skills and the need to consider this competence as basic skill in formal education.

KEYWORDS Digital entrepreneurship; competency; higher education; mixed research; field of knowledge; gender.

## RESUMEN

Este artículo se centra en el análisis del emprendimiento digital como competencia transversal para estudiantes universitarios. Se toma como punto de partida el modelo EmDigital (Emprendimiento Digital) que se compone de cuatro áreas competenciales. El objetivo del estudio fue analizar la competencia de emprendimiento digital de alumnado universitario

de último curso. Se trata de una investigación mixta que incluye una encuesta a estudiantes universitarios (muestreo representativo por conglomerados) y entrevistas a emprendedores digitales de éxito (muestreo no probabilístico de conveniencia). Se han utilizado dos instrumentos ad hoc previamente validados. La muestra de estudiantes universitarios de último curso que participaron en la encuesta fue de 1108 y la muestra de emprendedores de éxito entrevistados fue de 20. Nuestros principales resultados muestran que, aunque los estudiantes se perciben a sí mismos con competencias medias para el emprendimiento digital, existen diferencias significativas en función de la rama de conocimiento de sus estudios universitarios. Además, existen algunas diferencias en función del género. Los entrevistados coinciden en la importancia de formar a los estudiantes universitarios en competencias de emprendimiento digital y en la necesidad de considerar esta competencia como básica en la educación formal.

PALABRAS CLAVE Emprendimiento digital; competencia; universidad; investigación mixta; área de conocimiento; género.

## 1. INTRODUCTION

Entrepreneurship in the 21st century cannot be understood without its association with digitalization, as they end up being two sides of the same coin, but not all authors agree on how to understand this concept of digital entrepreneurship. On the one hand, some authors associate digital entrepreneurship with the idea of profitability and business from a strictly business perspective, as is the case with the approach of Satalkina and Steiner (2020) or Bogdanowicz (2015).

However, from our perspective and according to other different approaches, the business focus is not so relevant, but the focus must be on competence and its indicators, which allows us to better address the education and training of a digital entrepreneur. This is the perspective of Nambisan (2017), who considers digital entrepreneurship as a concept that involves the intersection between entrepreneurship and digital technologies in today's digital society. In this line we also find Kollmann (2009), Lorenzo (2012) or Omar et al. (2019). All of them serve as references to understand digital entrepreneurship as the ability to develop innovative ideas that, using digital technologies, involve value creation in a sustainable context.

On the other hand, Giones and Brem (2017) differentiate between technological entrepreneurship (creation of innovative products in the field of technologies), digital technological entrepreneurship (creation of products specifically supported by digital technologies such as the internet of things or smart devices) and digital entrepreneurship, understood as innovation (new products or services) supported by the internet, such as new products in the cloud, cloud computing, data mining, etc.

In addition to these concepts, we can consider "digital academic entrepreneurship" (Secundo et al., 2020), which is defined as the use of digital technologies to promote entrepreneurship in an academic context, taking into account four different possibilities: digital technologies for entrepreneurship training, the maker movement, digital technologies as tools to discover entrepreneurship opportunities (linked to start-ups or patents and innovative ecosystems) and finally, the promotion of entrepreneurship skills in digital university spaces linked to innovative projects or courses aimed at this purpose.

### 1.1. Entrepreneurship education

It is understood, as a starting point, that the capacity for entrepreneurship is not innate, but is developed and learnt, so it is relevant to understand the need of a formal entrepreneurship education in universities. Although some studies recognize certain characteristics in the personality of entrepreneurs, these are dimensions that can be worked on in formal training processes Fossatti et al. (2023) consider entrepreneurship education in higher education institutions as one of the main factors to improve employability of students, moreover taking into account the need to align the competences provided by institutions with the skills demanded by the employers.

Gutiérrez-Mora et al. (2021) point out that the most necessary trait of the entrepreneur is self-confidence and, on a second level, other traits such as the ability to detect opportunities, risk tolerance, initiative, responsibility, authority, the need for achievement, personal values such as perseverance, motivation and, also very important, the ability to face up to problems.

