Creativity VS Grit: key competences to understand Entrepreneurial Intention

Abstract

Universities are assuming an increasingly active and key role in promoting entrepreneurship and qualified entrepreneurial human capital. From the lens of the Entrepreneurial University, the institution integrates an entrepreneurial mindset into the management and commits to Entrepreneurial Education (EE) to foster potential entrepreneurship. Studying this reality from a competency-based approach is particularly interesting and useful from an applied angle. Entrepreneurial competences are understood to be highly relevant for entrepreneurship. However, the research has been more oriented to study their effect on entrepreneurial activity and success, lacking studies that analyze their impact on the first stage, the formation of entrepreneurial intentions (EI).

This research is novel extending the broadly validated Theory of Planned Behavior (TPB) by integrating specific entrepreneurial competences as antecedents of EI. With a sample of 732 university students, this research presents a SEM model that permits to jointly analyze the effect of six different entrepreneurial competences (creativity, opportunity recognition, networking, resilience, consistency of interest, and perseverance of effort) on EI, considering the three TPB dimensions: personal attitude, subjective norms, and perceived behavioral control.

The results show that not all competences are significant for EI and their influence differs markedly. Creativity proves to be a key competence for the potential entrepreneurship stage while the two competences that comprise the psychological Grit concept have no influence on EI. The findings are linked to pedagogical recommendations, presenting valuable insights for EE. Entrepreneurial training based on competences must be designed more consciously, targeting particular competences and considering the specific phase of the entrepreneurial process.

Keywords: Entrepreneurial University; potential entrepreneurship; student entrepreneurial intention; competences; Entrepreneurial Education.

1. Introduction

The well-being and dynamism of a society largely depend on the competitiveness of its companies, an aspect closely linked to successful and sustainable entrepreneurship over time and to the entrepreneurial competences of the population (Acs & Audretsch, 2005; Cuervo et al., 2007; Müller et al., 2023). Awareness of the relevance of entrepreneurship in society is increasing, leading to an expansion of resources allocated for this purpose by policymakers and institutional reforms to create productive entrepreneurial ecosystems (Belitski et al., 2021; López & Álvarez, 2018; Shi & Shi, 2022; van Praag & Versloot, 2007). National and regional governments are developing policies to enhance entrepreneurial values and traits to increase potential entrepreneurship and entrepreneurial activity, although they are not always effective (Audretsch & Fiedler,

2022; Luke et al., 2007). Companies of all sizes are developing programs to promote the entrepreneurial competences of their employees (Hornsby et al., 2013), and entrepreneurial vision is also increasingly being introduced in the curricula of different educational stages to create favorable perceptions of entrepreneurship from an early age (Arranz et al., 2017; Bourgeois, 2011).

In recent decades, universities have experienced a remarkable development in terms of awareness of the relevance of entrepreneurship, and the role they can and should adopt in entrepreneurial ecosystems (Etzkowitz, 2004; Guerrero et al., 2023). So, entrepreneurial thinking has been increasingly implemented into the structure and management of higher education, thereby impacting teaching, research, and knowledge transfer activities and fostering an entrepreneurial spirit among the university community, including academics, university staff, and students (Gibb & Hannon, 2006; Guerrero et al., 2016a). Theoretically, this evolution has been reflected by the concept of the Entrepreneurial University (Etzkowitz, 1983; Etzkowitz et al., 2004). As this understanding of the higher education institution is evolving (Clark, 1998; 2004; Rådberg & Löfsten, 2024), new research is required to address challenges and opportunities (Guerrero et al., 2023; Hytti, 2021), specifically on human capital, which is critical for the advancement of universities (Guerrero et al., 2016b).

Human capital is a key factor for the development of both formal and informal entrepreneurial activities (Hsu et al., 2015), and universities have become increasingly committed to integrating an entrepreneurial mindset, improving their curricular and extracurricular entrepreneurial training methods to increase the motivations and competences of university students (Arranz et al., 2017; Hoppe, 2016; Politis, 2005). Audretsch (2014) states that universities condition the supply of an economy's entrepreneurial capital and are responsible for forming qualified human capital in general—and future entrepreneurial professionals in particular—transferring this human value to society. This approach makes students a key asset. Even so, further research is required to successfully promote the generation of entrepreneurial human capital at the university level (Martínez-Martínez & Ventura, 2020).

Entrepreneurial intention (EI) or potential entrepreneurship is the first step in the entrepreneurial process (Reynolds et al., 2005) and, therefore, is considered a powerful theoretical framework (Liñán et al., 2014). The study of EI is crucial to understand the entrepreneurial phenomenon, especially in the context of higher education, but further research is needed on the antecedents of EI to improve the strategies that enhance its growth, as it is a rapidly evolving field (Fayolle et al., 2014; Martín-Navarro, 2023). Krueger and Brazeal (1994) developed the concept of EI at the societal level, and, taking this to the context of higher education, it is possible to state that universities can increase their EI levels by increasing the entrepreneurial potential of students, academics, and other staff, primarily through Entrepreneurial Education (EE) (Iwu et al., 2021; Lv et al., 2021). This study focuses on the first group of individuals, students, following one of the main lines of research in EI identified by Liñán & Fayolle (2015).

To develop targeted and effective actions for the promotion of EI, it is crucial to understand its antecedents. Previous research has highlighted the relevance of entrepreneurial competences in the entrepreneurial process, especially concerning enhancing spirit, behavior, and success (Barney, 1991; Bauman & Lucy, 2021; Lewis & Churchill, 1983; Omrane & Fayolle, 2011; Onstenk, 2003). However, while the positive

relation of competences to entrepreneurship has been generally demonstrated, with a focus on entrepreneurial activity and success and even on the transition from intention to nascent entrepreneurship (González-López et al., 2021), the first stage, i.e. the formation of EI, is understudied from a competency-based approach. There is a gap in the scientific literature in analyzing the effect of different entrepreneurial competences on EI. More knowledge is needed to understand the extent to which different competences influence entrepreneurial potential.

The theory of Planned Behaviour (TPB; Ajzen, 1991) is one of the most widely used theories for the study of EI. This theory frames the research, advancing knowledge by enhancing its extension. Adding variables to extend the TPB is a stream of research supported by many EI researchers (Aloulou, 2016; Lihua, 2022; Zaremohzzabieh et al., 2019). TPB provide a robust and validated approach, as the theory has been broadly applied to measure EI in different contexts (Al Halbusi et al., 2023; Krueger et al., 2000; Liao et al., 2022; Liñán et al., 2011a).

So, this paper presents a novel model based on an extension of TPB that measures the impact of six different entrepreneurial competences on EI: creativity (CR), opportunity recognition (OR), networking (NT), resilience (RS), consistency of interest (CI), and perseverance of effort (PE). The last two competences represent the two dimensions of the psychological concept of Grit (Arco-Tirado et al., 2019; Duckworth et al., 2007). The selection of competences is based on their critical role generally for entrepreneurship (Kautonen et al., 2015; Liñán, 2008; Renko et al., 2020), their individual positive effect on aspects related to the entrepreneurial process (Al-Qadasi et al., 2024; Duckworth et al., 2007; Hamidi et al., 2008; Igwe et al., 2020; Mooradian et al., 2016; Renko et al., 2020) and the existence of previous research developed with university students in the same context (Martínez-Martínez & Ventura, 2020). Framing the study in the TPB enables the analysis of the indirect effects of the six competences through three dimensions: personal attitude (PA), subjective norms (SNs), and perceived behavioral control (PBC), enriching the outcomes of the research. With this approach, the study covers key aspects related to theory and practice, which lead to several contributions: to the theoretical model, to EI, and to entrepreneurial competences.

On the one hand, related to the advancement of knowledge, a gap is observed in the application of TPB; the model has not been extended before integrating different kinds of competences in the context of Entrepreneurial University. The competences are included as antecedents in the model, following the recommendation of recent studies (Patricio & Ferreira, 2023; Villanueva-Flores et al., 2023). Other papers also emphasize the need to analyze diverse antecedents to understand EI (Del Brío et al., 2022; Iwu et al., 2021). Thus, this paper contributes to advancing TPB as the first study applying a competency-based approach to extend the TPB model, jointly analyzing six different entrepreneurial competences. This approach also addresses the gap identified by previous research calling for models that integrate mediators to enrich the investigation between competences and EI (Botha & Taljaard, 2021).

A second contribution is made to EI, as the application of a competency-based approach leads to its better understanding. EI is typically used as a relevant proxy to entrepreneurial behavior (Al-Qadasi et al., 2024; Liñán et al., 2011; Munir et al., 2019), but in this study, it is analyzed directly based on its nature as a variable that represents the first stage of the entrepreneurial process or potential entrepreneurship. This approach is especially relevant

in the context of the Entrepreneurial University and attends recent calls to explore EI in new ways for a better understanding of the entrepreneurial phenomenon (Singh & Mehdi, 2022).

A third impact domain is the knowledge on competences. There is a lack of knowledge on the joint study of critical competences such as CR, OR, RS, NT, and Grit (CI and PE) in relation to potential entrepreneurship in the Entrepreneurial University context. The independent consideration of the competences offers new insights and attends the call of previous studies. As Bernadó & Bratzke (2024) suggest, after the recent global pandemic, some competences such as RS stand out and must be "levelled up", being included in more studies as a "standalone competence" (p.31). Along the same line, this research advances knowledge of the Grit concept. As highlighted by Lawrence & Krueger (2022), there are “mixed results of the impact of Grit on entrepreneurial phenomena" (p.96), and more research is needed to understand the effect of Grit on EI (Butz et al., 2018; Barrientos et al., 2022). Its inclusion in the model differentiates both dimensions and provides knowledge on the specific effect of CI and PE on EI, PA, SN, and PBC, which is another novelty of this study.

On the other hand, related to the practical contributions, the findings of this research are especially relevant for education. Recent reviews on EE literature have shown the current interest in studying how EE influences EI, the effectiveness of the training and the curriculum design (Shabbir et al., 2022; Mohamed & Sheikh, 2021). As entrepreneurship is a process with distinct stages, EE must address the different training needs that arise at each stage, based on the dynamic nature of entrepreneurial learning (Politis, 2005). This study develops applied knowledge to improve first-stage EE programs, offering insights into which competences should be developed to foster EI. The findings also encourage to face current challenges of teaching entrepreneurship, as the difficulty of teaching specific entrepreneurial competences related to the entrepreneurial “know-how” (Haase & Lautenschläger, 2011). So, this research calls for a more conscious and competency-based EE design, encourages the commitment of educators in curriculum design and proposes an EE approach that moves away from linear, conventional EE methods and technical competences, to focus on experiential learning methodologies.

The remainder of the paper is structured as follows: The theoretical section starts with the theory that frames this research (TPB) and its application to the study of EI. This is followed by contextualizing the study within the scope of the Entrepreneurial University and applying the competency-based approach, which leads to the hypothesis of the research and the proposed model. Then, the methodology section explains the measurement process and the statistical procedure used. The results and discussion are subsequently presented, followed by the last section, which contains the contributions and future agenda.

2. Theoretical framework

2.1. Entrepreneurial Universities fostering entrepreneurial human capital

The evolution of higher education in the last decades has resulted in Entrepreneurial or “third-generation” Universities (Etzkowitz, 2004; Wissema, 2009; Guerrero et al., 2023), centered on the pursuit of valuable teaching and research while generating economic and

societal impact in the ecosystem and the region (Guerrero et al., 2016a; Pugh et al., 2021). In this context, forming qualified entrepreneurial human capital through flexible, innovative, and close-to-reality training (such as living labs or site visits) is becoming crucial (Martínez-Martínez, 2021; Ratten & Usmanij, 2021). So, universities have a great capacity to ensure that individuals are given the "capabilities to discover new business opportunities, [the] decision[s] to exploit them and [the] capabilities to consolidate current businesses" (Junquera, 2011, p. 392). Audretsch (2014) states that the university provides students with the necessary knowledge, competences, and experiences to be competitive in the market. This is achieved mainly through EE (Do Nguyen & Nguyen, 2023; Hou et al., 2023; Salamzadeh et al., 2022), as "students exposed to entrepreneurial education have increased attitude, cognition, zeal, and the needed skills to engage in entrepreneurial activities" (Adelaja et al., 2023, p. 3). In this sense, EE is a dynamic field, continuously evolving and improving (Ratten & Usmanij, 2021), which encompasses a wide range of pedagogical methods, including formal coursework, experiential learning, business plan competitions, and mentorship programs (Zhang et al., 2022). Also, as entrepreneurship is an applied knowledge, entrepreneurial training has a crucial experiential sphere (Motta & Galina, 2023), that not only provide knowledge but also confidence and practical competences essential for EI and action (Zhang et al., 2022).

At this point, it is relevant to discern between EI and behaviour, as both are fundamental to maintaining sustainable levels of entrepreneurship (Reynolds et al., 2005). EI is defined as an individual's cognitive state that precedes the decision to create a new business (Krueger & Brazeal, 1994; Liñán & Fayolle, 2015), determining entrepreneurial potential and conditioning future entrepreneurial activity, as opposed to behavior, that defines actual levels of entrepreneurship. In the context of University, EI has been defined as a university student's cognitive inclination to choose and pursue an entrepreneurial career (e.g., starting a new business) after graduation (Krueger & Brazeal, 1994). Previous research on the subject agrees that higher education has a key responsibility in promoting entrepreneurship (Audretsch, 2014; Guerrero et al., 2023; Guerrero et al., 2016b; Hytti, 2021; Rådberg & Löfsten, 2024) facing a clear challenge: to generate EI among university students.

EI is considered the best predictor of planned entrepreneurial behavior and its immediate antecedent (Ajzen, 1991, 2002; Fishbein & Ajzen, 1975; Krueger & Carsrud, 1993). In populations where the development of entrepreneurial activities is scarce, such as the student population, potential entrepreneurship is an important entrepreneurship-related outcome worthy of study (Aboobaker, 2020). Thus, most research analyzing student entrepreneurship use EI (Maheshwari et al., 2023).