Beyond trying to promote conditions (political, social or economic) for the design of entrepreneurial proposals and initiatives, we must think about the importance of training our students from the initial stages of the system to become entrepreneurs. Entrepreneurship education is a relatively new approach. Ruiz (2012) indicated that there was hardly any reference to this specific training in academic university education. However, the European Union has now included training in entrepreneurial skills as one of the fundamental elements to face the economic, social and cultural changes of the present and the future (European Commission, 2018) and universities must create the optimal conditions to promote this training (González-Calatayud et al., 2018; Mababu, 2017; Ratten & Usmanji, 2021). As Standing and Mattsson (2016) point out, this is not an easy goal, since there are certain gaps in knowledge about how digital entrepreneurs identify business opportunities and conceptualize them into a business model, an aspect that we will explore in more depth in our empirical research. It will be necessary to "find innovative teaching methods and develop critical thinking skills" (Ratten & Usmanji, 2021, p. 7).

Moreover, recent data show that the level of entrepreneurship in Spain, although stable, is far behind many other countries (GEM, 2020). In Spain, in general, initiatives on entrepreneurship training are very limited and of little depth compared to other countries in our European and international environment, where the relevance of such training is recognized. It is true that the current education law (BOE, 2020) points to the need to encourage and develop the entrepreneurial spirit. Similarly, in the Higher Education system, entrepreneurial training is also a pending issue. It is important to understand that training in entrepreneurial competences requires addressing all its dimensions and indicators, thus abandoning the business approach that has traditionally been associated with entrepreneurship and focusing on a more globalizing approach that allows us not only to analyse the competence, but also to design successful training proposals.

### 1.2. Digital entrepreneurship models

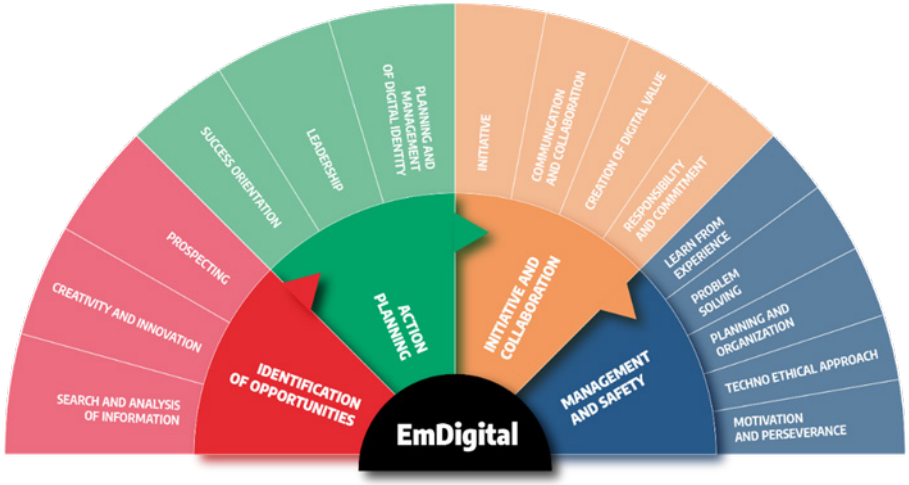
The research shows us several digital entrepreneurship models. Basly and Hammouda (2020) highlight that one of the main needs of digital entrepreneurship is to have a theoretical model that captures all the dimensions necessary for its analysis and for understanding the needs of digital entrepreneurs. Some models

analyse the competence of entrepreneurship (not digital entrepreneurship), although they propose among their dimensions some indicators that can be considered linked to digital competences. This is the case of the EntreComp model (Bacigalupo et al., 2016; Bacigalupo, 2022; McCallum et al. 2018), with three competence areas and 15 sub-competences. In the university context, the HEInnovate model, developed in 2012 between the OECD and the European Commission, is worth mentioning; it is a self-reflection tool for higher education institutions on their innovative potential. Other proposals include the model of Jardim (2021), who builds a reference framework that includes innovation, value creation and effective communication, based on the analysis of contexts and problems, as well as challenges and opportunities.

However, we find models that specifically break down the competence of digital entrepreneurship. Thus Carreón (2014) identifies five areas: basic digital knowledge and knowledge of the ICT market; digital business; access to finance and investment; digital skills and digital leadership; and finally, entrepreneurial culture. On his hand, Cruz García (2016) also proposes four areas of interest: digital agenda, teaching-learning, digital skills and employment. In a previous work, Cruz García (2015) conducts a documentary review and concludes that perceptions of compatibility, usefulness and ease of use are essential to explain the process of adoption and use of technologies for entrepreneurship. For their part, Pérez et al. (2016) design a model of digital entrepreneurship that does not rely on competences, but describes a sequence in which values, beliefs and perceptions are the basis on which people will develop their attitude and knowledge to tackle entrepreneurial projects.