The study of EI has been approached fundamentally from two theoretical comprehensive and widely tested frameworks: Shapero and Sokol's (1982) Entrepreneurial Event Model (EEM) and Ajzen's (1991) Theory of Planned Behavior (TPB). Applying these models in entrepreneurship research over the past decades has provided valuable insights into EI (Fayolle & Liñán, 2014; Kautonen et al., 2015; Krueger et al., 2000; Schlaegel & Koenig, 2014).

In the educational context, TPB has been broadly used to improve the understanding of students' EI (Aloulou, 2016; Fayolle et al., 2006; Fayolle & Gailly, 2015; Gird & Bagraim, 2008; Malebana, 2014; Shook & Bratianu, 2010; Devonish et al., 2010; Solesvik et al., 2014; Rueda et al., 2015; Zhang et al., 2015). Most of these studies have

used university students as a sample and yielded successful results (Farrukh et al., 2018; Ferreira et al., 2022; González-López et al., 2021; Ukil & Jenkins; 2023). Thus, following the research stream of previous studies in the field of university entrepreneurship, this research is framed within the theoretical approach of TPB.

2.2. Theory of Planned Behavior

TPB is "one of the most influential theories of human behavior (Nishimura & Tristán, 2011, p. 57) and offers a robust and validated theoretical framework for understanding intention and predicting deliberate and goal-oriented behavior (Kautonen et al., 2015; Krueger et al., 2000). As a precursor to TPB, Ajzen (1991) stated that personal intentions are determined by three dimensions: PA (perception of desirability of starting an entrepreneurial career), SNs (perceived social pressure), and PBC (perception of easiness or difficulty of becoming an entrepreneur conditioned by confidence in one's ability).

TPB is widely used in the field of economics and business, particularly in the study of entrepreneurship (Al Halbusi et al., 2023; Aloulou, 2016; Krueger et al., 2000; Liao et al., 2022; Liñán, 2008; Liñán & Chen, 2009; Liñán et al., 2011a) and helps to explain how entrepreneurial behavior develops before any visible actions take place (Liñán & Chen, 2009).

Research on TPB conducted over the past few years has encouraged the extension of this theoretical model to add new constructs or variables that improve its explanatory power (Zaremohzzabieh et al., 2019). As Fen and Sabaruddin (2008) state, TPB offers flexibility and allows for the inclusion of additional variables to enhance the explained variance and facilitate its application in different research contexts.

Thus, TPB has been extended in several forms by including different independent and mediating variables. Zaremohzzabieh et al. (2019) and Lihua (2022) suggest the aggregation of constructs to extend TPB; the latter mentions the relevance of self-perceived competences such as resilience. Aloulou (2016) adds demographic variables to the original model as antecedents of the TPB constructs. Fen and Sabaruddin (2008) extend the model by integrating perceived need as an independent variable. Eid et al. (2019) include autonomy and creativity as two variables influencing the original TPB constructs and indirectly affecting EI. Kumar and Das (2019) extend TPB by adding institutional infrastructure and social factors such as peer effect and gender discrimination. Also, recent studies in social entrepreneurial intention have adapted TPB to include additional constructs such as social capital and personality traits, further strengthening its predictive validity (Ernst, 2011; Hockerts, 2017).

Specifically, in the university context, TPB has been extended to study the influence of EE on students' EI (Liu, 2017; Qi & Liu, 2010), yielding positive results. Karimi and Makreet (2020) demonstrate the positive influence of education and motivation on students' EI. Nowiński et al. (2019) extend the model by analyzing the impact of entrepreneurship education, entrepreneurial self-efficacy and gender. Lihua (2022) constructs a two-step extended entrepreneurial intention–behavior model, integrating professional skills, entrepreneurial capabilities, experience, and personality traits. Zaremohzzabieh et al. (2019) also add personal traits, social capital and human capital (experience and education) to the model.

As shown above, the theory is evolving towards its extension, increasingly incorporating variables that allow knowledge to advance. Even so, although EE has been incorporated into the model, and even traits that measure entrepreneurial human capital, no research has addressed the extension of TPB from a competency-based approach. The present study addresses this gap by analyzing entrepreneurial competences as antecedents of EI.

2.3. A competence approach to EI

The competency-based approach builds on the findings of previous studies that entrepreneurial competences enhance entrepreneurial spirit, intention, and successful behavior (e.g., Hou et al., 2023; Lewis & Churchill, 1983; Onstenk, 2003). Given the many definitions of "entrepreneurial competences," the present study uses the concept developed by Hunjet et al. (2015) as a reference, who defines competence as:

> A combination of knowledge, skills, attitudes and capabilities to create and discover opportunities in the environment, to introduce changes, and to direct one's behavior toward the successful creation and management of an organization, whose purpose is to take advantage of these opportunities and to deal with a high level of uncertainty and complexity in a challenging environment. (p. 623)

Hence, it follows that "competence" is a broad concept that encompasses not only the skill to perform tasks effectively but also the knowledge and attitude to use that specific ability. In the same line, Morris et al. (2013), also include the term skill as a part of the broader competence definition, stating that competences "refers to the knowledge, skills, attitudes, values, and behaviors that people need to successfully perform a particular activity or task" (p.353).

Determining entrepreneurial competences is not a simple task. For this reason, previous research has identified a wide range of entrepreneurial competences across various categories (Abdullah et al., 2009; Chandler & Jansen, 1992; Di Zhang & Bruning, 2011; Hayton & Kelley, 2006; Morris et al., 2013; Onstenk, 2003; Wu, 2009). Regardless, similarities can be seen in these classifications, and it is possible to identify competences across many categories (Tittel & Terzidis, 2020).

This study selects six of the competences understood as entrepreneurial and included in the classifications most commonly used by the literature: creativity (CR), opportunity recognition (OR), networking (NT), resilience (RS), consistency of interest (CI), and perseverance of effort (PE). Table 1 contains the definitions of these competences.

Table 1 Definition of the selected entrepreneurial competences

Competence	Definition
CR – Creativity	CR is the ability to think, modify, discover, and create outcomes between previously unrelated objects in a new, original, practical, and unexpected way (Anjum et al., 2021; Lee et al., 2004).
OR – Opportunity recognition	OR involves the detection of trends, changes, events, and their links, leading to opportunities that others overlook (Baron, 2006).

NT – Networking	NT is the competency to create relationships and mobilize contacts to assemble diverse information, support, and other resources (Forret & Dougherty, 2001).
RS – Resilience	RS is the capacity to recover from, or adapt to, an adversity context or environmental changes that provoke threat, tragedy, trauma, or stress by maintaining a positive mindset and facilitating personal or professional growth (Renko et al., 2020; Salisu et al., 2020).
CI – Consistency of interest	CI involves focusing on achieving long-term goals and ambitions without losing or changing interest (Salisu et al., 2020). It is one of the two dimensions of the concept of Grit, defined by Duckworth et al. (2007, p. 1087) as "the perseverance and passion for long-term goals."
PE – Perseverance of effort	PE, as the second dimension of Grit (Duckworth et al., 2007), is the persistence to accomplish long-term goals despite hardships or setbacks; it involves withstanding adversity and challenges while maintaining effort and courage (Salisu et al., 2020).

Several studies have shown that individuals with perceived entrepreneurial competences are likelier to engage in entrepreneurship (Kautonen et al., 2015; Liñán, 2008; Renko et al., 2020). However, apart from this general relevance, two additional criteria justify the selection of these six competences: 1) the existence of previous research that shows the positive influence of each competence on entrepreneurial activity and 2) the outstanding role of these competences in previous research developed with university student population in the same context (Martínez-Martínez & Ventura, 2020). In this earlier study, which identifies competence profiles of students based on their competence levels, CR, OR, NT, RS, CI and PE are defined as key competences that differentiate the profiles.

CR provides problem-solving capacities, facilitates decision-making, and is a determinant of EI (Hamidi et al., 2008). It is related to self-confidence and a favorable attitude toward entrepreneurship, as creative thinking facilitates decision-making and reduces the perceived risk associated with venture creation (Anjum et al., 2021). **OR** encompasses willingness and a state of alertness (Kirzner, 1979), and, as a catalyst of entrepreneurial thinking (Dyer et al., 2008), it enhances EI and entrepreneurial behavior. It is also related to self-control and self-efficacy (Al-Qadasi et al., 2024; Karimi et al., 2016), leading to a positive perception of entrepreneurship (Baron, 2006). As **NT** provide relationships and access to diverse tangible and intangible resources (Forret & Dougherty, 2001), a networking competence can compensate for a lack of knowledge and personal capabilities, increasing self-efficacy (Bratkovič et al., 2012). NT is related to higher EI, entrepreneurial behavior, and business success (Aldrich, 1997; Igwe et al., 2020), as entrepreneurship is a socially situated and collective practice (Johannisson, 1988). **RS** enhance personal and professional growth (Salisu et al., 2020), and its main components (i.e., positivity, CR, and personal fulfilment) increase the willingness and determination to create a business and handle entrepreneurial challenges (Renko et al., 2020; Thompson, 2009) while helping to overcome setbacks or missteps (Ukil & Jenkins, 2023). Positive psychology supports the study of psychological resources that can be developed, rather than psychological traits, to understand EI. RS is considered a useful psychological resource, part of the psychological capital (Chevalier et al., 2022; Luthans et al., 2007).

CI and **PE** represent the dimensions of Grit, a psychological concept positively related to success and achievement of objectives, also associated with entrepreneurial activity (Arco-Tirado et al., 2019; Duckworth et al., 2007). On the one hand, as venture creation implies multiple and complex tasks and is a long-term process requiring maintained focus, CI is considered a positive factor for business creation and success (Duckworth et al., 2007; Martínez-Martínez & Ventura, 2020; Mueller et al., 2017). On the other hand, PE is relevant to the entrepreneurial process (Mooradian et al., 2016; Mueller et al., 2017) and can counteract setbacks and ensure continued work towards entrepreneurial success (Salisu et al., 2020). Mooradian et al. (2016) have suggested studying the two Grit constructs, CI and PE, separately, as they might have different effects.

Although the general relevance of these competences for entrepreneurship has been demonstrated, studies that jointly examine the effect of competences on EI are scarce. Previous literature has called for further research into the antecedents of EI (Del Brío et al., 2022; Carsrud & Brännback, 2011; Iwu et al., 2021). Particularly, Fayolle et al. (2014) noted the gap in the literature on the antecedents of EI and how they are formed. Noting the lack of empirical research focused on the differential effects of competences as antecedents of EI and attending the recommendations of previous research about the extension of TPB from a competency-based approach (Patricio & Ferreira, 2023; Villanueva-Flores et al., 2023), this study defines two research questions (RQ):

RQ1: Do the six entrepreneurial competences (CR, OR, NT, RS, CI, and PE) have the same effect on the formation of university students' EI?

RQ2: Is it possible to distinguish any key entrepreneurial competence in the EI formation of university students?

2.4. Model and hypotheses development

Many studies have been conducted in recent years on students' EI (Fayolle et al., 2006; Guerrero et al., 2008; Kolvereid & Isaksen, 2006; Krueger et al., 2000; Liñán & Chen, 2009; Sánchez, 2011), but clear answers for the aforementioned RQ are yet to be provided. To meet that goal, this article applies TPB going further by integrating the six competences into the model as independent variables. Their indirect effect on EI through PA, SN, and PBC permits the identification of differences in the domains of impact.

Figure 1 and Table 2 show the proposed model and the hypotheses, respectively. A positive effect of all competences with the three dimensions (PA, SN, PBC) is assumed for their "entrepreneurial" nature, based on the many existing classifications that characterize them as factors favorable to entrepreneurship (Tittel & Terzidis, 2020) and studies that relate them to entrepreneurial engagement, capacity, attitude, self-efficacy and other personal valuable conditions for entrepreneurship; as explained in the previous section. Also, Liñán (2008) demonstrated the relation of "entrepreneurial skills", considered a general construct, with PA, SNs, PBC. The present study goes one step further, focusing on the broader concept of competence and differentiating between the effects of six key competences.

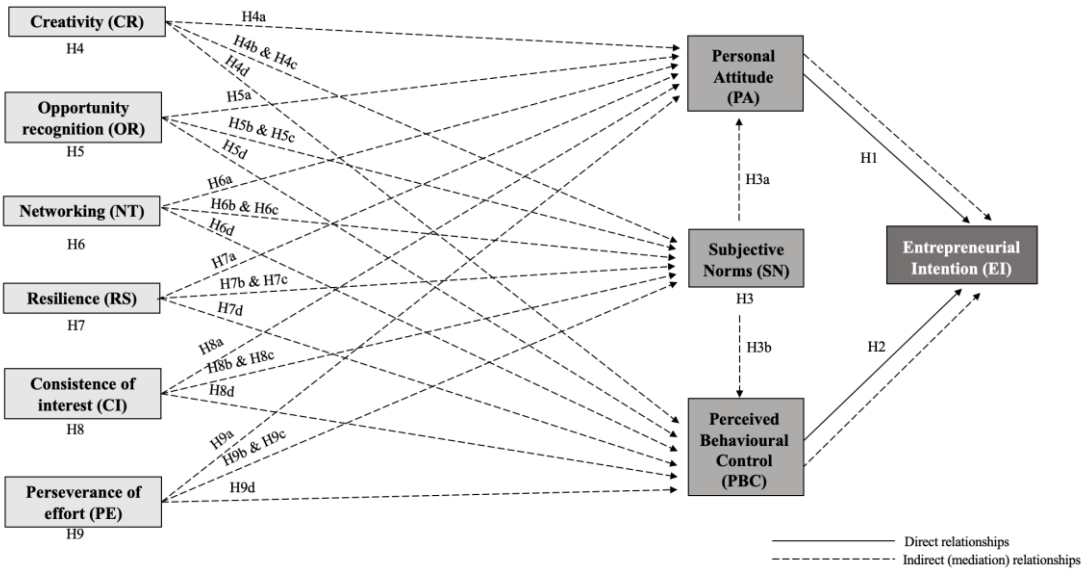
Moreover, the hypothesized positive relationship between competences and the three core dimensions of TPB is also given by the factors that underlie the model. Previous studies analyzing the foundations and rationale behind TPB highlight the role of individual beliefs (Laukkanen, 2022). In 2020, Ajzen delves into the background factors of his TPB

model, identifying behavioral, normative and control beliefs that explain the three dimensions. So, PA is a function of behavioral beliefs, i.e., "readily accessible beliefs regarding the behavior's likely consequences" (Ajzen, 2020, p. 315). SN is grounded in two types of normative beliefs, injunctive and descriptive, explaining how social pressure or support to act entrepreneurially is formed. PBC is based on control beliefs concerned with factors that can facilitate or impede entrepreneurial actions (Ajzen, 2020). Similarly, Drnovšek et al. (2010) recognize that entrepreneurial self-efficacy beliefs about outcomes are more relevant during the intent formation phase.