And finally, we need to explain the EmDigital model (see Figure 1) on which our research is based and whose design has involved a complex process of qualitative research supported by documentary analysis techniques, content analysis, focus group and expert judgement through the Delphi method (García-Tudela et al., 2020; Prendes-Espinosa, 2022; Prendes-Espinosa & García-Tudela, 2020). The result of this complex process is the EmDigital model of digital entrepreneurship for university students, which includes 4 competence areas with 15 sub-competences and 45 indicators (García-Tudela et al., 2020; Prendes-Espinosa et al., 2021; Prendes-Espinosa & García-Tudela, 2020). The EmDigital areas are: identification of opportunities; action planning; implementation and collaboration; and finally, management and security.

**FIGURE 1. EmDigital model about digital entrepreneurship (Prendes et al., 2021, p. 9)**



## 2. RESEARCH PROBLEM AND OBJECTIVES

Based on the analysis of previous work on digital entrepreneurship, we have focused on the research problem about how the digital entrepreneurship competence is being worked on in Spanish universities. This problem has been specified in the following general and specific research objectives (Table 1).

**TABLE 1. Research objectives**

| General Objectives | Specific objectives |
|---|---|
| To analyse the self-perception of digital entrepreneurship competence of Spanish university students | To describe the self-perception about digital entrepreneurship of Spanish university students in relation to every dimension of EmDigital model.<br>Compare data on self-perception in each dimension of the EmDigital model according to gender and area of knowledge.<br>To propose recommendations about training programs for university students to promote digital entrepreneurship. |
| To identify the strategies used by successful digital entrepreneurs. | To analyse the perception of successful digital entrepreneurs about the main factors to promote entrepreneurship initiatives.<br>To identify the main strategies to promote successful practices in relation to the processes of opportunity identification, planning and implementation of the digital entrepreneurial action. |

## 3. MATERIALS AND METHOD

### 3.1. Research design

Based on our model EmDigital (Figure 1), we have designed our research using a mixed method which combines quantitative and qualitative techniques. A quantitative research phase was carried out using the survey technique (with an ad hoc questionnaire validated with diverse techniques like a focus group, expert judgement, cognitive interviews and a pilot study) and a qualitative phase using interviews (validated with a focus group) with successful digital entrepreneurs who have been considered as examples of good practices in digital entrepreneurship.

### 3.2. Data collection tools

A questionnaire was designed and validated. Based on the theoretical model of digital entrepreneurship (EmDigital), a questionnaire was created that has gone through several validation phases: expert judgement (8 experts in the field of educational technology and entrepreneurship validated the instrument), cognitive interviews (19 interviews) and a pilot test. After all this process, the questionnaire is composed of 55 Likert-type items with 5 levels - 1 strongly disagree and 5 strongly agree - and a “no answer” option, which fall into 4 dimensions: Identification of opportunities (8 items), Action plan (11 items), Interactive and Collaboration (15 item), and Management and Safety (21 item). The CFA confirms a 4-dimensional structure that explains 47% of the total variance. The Bartlett’s test obtained a value of $\chi 2=25,265.83$, with 1,485

degrees of freedom and a p-value of $p<0.05$. The KMO coefficients were: 0.85, 0.86, 0.92, and 0.95. The overall model fit was excellent, with an RMSR value of 0.03. Cronbach's alpha of the overall questionnaire was .966. The reliability per dimension was as follows: 1. Identification of opportunities .83; 2. Action planning .84; 3. Implementation and collaboration .90; and 4. Management and safety .94. The questionnaire can be found at the following link in its Spanish version: https://acortar.link/8i9a4t

In the qualitative phase, a semi-structured interview was designed based on the analysis of good practices and previous work on successful digital entrepreneurship experiences. The interview was validated using the expert judgement method. Subsequently, the interviews were conducted by videoconference, as they were carried out during the Covid pandemic.

The main purpose of the interview was to determine the factors that influence the success of an entrepreneur in the digital world. To achieve this purpose and guide the content of the items, the following interview objectives were established:

- To know the keys to idea development and opportunity identification.
- To know the main aspects of entrepreneurial action planning and business design.
- To know the main aspects of the implementation of entrepreneurial action and the collaboration with other agents.
- To address global aspects of the keys to success.