In a competency approach based on positive relations, competences are understood as factors that can increase the strengths of the beliefs and the subjective evaluation of the expected outcome or experience (Ajzen, 2020). Different studies show the positive effect of competences on entrepreneurial beliefs. Obschonka et al. (2010) state that early entrepreneurial competence is useful for predicting EI directly and indirectly, revealing an effect through control beliefs. Specifically, Pérez-López et al. (2016) relate RS to PA, SN, and PBC, with a strong grounding in self-efficacy beliefs. Thus, the inclusion of competences in the TPB model as antecedents with a positive influence on PA, SN and PBC, is due not only to their entrepreneurial nature and the previous studies that define them as facilitators of entrepreneurship, but also to the rationale of the theoretical model used, based on beliefs and self-efficacy, aspects also positively related to the independent variables.

Regarding the direct effect of PA, SN and PBC on EI, there is a consensus in the literature on the direct and positive relationship between PA and EI (Kautonen et al., 2015; Munir et al., 2019), the indirect and positive effect of SNs on EI through PA and PBC (Lechuga et al., 2020), and the direct and positive influence of PBC on EI (Farrukh et al., 2018).

Fig. 1 EI model with entrepreneurial competences



H1, H2, H3, H4, H5, H6, H7, H8, and H9 represent the total effect of the direct or indirect relation of the dependent variables on the independent variable EI, whereas H4a, H4b, H4c, H4d, H5a… indicate the individual indirect effect through a specific mediator.

Table 2 Hypotheses

H1	**PA positively and directly influences EI.**	
H2	**PBC positively and directly influences EI.**	
H3	**SNs positively and indirectly influence EI through PA and PBC.**	H3a: SNs positively and indirectly influence EI through PA. H3b: SNs positively and indirectly influence EI through PBC.
H4	**CR positively and indirectly influences EI through PA, SNs, and PBC.**	H4a: CR positively and indirectly influences EI through PA. H4b: CR positively and indirectly influences EI through SNs and PA, sequentially. H4c: CR positively and indirectly influences EI through SNs and PBC, sequentially. H4d: CR positively and indirectly influences EI through PBC.
H5	**OR positively and indirectly influences EI through PA, SNs, and PBC.**	H5a: OR positively and indirectly influences EI through PA. H5b: OR positively and indirectly influences EI through SNs and PA, sequentially. H5c: OR positively and indirectly influences EI through SNs and PBC, sequentially. H5d: OR positively and indirectly influences EI through PBC.
H6	**NT positively and indirectly influences E through PA, SNs, and PBC.**	H6a: NT positively and indirectly influences EI through PA. H6b: NT positively and indirectly influences EI through SNs and PA, sequentially. H6c: NT positively and indirectly influences EI through SNs and PBC, sequentially. H6d: NT positively and indirectly influences EI through PBC.
H7	**RS positively and indirectly influences EI through PA, SNs, and PBC.**	H7a: RS positively and indirectly influences EI through PA. H7b: RS positively and indirectly influences EI through SNs and PA, sequentially. H7c: RS positively and indirectly influences EI through SNs and PBC, sequentially. H7d: RS positively and indirectly influences EI through PBC.
H8	**CI positively and indirectly influences EI through PA, SNs, and PBC.**	H8a: CI positively and indirectly influences EI through PA. H8b: CI positively and indirectly influences EI through SNs and PA, sequentially. H8c: CI positively and indirectly influences EI through SNs and PBC, sequentially. H8d: CI positively and indirectly influences EI through PBC.
H9	**PE positively and indirectly influences EI through PA, SNs, and PBC.**	H9a: PE positively and indirectly influences EI through PA. H9b: PE positively and indirectly influences EI through SNs and PA, sequentially. H9c: PE positively and indirectly influences EI through SNs and PBC, sequentially. H9d: PE positively and indirectly influences EI through PBC.

3. Methodology

3.1. Participants and data collection

This research is based on a quantitative methodology, and Structural Equation Modeling (SEM) is applied to achieve the research objectives and test the proposed hypotheses. Previous studies have used university students as a sample and yielded successful results (Farrukh et al., 2018; Ferreira et al., 2022; González-López et al., 2021; Ukil & Jenkins; 2023). The sample is composed by 732 students from the University of Malaga, the first university in Spain to be accredited as an Entrepreneurial University (ACCEU, 2021). The sample is varied in terms of knowledge area, comprising students from 16 different faculties: industrial engineering (5.7%), architecture (0.8%), telecommunication engineering (1.3%), computer science (1.9%), arts (1%), science (7.8%), communication sciences (6.1%), educational sciences (2.3%), health sciences (1.1%), economics and business sciences (23.3%), trade and management (2.5%), law (7.8%), social and labor sciences (2.9%), philosophy and literature (17.2%), psychology (14.3%), and tourism (4%). In terms of gender, 38.1% are male and 61.9% are female students, aged between 20 and 33 (average: 26 years).

To collect data, two validated questionnaires were distributed to the students through the official employment platform of the University of Malaga Talent Tank[1], which allowed students from all knowledge areas access. The platform belongs to the university, which guarantees compliance with the data protection law, maintains the anonymity of the students, and allows full control of compliance with ethical standards throughout the process.

Questionnaires are the prevailing tool in most academic research analyzing university EI (Do Nguyen & Nguyen, 2023; Ferreira et al., 2022). Specifically, the questionnaires used in this study have been extensively applied by previous research both internationally and in the Spanish context (Barba-Sánchez et al., 2022; González-López et al., 2021; Liñán, 2008). Participants rated statements regarding TPB variables (i.e., PA, PBC, SNs, and EI; Likert scale: 1–7) and entrepreneurial competences (i.e., CR, OR, NT, RS, CI, and PE; Likert scale: 1–5) on questionnaires sourced from Liñán and Chen (2009) and Morris et al. (2013), respectively. The data collection period was between September 2021 and May 2022.

Table 3 shows the items measuring the variables under study.

Table 3 Dependent and independent variables

Variable	Item reference	Item description
EI	EI1	I am ready to do anything to be an entrepreneur.
	EI2	I will make every effort to start and run my own business.
	EI3	I am determined to create a business venture in the future.
	EI4	My professional goal is to be an entrepreneur.
PA	A1	A career as an entrepreneur is totally unattractive to me.
	A2	If I had the opportunity and resources, I would love to start a business.
	A3	Amongst various options, I would rather be anything but an entrepreneur.