Documentary review and collaborative procedure were the main methods followed to design the semi-structured interview. This initial phase was used to design the indicators of good practices in digital entrepreneurship. The interview script was validated using the expert judgment technique. All members of the EmDigital Project research team participated in a two-phase validation sequence. The final version of this instrument, after applying adjustments during the validation process, can be consulted in Prendes-Espinosa et al. (2021).

### 3.3. Context of the study and research participants

For the survey we have used the population of university students in the Region of Murcia (Spain). The questionnaire was applied to a sample representative of 1108 final-year university students selected by clusters. A sample of 20 digital entrepreneurs was chosen (non-probabilistic discretionary sampling) to be interviewed.

The sample selection for the questionnaire was carried out using a stratified random cluster sampling technique. Universities and branches of knowledge were used as the strata for the distribution. Subsequently, the degrees included in the branch and the final year under-graduate classrooms were used as the clusters. Firstly, the minimum representative sample was established with a confidence level of 95% and a sampling error of 0.03, the minimum sample being 1032.07 for a population of 31951 students.

**TABLE 2. Distribution of participants by field of knowledge**

| Field of knowledge | Students | Required sample | Participants |
|---|---|---|---|
| Arts and Humanities | 3317 | 107 | 157 |
| Social and Legal Sciences | 14520 | 469 | 503 |
| Health Sciences | 5957 | 192 | 152 |
| Engineering and Architecture | 1370 | 44 | 39 |
| Sciences | 2596 | 84 | 140 |
| Engineering and Architecture | 3778 | 122 | 117 |

The final sample of participants consisted of a total of 1108 final year undergraduate students from the public universities of the Region of Murcia. Specifically, 64.17% were women, with a mean age of 22.81 (SD= 3.28). The final distribution by branches of knowledge and University according to the total population is shown in Table 2.

For the selection of the participants to be interviewed, firstly it was necessary to determine the characteristics and requirements necessary to define the so-called good practices of digital entrepreneurship. The main sources used were the next: EmDigital model (see Figure 1) and the Strategic Tree (Ogel & Castillo, 2012), a visual management tool oriented towards strategic thinking for entrepreneurs.

A non-probabilistic convenience sampling was used to select the participants. In the first round, 45 cases were selected after applying some indicators of good practices in digital entrepreneurship, these were the next:

- A prize, award, or recognition of success.
- Person who has funding or is hosted in development and innovation centers.
- Clearly defines mission motivations (what for) and opportunities.
- It contemplates the customer in the development and distribution of the product.
- A clear and accessible digital corporate identity.
- Develops and uses digital spaces to foster collaboration and participation of different agents.
- Develops, uses and disseminates digital content.

However, it was not possible to interview all those selected entrepreneurs due to the complications that many of them experienced during the Covid-19 crisis. Others declined the possibility of being interviewed for personal reasons or time constraints. Finally, 20 people were interviewed, all of them meeting the criteria previously defined to be considered successful digital entrepreneurs.

### 3.4. Data collection process

To collect the quantitative data from the survey, the questionnaire was used in an online form, but the information was collected in person in the university classrooms. After the random sampling process, the researchers wrote via email to teachers involved to ask for permission. After having the teachers' permission, researchers went in person to the classrooms and its purpose was explained before applying the

questionnaire. A QR code was used to facilitate access to the online questionnaire, which included an informed consent check box at the beginning. Those who consented to answer the questionnaire used the link provided at the time, so the research complies with the ethical requirements.

To access successful entrepreneurs, after searching for those chosen for having received official and public awards or recognition, they were contacted by e-mail. An authorization (informed consent) was requested to proceed with the interviews and their recording. All interviews were conducted virtually, audio-recorded and conducted by a member of the research team. Data was collected in 2020/21 and a protocol was designed for the interviewers, all of whom were members of the project's research team.

The procedure and instruments were approved by the Ethic Committee of the University of Murcia taking into account the data protection of participants too.