[1] https://talentank.uma.es

SNs	SN1	My friends would approve of my decision to start a business.
	SN2	My immediate family would approve of my decision to start a business.
	SN3	My colleagues would approve of my decision to start a business.
PBC	PBC1	Starting a firm and keeping it viable would be easy for me.
	PBC2	I believe I would be completely unable to start a business.
	PBC3	I am able to control the creation process of a new business.
	PBC4	If I tried to start a business, I would have a high chance of being successful.
	PBC5	It would be very difficult for me to develop a business idea.
	PBC6	I know all about the practical details needed to start a business.
CR	CR1	I demonstrate originality in my work.
	CR2	I am creative when asked to work with limited resources.
	CR3	I identify ways in which resources can be recombined to produce novel products.
	CR4	I find new uses for existing methods or equipment.
	CR5	I think outside of the box.
	CR6	I identify opportunities for new services/products.
	CR7	Freedom to be creative and original is extremely important to me.
OR	OR1	I am an avid seeker of information.
	OR2	I am always actively seeking new information.
	OR3	I frequently discover innovative connections and perceive new or emerging relationships between different data.
	OR4	I see links between seemingly unrelated pieces of information.
	OR5	I am good at "connecting dots."
	OR6	I often see connections between previously unconnected domains of information.
NT	NT1	I have attended social functions for the purposes of building professional relationships.
	NT2	I have gone to lunch with a boss or supervisor.
	NT3	I have attended meetings of professional-related organizations.
	NT4	I have attended professional seminars or workshops.
	NT5	I have attended meetings of civic and social groups, clubs, and so forth.
	NT6	I have attended conferences or trade shows.
RS	RS1	I actively look for ways to replace the losses I encounter in life.
	RS2	I look for creative ways to alter difficult situations.
	RS3	I believe that I can grow in positive ways by dealing with difficult situations.
	RS4	Regardless of what happens to me, I believe I can control my reactions.
CI	CI1	New ideas and projects sometimes distract me from existing ones.
	CI2	My interests change from year to year.
	CI3	I have been obsessed with a certain idea or project for a short time but later lost interest.
	CI4	I have difficulty maintaining my focus on projects that take more than a few months to complete.
PE	PE1	I finish whatever I begin.
	PE2	Setbacks don't discourage me.
	PE3	I am a hard worker.
	PE4	I am diligent.

3.2. Analysis of Potential Biases

The survey was carried out anonymously to minimize any bias stemming from social approval (Fisher, 1993). Regarding the common method bias, the relationships between the variables might be inflated as information for both the dependent and independent variables is obtained from a single source (Podsakoff et al., 2003). Three approaches were employed to demonstrate minimal risk of common method bias among latent variables.

Firstly, we analyzed this bias by applying Harman's single-factor test. As noted in Appendix A, Table A1, the analysis yields eight factors (KMO: 0,847; Bartlett sphericity test Sig. 0.000) which explain 70.84% of the total variance. The proportion of variance accounted by a single factor in the research model was found to be 41.28% (KMO: 0.831; Bartlett sphericity test Sig. 0.000). According to Harman's single-factor analysis, it is recommended that this proportion is below 50% to mitigate common method bias (Podsakoff et al., 2003). Secondly, as shown in Table 6, the variance inflation factor (VIF) was utilized to identify multicollinearity among latent variables post PLS-SEM, yielding values below 3.3, ranging from a minimum of 1.088 to a maximum of 1.811(Kock, 2015; Kock & Gaskins, 2014; Kock & Lynn, 2012). Finally, the marker variable method (Rönkkö & Ylitalo, 2011) was conducted selecting prior entrepreneurship experience as the indicator variable, which is unrelated to the constructs in the research model.

Both models (with and without the indicator) were tested using SmartPLS. As noted in Appendix A, Table A2, the results indicate that the original model (without an indicator variable) and the test model (with an indicator variable) exhibit no significant differences in terms of path coefficients and explained variance. Additionally, the indicator variable does not have significant influences on the endogenous variables. Based on the above, it is possible to conclude that common method bias is not a serious issue in this study.

Finally, regarding non-response bias, the sample has been split into two segments. The initial group comprises 85% of the first responses, while the remaining responses constitute the second group. Analysis of variance (ANOVA) conducted on all variables indicates no noteworthy distinctions between both groups.

3.3. Statistical procedure

Based on the validated nature of the questionnaires, a defining relationship between all the variables and their indicators was assumed. Furthermore, due to the tested high correlation between the indicators that form each variable, they were considered Mode A composites (correlation weights; Hair et al., 2014; Sarstedt et al., 2016). This is the main reason for applying Partial Least Squares Structural Equation Modelling (PLS-SEM; Cepeda-Carrion et al., 2019) to obtain an explanatory/confirmatory and predictive model. The use of PLS-SEM was also based on the fact that the data were not required to fit a specific distribution. This technique is appropriate for analyzing multiple complex relationships with mediating effects, such as those in the proposed model (Castro & Roldán, 2013; Hair & Sarstedt, 2019; Ruiz-Palomo et al., 2019; Sarstedt et al., 2020).

PLS-SEM presents an alternative to conventional methods such as Ordinary Least Squares (OLS) regression, canonical correlation, or covariance-based SEM for analyzing systems of independent and response variables (Yusif et al., 2020). It represents a second-generation multivariate data analysis technique, offering robust statistical efficiency, particularly when utilized with powerful software like SmartPLS (used in this study) (Hair et al., 2014). Its development has significantly impacted empirical research by facilitating the simultaneous examination of numerous dependent relationships between independent and dependent variables (León-Gómez et al., 2022). The proposed hypotheses were tested using SmartPLS 4.0.8 software (Ringle et al., 2022).

Regarding the sample, following the recommendation of Streukens and Leroi-Werelds (2016), bootstrapping was performed with 10,000 samples. Statistical power was measured using G*Power 3.1.9.4 software (Mayr et al., 2007). Considering the existence of two paths to the final endogenous variable and assuming a significance level of 5%, an average effect size (0.15), and a statistical power of 80%, the results obtained by

performing an “a priori” analysis determine the need for a minimum sample of 65 observations (Cohen, 1988).

The use of PLS-SEM comprises the measurement model, which illustrates the relationships between constructs and their indicators, and the structural model, which delineates the dependency relationships between independent and dependent variables (Martínez & Fierro, 2018).

The measurement model analysis involves assessing item reliability through loadings (simple correlations of each indicator with its construct). Construct reliability is evaluated via composite reliabilities (Cronbach's alpha, composite reliability, and the Dijkstra-Henseler rho ratio), each serving as an indicator of the consistency and stability of measurement data (Kline, 2023). Convergent validity is evaluated using the average variance extracted (AVE), which quantifies the variance a construct extracts from its indicators relative to measurement error (Fornell & Larcker, 1981). Discriminant validity is assessed using two methods: Fornell-Larcker criterion and Heterotrait-monotrait (HTMT) values (Fornell & Larcker, 1981).

The structural model's fit is evaluated using SRMR and VIF to assess goodness-of-fit and multicollinearity, respectively. The coefficient of determination (R^2) gauges the model's explanatory power, while f2 measures effect size in explaining endogenous constructs based on R^2 (Hair et al., 2019).

Finally, the predictive power of the model and the impact of the exogenous variables on EI in terms of importance and performance (IPMA) is analyzed.