### 3.5. Data analysis

The results of the questionnaire have been analyzed using SPSS (version 24). The mean and frequency were used for descriptive analysis of the data. Non-parametric techniques were used to analyze possible differences according to sex and branch of knowledge, as these are the most robust tests for ordinal variables. Thus, the Mann-Whitney U test was used for crosses with two-level factors, and the Kruskal-Wallys H test was used for crosses with factors of three or more levels. When significant differences are found, the effect size is also shown, using Cohen's d (0.2 small effect, 0.5 medium and 0.8 large) for two-group crosses and eta-squared for crosses with three or more levels (0.01 small effect, 0.06 medium and 0.14 large).

About the qualitative information, the categorization strategy used was the coding of text fragments and the use of dimensions of analysis (Maxwell & Miller, 2008). Four cycles were followed to establish the final codebook combining inductive and deductive methods. As a first step in the data analysis process, the researchers responsible for coordinating the interview design and validation task created an initial outline of initial categories and subcategories. Subsequently, the transcripts were actively read, noting tentative ideas about the functioning of the categories and subcategories already created and their relationships according to the data. After updating the initial list of categories and codes, two members of the research team analyzed 5 interviews based on this list. In addition, codes were created for each of the categories and subcategories and examples of the interviews that corresponded to each code were indicated. After sharing the analysis of the 5 interviews, the researchers designed a new codebook, which was then refined following an emergent analysis of the data. After completing the data analysis with the qualitative analysis tool Nvivo, a codebook with 5 major categories, 16 subcategories and 66 codes was obtained.

## 4. RESULTS

### 4.1. Quantitative method: questionnaire for university students

Following the EmDigital model, the results of the quantitative part are shown in relation to the four dimensions that constitute the EmDigital model explained above: identification of opportunities; action planning; initiative and collaboration; and finally, management and security.

### 4.1.1. First dimension: identification of opportunities

The dimension of identification of opportunity is composed of three competences: information search and analysis, creativity and innovation, and prospecting. The following Table 3 shows the descriptive values of these competences and of the dimension.

**TABLE 3. Descriptive data for the dimension Identification of opportunities**

| | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| **Information search and analysis** | 3 | 20 | 13.65 | 3.01 |
| **Creativity and innovation** | 1 | 10 | 6.28 | 1.98 |
| **Prospecting** | 1 | 10 | 7.6 | 1.61 |
| **Identification of opportunities** | 8 | 40 | 27.44 | 5.59 |

If we look at the differences according to sex, we find significant differences, with higher scores for men (Md= 28, Range=32) than for women (Mdn=27, Range=32), U= 123686, p=.001, PSest= 0.21. With regard to the branch of knowledge in this dimension, we could see how the differences between the branches are pronounced, especially be-tween the Science branch (M= 24,9) with Engineering and Architecture (M= 28,63, p< .001) IC95% [2.05,5.42] as well as with Social and Legal Sciences (M= 28,06, p=.002) IC95% [1.77,4.56], with this difference being significant, H(4)= 49.98, p< .001.

### 4.1.2. Second dimension: action planning

This dimension is composed of the competences: success orientation, leadership and planning and management of digital identity. Table 4 below shows the descriptive values of the dimension.

**TABLE 4. Descriptive data for the dimension Action planning**

| | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| **Success orientation** | 5 | 25 | 21.56 | 3.4 |
| **Leadership** | 3 | 15 | 11.3 | 2.27 |
| **Planning and management of digital identity** | 1 | 15 | 11.19 | 2.67 |
| **Action planning** | 5 | 55 | 44 | 6.59 |

### 4.1.3. Third dimension: initiative and collaboration

The third dimension is composed of four competences: initiative, communication and collaboration, creation of digital value and responsibility and commitment. The descriptive data for the dimension and these competences can be found in Table 5 below.

**TABLE 5. Descriptive data for the dimension Initiative and collaboration**

| | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| **Initiative** | 1 | 10 | 6.09 | 1.97 |
| **Communication and collaboration** | 2 | 30 | 21 | 5.37 |
| **Creation of digital value** | 1 | 15 | 10.37 | 2.84 |
| **Responsibility and commitment** | 2 | 20 | 15.14 | 3.39 |
| **Initiative and collaboration** | 10 | 75 | 52.5 | 11 |

In this dimension, the Mann Whitney U-test determines the acceptance of the null hypothesis, so no significant differences were found between males and females. The Kruskal Wallis test indicates that the null hypothesis must be rejected and that there are differences between the different branches of knowledge, H(4)= 46.07, p< .001. Using the Games-Howell post hoc test, it can be verified how the branch of Sciences (M= 47.51) and Health Sciences (50.91) obtained a significantly lower score than Social and Legal Sciences (54.24, p<.01) IC95% [4.07,9.40] and (p<.01) IC95% [0.39,6.28].