4. Results

4.1. Measurement model

First, to accept or reject the proposed hypotheses, the reliability and validity of the items and variables, i.e., the measurement model, were analyzed. Regarding reliability (Table 4), all standardized factor loadings of the indicators exceeded the minimum value of 0.7 (or are very close to it), except one of the items that make up the CI variable. However, as its value exceeded 0.4, it was retained in the model since the indicators with loadings between 0.4 and 0.7 should only be removed from the scale if the purification increases or improves composite reliability or average extracted variance (Hair et al., 2019). This is not the case with the item in question. Therefore, for the sake of model interest, this item has been retained.

The reliability of the variables was also confirmed, as their Cronbach's alpha, composite reliability, and Dijkstra–Henseler rho ratio (Dijkstra & Henseler, 2015) were higher than 0.7 (Hair et al., 2019). Likewise, the convergent validity was confirmed, as the average variance extracted measures exceeded the minimum value of 0.5 (Hair et al., 2020).

Table 4 Measurement model results

Composite indicators	**Mean**	**SD**	**Loading**	**t-student***	**α**	**ρA**	**ρC**	**AVE**
CR					0.898	0.907	0.919	0.621
CR1	3.910	0.907	0.757	32.529				
CR2	3.902	0.957	0.818	52.737				

	CR3	3.697	0.960	0.834	55.887			
	CR4	3.534	0.977	0.789	47.527			
	CR5	3.873	0.960	0.832	61.295			
	CR6	3.593	0.964	0.780	51.170			
	CR7	3.881	1.022	0.697	28.164			
OR						0.858	0.866	0.894	0.585
	OR1	4.254	0.832	0.663	19.785			
	OR2	4.049	0.912	0.705	24.894			
	OR3	3.604	0.960	0.822	51.473			
	OR4	3.581	0.975	0.800	41.424			
	OR5	3.970	0.862	0.792	45.585			
	OR6	3.380	0.977	0.795	41.559			
NT						0.846	0.861	0.886	0.565
	NT1	3.265	1.317	0.824	46.197			
	NT2	2.877	1.471	0.644	18.083			
	NT3	3.137	1.360	0.819	41.074			
	NT4	3.757	1.195	0.746	27.751			
	NT5	3.329	1.309	0.724	25.698			
	NT6	3.522	1.295	0.740	29.900			
RS						0.776	0.786	0.857	0.600
	RS1	3.766	0.918	0.801	36.005			
	RS2	3.799	0.938	0.826	47.206			
	RS3	4.179	0.844	0.790	36.259			
	RS4	3.809	0.949	0.673	18.786			
CI						0.799	0.925	0.836	0.574
	CI1	3.014	1.128	0.448	2.034			
	CI2	3.497	1.182	0.763	5.023			
	CI3	3.596	1.184	0.824	6.247			
	CI4	3.798	1.161	0.915	6.986			
PE						0.761	0.776	0.844	0.576
	PE1	4.000	0.986	0.693	18.292			
	PE2	3.534	1.127	0.746	21.693			
	PE3	4.384	0.826	0.791	29.596			
	PE4	4.212	0.840	0.801	30.648			
PA						0.771	0.791	0.866	0.682
	PA1	4.388	1.954	0.786	35.793			
	PA2	5.186	1.808	0.840	73.798			
	PA3	4.184	1.917	0.851	62.839			
SNs						0.833	0.851	0.900	0.750
	SN1	5.548	1.396	0.848	42.628			
	SN2	5.378	1.669	0.831	43.375			
	SN3	5.605	1.391	0.916	102.468			
PBC						0.789	0.835	0.850	0.500
	PBC1	4.128	1.445	0.821	60.032			
	PBC2	5.253	1.624	0.565	13.037			

	PBC3	4.616	1.437	0.818	60.319				
	PBC4	4.654	1.461	0.836	66.187				
	PBC5	4.454	1.525	0.536	11.238				
	PBC6	3.127	1.639	0.566	16.870				
EI						0.886	0.889	0.922	0.746
	EI1	3.518	1.637	0.851	63.524				
	EI2	4.601	1.733	0.828	58.897				
	EI3	3.777	1.814	0.890	100.794				
	EI4	3.204	1.800	0.885	98.007				

SD: standard deviation; α: Cronbach's alpha; ρA: Dijkstra–Henseler's composite reliability; ρC: Jöreskog's composite reliability; AVE: average variance extracted; ∗∗∗: All loadings are significant at the 0.001 level. Significance and standard deviations performed by 10,000-repetition bootstrapping.

The Fornell–Larcker criterion was applied to examine the discriminant validity (Fornell & Larcker, 1981). This criterion was met, as the correlation between each pair of variables did not exceed its square root (Table 5). In addition, the discriminant validity was corroborated by verifying that all heterotrait–monotrait ratio values do not exceed 0.85 for conceptually different constructs or 0.90 for conceptually similar constructs (Hair et al., 2019).

Table 5 Discriminant validity

		I	II	III	IV	V	VI	VII	VIII	IX	X
I	**CR**	**0.788**	*0.618*	*0.445*	*0.631*	*0.104*	*0.426*	*0.313*	*0.274*	*0.530*	*0.388*
II	**OR**	0.551	**0.765**	*0.417*	*0.510*	*0.119*	*0.390*	*0.241*	*0.191*	*0.448*	*0.287*
III	**NT**	0.393	0.353	**0.752**	*0.456*	*0.082*	*0.279*	*0.227*	*0.201*	*0.343*	*0.285*
IV	**RS**	0.535	0.420	0.372	**0.775**	*0.171*	*0.533*	*0.316*	*0.293*	*0.479*	*0.374*
V	**CI**	0.054	0.021	-0.019	0.165	**0.758**	*0.456*	*0.069*	*0.072*	*0.171*	*0.067*
VI	**PE**	0.369	0.319	0.228	0.412	0.352	**0.759**	*0.179*	*0.200*	*0.354*	*0.225*
VII	**PA**	0.276	0.210	0.200	0.255	0.052	0.159	**0.826**	*0.424*	*0.736*	*0.887*
VIII	**SNs**	0.238	0.162	0.172	0.237	0.078	0.166	0.364	**0.866**	*0.494*	*0.396*
IX	**PBC**	0.463	0.380	0.298	0.373	0.145	0.288	0.576	0.421	**0.704**	*0.736*
X	**EI**	0.356	0.255	0.253	0.311	0.011	0.195	0.745	0.345	0.646	**0.864**

Heterotrait–monotrait ratio over the diagonal (italics). Fornell–Larcker criterion: square root of average variance extracted values in diagonal (bold) and construct correlations below the diagonal.

Finally, for both the saturated and estimated models, the standardized root mean square residual values did not exceed the established maximum values of 0.08; moreover, the normed fit index exceeded the minimum value of 0.9. These findings demonstrate an acceptable model fit (Henseler et al., 2014; Hu & Bentler, 1998).

4.2. Structural model - path analysis

Prior to analyzing the relationships established in the model, the possible existence of a multicollinearity problem was ruled out. The variance inflation factor, as shown in Table 6, fluctuates between 1.088 and 1.811, a range significantly below the maximum value of 3.