### 4.1.4. Four dimension: management and safety

The last dimension is composed of up to 5 competences: learn from experience, problem solving, planning and organization, techno ethical approach and motivation and perseverance. As before, the following Table 6 shows the descriptive data.

**TABLE 6. Descriptive data for the dimension Management and safety**

| | Minimum | Maximum | Mean | SD |
|---|---|---|---|---|
| **Learn from experience** | 2 | 20 | 14.13 | 3.57 |
| **Problem solving** | 3 | 25 | 17.24 | 4.15 |
| **Planning and organization** | 4 | 20 | 13.76 | 3.3 |
| **Techno ethical approach** | 1 | 20 | 13.96 | 3.49 |
| **Motivation and perseverance** | 1 | 20 | 13.53 | 3.67 |
| **Management and safety** | 14 | 105 | 72.41 | 15.99 |

In this dimension, the Mann Whitney U-test determines the acceptance of the null hypothesis, so no significant differences were found between males and females. The Kruskal Wallis test indicates that the null hypothesis must be rejected and that there are differences between the different branches of knowledge, H(4)= 84.23, p< .001. Using the Games-Howell post hoc test, it was verified how the Science branch (M=61.57) obtained significantly lower scores than the rest of the branches: Arts and Humanities (M=70.09, p<.001) IC95% [3.06,13.99], Health Sciences (M=71.58, p<.001) IC95% [4.86,15.17], Social and Legal Sciences (M=75.26, p<.001) IC95% [9.62,17.77], and Engineering and Architecture (M=75.6, p<.001) IC95% [9.31,18.76].

## 4.2. Qualitative results: interviews to successful digital entrepreneurs

Knowing the keys to the development of ideas and identification was one of the objectives of the interview conducted with the successful digital entrepreneurs who participated in the research. The essential point analyzed was whether the entrepreneurs really make a prior reflection on their experiences, beliefs, values, and training available to them and if all of the above connects with a purpose. The results show that in only two cases did they carry out a prior reflection of this initial step. The rest of the participants commented on superficial reflections on this supposedly essential step.

Yes, but I started with the idea of the type of business I wanted to create based on the kind of lifestyle I wanted, not the idea of the product itself. I wanted to work online. I wanted to work remotely, to have the freedom to work here and there. So, I thought of creating a product that would allow me to do that. I didn't really care about the specific product idea.

It is also true that once they have launched their entrepreneurial project, it seems they have a clearer understanding of their purpose. In other words, it may not be clear at the beginning, but during the development process, they become more aware of the purpose the product or idea they are working on serves. At least that's what six cases indicated.

Well, my ideal mission... I think it has always been about reaching people and helping them. Besides my studies... my interest lies in personal growth, motivation, coaching. So, if I do something, I would like it to help others in some way... to serve a purpose beyond being just a consumer product or something that passes through your life without any significance.

Understanding the key aspects of entrepreneurial action planning is the second objective of the interview. More than half of the participants implement strategies to organize and differentiate between the urgent and the important. It is surprising that many entrepreneurs do not apply this productivity strategy widely used in the entrepreneurial world when it comes to organization. Nevertheless, they recognize the need for it.

I have the theory, but in daily practice, I'm kind of jumping from one thing to another. Just yesterday, I was reflecting on it with a colleague, realizing that I need more organization. Entrepreneurship is a massive undertaking, and you must adapt a lot.

One of the participants clearly highlighted that investing in long-term organization limits the ability to adapt to uncertainty and the changing context of the modern world.

We don't make long-term plans because it would be a waste of time. Experience has taught us that if we plan for twelve months, after three weeks, so many things have happened in the market that we had to pivot or change direction.

Among the most commonly used digital productivity tools mentioned are Trello, Slack, D.Gantt, and Canva. However, in three cases, there is still a preference for using analogue tools. One of the reasons is the lack of preparedness of the team to manage work using this type of technology.

Not everyone internally is accustomed to it, especially if they are not from the technology field. In work teams, not everyone is ready to deal with this kind of burden.

Based on the previous results, we can conclude that although successful digital entrepreneurs are aware of the importance of using personal organization strategies, they lack the habits to apply them in practice. Among those who do use them, there is a diversity of opinions regarding the relevance of using digital tools versus analogue methods.

The third objective of the interview relates to the processes of implementing entrepreneurial action and collaborating with other agents. From the gathered data, we can observe that entrepreneurs do not have a clear understanding of what a digital strategy is. Among those who did (three cases), they indicated that they have not defined it, despite recognizing its importance.

We also noticed that the role of the Community Manager is not fully present because they consider it a lower priority, as indicated in eight cases. The most used communication tool is WhatsApp. Over half of the participants use surveys with their audience and the digital storytelling technique to communicate.

Regarding the digital tools used by entrepreneurs to disseminate digital content related to their idea, product, or company, we see that social media platforms (eleven cases) are the most used.

Finally, regarding the success keys mentioned by the interviewees to improve their digital entrepreneurship competence, they consider the following factors fundamental:

- Self-awareness of strengths and limitations (general agreement of all of them).
- Persistence (six cases).
- Continuous learning (five cases).
- Turning problems into learning opportunities (three cases).

To finish this section around the interviews, we would like to remark this idea expressed by one successful entrepreneur interviewed in the research: "For an entrepreneur, whether digital or not, it is essential to be consistent and not give up because it is a very long, long journey. We tend to be impatient and want to see new results".

## 5. DISCUSSION

In recent years, there has been a growing consensus that aligning life purpose with entrepreneurship (Vázquez, 2021) significantly increases the likelihood of success. Surprisingly, while this concept has gained traction, academic research confirming this correlation remains elusive, a finding that aligns with the results obtained in this study.

Interestingly, participants in this study offered somewhat superficial reflections on this seemingly critical phase. This phenomenon raises the intriguing proposition that, for entrepreneurs, iterative processes based on trial and error may be more effective than introspective processes rooted in pre-existing beliefs and values. This view of successful entrepreneurs would be in contradiction with previous research (Chatterjee et al., 2022). In addition, students indicate that they feel able to identify their opportunities, based on their own assessment. It is worth noting that in this case males showed a perception of feeling more capable than females. Some gender differences have also been found in previous studies on entrepreneurship (Adachi & Hisada, 2017; Camelo et al., 2016; Ruiz et al., 2021; Zesser et al., 2019) and even in studies based on our own model (Román-Garcia & González-Calatayud, 2022).

An alternative interpretation related to the distancing of successful entrepreneurs from planning arises from the recognition of the historical gap between academic theories of entrepreneurship and their practical application. Blank and Eckhardt (2023) have ventured to bridge this chasm by forging a connection between the Lean Startup methodological approach and the world of academic theories of entrepreneurship. Their argument is that both spheres can benefit from a closer relationship. The Lean Startup paradigm revolves around a continuous build-measure-learn cycle, enabling early validation of hypotheses and rapid refinement of products and services. It is now postulated as a scientific approach to accelerate the delivery of services and products to consumers. Different previous studies (Ghezzi & Cavallo, 2020; Chung, 2015; Harms, 2015; Tohanean & Weiss, 2019) attest to its effectiveness, not only in the broader business context,

but also in the realm of digital entrepreneurship. Surprisingly, there is even a specific guide for scientists and researchers aspiring to become entrepreneurial academics (Ruíz & García, 2023).

Other important issue in our model is the action plan and it is reflected both in interviews and questionnaires results. Thus, students highlight that they feel competent to plan, for example to design a digital entrepreneurship process. Therefore, we find ourselves with a key competence that students say they have mastered, although female students seem to feel more competent than their male peers (Román-García & González-Calatayud, 2022).

In the area of planning, successful digital entrepreneurs recognize the paramount importance of employing personal organizational strategies, which other authors call autonomy (Azqueta & Naval, 2019). However, when it comes to putting them into practice, they often find it difficult to establish effective habits. This contrasts with students' perception that they are able to put ideas into practice and solve problems. This difference in perception is probably due to a lack of actual implementation on the part of the students.

In addition, there is a divergence of opinion among these entrepreneurs as to the desirability of using digital tools versus adhering to traditional analogue methods. This also applies to students when asked about their use of tools for learning (Prendes-Espinosa et al., 2018). Interestingly, no existing study has delved into the intricate landscape of productivity strategies and effective organization in digital entrepreneurship, which sheds light on an attractive avenue for future research. It is worth noting that, by contrast, social media platforms abound with information on these very topics.

If we focus on the data provided by the students, it is curious to find that students show themselves to be capable when it comes to project management. In general, in all the competences included in this dimension, the results show a profile of students who are able to learn from experience, solve problems, organize themselves, motivate themselves and follow an ethical vision of their work (García-Tudela et al., 2022). If anything stands out about the students, it is the dimension of implementation and collaboration, especially considering that within this is the Communication and Collaboration competence. Standing out in this aspect seems to be a factor of possible future success when setting up a business, as Fernández (2023) states in his study. In neither of these two dimensions were significant differences found between men and women, with both feeling equally capable.

The entrepreneurs themselves highlight the virtue of persistence as a key factor underpinning their achievements, a sentiment that partially coincides with the findings of Santos et al. (2023). In contrast to our study, this body of work introduces the facets of self-promotion and social connectedness as fundamental pillars of entrepreneurial success. Notably, the entrepreneurs who participated in our research also highlighted other keys to their success, such as strong problem-solving skills, deep self-awareness and an unwavering commitment to lifelong learning. Several of these latter characteristics are aspects of the Em-Digital model (Prendes-Espinosa & García-Tudela, 2020) and the students surveyed seem to exhibit some of them, such as problem solving.

These characteristics of successful entrepreneurs related to those possessed by students are essential for improving students' digital entrepreneurship competence. Equipping students with sufficient skills to be able to become entrepreneurs is becoming essential in today's society (Čapienė & Ragauskaitė, 2017).

But these skills or training needs are not the same for all students. Most significantly, students show more or less entrepreneurial competence depending on the field of knowledge of the degree. Fostering entrepreneurship is a key factor for students to take the initiative (Scuotto & Morellato, 2013). This suggests that universities should make an effort to integrate this competence more transversally in these branches, providing resources to students and training teachers.

## 6. CONCLUSIONS

Entrepreneurship has become an essential aspect of today's society, but today it cannot be understood without its link to the digital world. Thus, digital entrepreneurship is the key point of this research and it must be also considered a basic skill in university students education. We started from the creation of a model called EmDigital, which is based on the EntreComp model (Bacigalupo et al., 2016) and the DigComp model (Vourikari et al., 2016), both from the European Commission. Based on this EmDigital model, the aim of our study was to find out the level of digital entrepreneurship competence of final-year undergraduate students. In addition, we wanted to know the opinion of successful digital entrepreneurs on the keys to success in a digital entrepreneurship project. The information collected from both profiles allows us to generate valuable results in terms of training related to digital entrepreneurship competence.

One of the main contributions to knowledge generated in this research is the EmDigital model itself, but also the research instruments (quantitative and qualitative) designed and validated on the basis of it. We have mainly used the European models EntreComp and DigComp, so this proposal is aligned with the European framework of competences for citizenship. Moreover, a substantial part of the interview design was inspired by the visual tool known as StrategicTree (Ogel & Castillo, 2012). This tool highlights the fundamental nature of pre-entrepreneurship introspection, which encompasses considerations of purpose, life experiences, personal beliefs, values and educational background. If we focus on the EmDigital model, this introspection task is observed in the dimension of identification of opportunities. This introspective task is seen as the basis for shaping innovative ideas, products and companies, so data collected can have a relevant educational and social impact.

Our model also reflects the process of generating and managing entrepreneurial projects, as the four competence areas can also be used as the four reference phases for the development and management of digital entrepreneurial projects. Thus, the next step is the need to generate a clear plan that serves as a route to follow, an aspect that successful digital entrepreneurs also highlight as an element to consider if we want to achieve success in our ideas, although without starting from the previous introspection mentioned above. And after the plan, we need skills to implement, to manage and to solve problems taking into account the other aspects as security, ethic or sustainability.

All these topics of interest have been remarked by successful digital entrepreneurs in the interviews, so have been able to identify the main elements and strategies used by them in their real projects. The other research objective was to analyze the self-perception of digital entrepreneurship competence of university students. Although some questions are open for future research, we found that in general, final year university students have an acceptable perception of digital entrepreneurship competence, with some differences

observed between the female and male population, as well as some differences between fields of knowledge. All these aspects will have to be studied in greater depth in the project on which we are currently working, with the approach of a more extensive and international data collection in order to be able to make comparative analyses.

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