Table 6 Multicollinearity assessment

PA	SNs	PBC	EI

CR	1.811	1.793	1.811	
OR	1.537	1.537	1.537	
NT	1.280	1.275	1.280	
RS	1.622	1.607	1.622	
CI	1.175	1.173	1.175	
PE	1.434	1.433	1.434	
PA				1.497
SNs	1.088		1.088	
PBC				1.497

To analyze the sign, magnitude, and significance of the model relationships, a one-tailed test of percentile bootstrapping with 10,000 subsamples and a significance level of 5% was executed. This resulted in the t-values and percentile confidence intervals (PCI) shown in Table 7.

Table 7 Structural model and hypotheses testing

					PCI				
	Path	**SD**	**T-value**	**f^2**	**5% (LL)**	**95% (UL)**		**H**	**Supported**
Direct effects									
PA -> EI	0.558	0.029	19.371***	0.555	0.510	0.604		H1	YES
PBC -> EI	0.325	0.032	10.297***	0.188	0.274	0.377		H2	YES
Indirect effects									
Individual indirect effects							VAF		
SNs -> PA -> EI	0.167	0.022	7.506***		0.131	0.205	62,78	H3a	YES
SNs -> PBC -> EI	0.098	0.015	6.376***		0.073	0.124	36,84	H3b	YES
CR -> PA -> EI	0.063	0.027	2.319*		0.018	0.108	36,21	H4a	YES
CR -> SNs -> PA -> EI	0.022	0.009	2.328*		0.007	0.037	12,64	H4b	YES
CR -> SNs -> PBC -> EI	0.013	0.006	2.277*		0.004	0.022	7,47	H4c	YES
CR -> PBC -> EI	0.077	0.016	4.951***		0.052	0.103	44,25	H4d	YES
OR -> PA -> EI	0.024	0.026	0.948		-0.018	0.067	34,78	H5a	NO
OR -> SNs -> PA -> EI	0.001	0.009	0.078		-0.014	0.016	1,45	H5b	NO
OR -> SNs -> PBC -> EI	0.000	0.005	0.078		-0.008	0.009	0,00	H5c	NO
OR -> PBC -> EI	0.044	0.013	3.337***		0.023	0.066	63,77	H5d	YES
NT -> PA -> EI	0.032	0.023	1.383		-0.005	0.073	42,67	H6a	NO
NT -> SNs -> PA -> EI	0.011	0.007	1.534		0.000	0.024	14,67	H6b	NO
NT -> SNs -> PBC -> EI	0.007	0.004	1.509		0.000	0.015	9,33	H6c	NO
NT -> PBC -> EI	0.025	0.011	2.147*		0.007	0.045	33,33	H6d	YES
RS -> PA -> EI	0.044	0.026	1.731*		0.003	0.087	45,83	H7a	YES
RS -> SNs -> PA -> EI	0.020	0.009	2.332*		0.006	0.034	20,83	H7b	YES
RS -> SNs -> PBC -> EI	0.012	0.005	2.244*		0.004	0.021	12,50	H7c	YES
RS -> PBC -> EI	0.020	0.013	1.523		-0.001	0.042	20,83	H7d	NO
CI -> PA -> EI	0.004	0.026	0.167		-0.038	0.046	9,52	H8a	NO
CI -> SNs -> PA -> EI	0.007	0.007	0.925		-0.005	0.018	16,67	H8b	NO
CI -> SNs -> PBC -> EI	0.004	0.004	0.917		-0.003	0.011	9,52	H8c	NO
CI -> PBC -> EI	0.028	0.013	2.196*		0.008	0.047	66,67	H8d	YES
PE -> PA -> EI	0.002	0.023	0.101		-0.034	0.040	8,33	H9a	NO

PE -> SNs -> PA -> EI	0.006	0.007	0.875	-0.005	0.019	25,00	H9b	NO
PE -> SNs -> PBC -> EI	0.004	0.004	0.867	-0.003	0.011	16,67	H9c	NO
PE -> PBC -> EI	0.011	0.012	0.918	-0.008	0.032	45,83	H9d	NO
Total effect								
SNs -> EI	0.266	0.029	9.085***	0.217	0.314		H3	YES
CR -> EI	0.174	0.037	4.667***	0.112	0.234		H4	YES
OR -> EI	0.069	0.035	1.959*	0.013	0.128		H5	YES
NT -> EI	0.075	0.031	2.394**	0.026	0.129		H6	YES
RS -> EI	0.096	0.035	2.757**	0.037	0.152		H7	YES
CI -> EI	0.042	0.036	1.187	-0.012	0.097		H8	NO
PE -> EI	0.024	0.032	0.741	-0.028	0.078		H9	NO

R^2 adjusted [95% Confidence intervals in brackets]: PA: 0.175 [0.140; 0.234]; SNs: 0.073 [0.052; 0.119]; PBC: 0.350 [0.307; 0.414]; EI: 0.624 [0.591; 0.659]. ^{F2}: size effect index; 95PCI: 95% percentile confidence interval; VAF: variance accounted formula X 100, representing the proportion mediated; SD: standard deviation; H: hypotheses. Significance, standard deviations, and 95% bias-corrected CIs were performed by 10,000-repetition bootstrapping; *: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$. Only total effects that differ from direct effects are displayed.

Based on the R^2 analysis, the proposed model explains 17.5% of the variance in PA, 7.3% in SNs, 35% in PBC, and 62.4% in EI. Falk and Miller (1992) established a minimum value of 0.10, and, according to Hair et al. (2019), values of 0.75, 0.50, and 0.25 are considered substantial, moderate, and weak, respectively. Therefore, these results prove that the model has adequate explanatory capacity. To conclude the analysis of the structural model, the effect size was analyzed to measure the contribution of each independent variable to the dependent variable of influence. Following Cohen (1988), 0.02 was used as a minimum value to determine whether the results corroborate the hypotheses.

First, in relation to the dimensions of TPB and its influence on EI:

- **H1** and **H2**: The two hypotheses established from the positive direct effects, i.e., PA→EI ($\beta=0.558^{***}$) and PBC→EI ($\beta=0.325^{***}$), are accepted with the highest level of significance.

- **H3**: SNs→EI is positive and significant ($\beta=0.226^{***}$), supporting H3. This result is reached through the indirect, positive, and significant effect of SNs→PA→EI ($\beta=0.167^{***}$; 62.78% of the total effect) and the indirect, positive, and significant effect of SNs→PBC→EI ($\beta=0.098^{***}$; 36.84% of the total effect). Therefore, H3a and H3b are accepted.

Second, regarding the indirect effect of each of the competences on EI (total effect) and the individual indirect effects of each relation:

- **H4:** CR→EI presents a positive and significant effect ($\beta=0.174^{***}$), supporting H4. This result is made possible by CR→PA→EI ($\beta=0.063^{*}$; 36.21% of total effect), CR→SNs→PA→EI ($\beta=0.022^{*}$; 12.64% of total effect), CR→SNs→PBC→EI ($\beta=0.013^{*}$; 7.47% of total effect), and CR→PBC→EI ($\beta=0.077^{***}$; 44.25% of total effect). Thus, H4a, H4b, H4c, and H4d are supported.

- **H5:** Likewise, the results demonstrate the indirect and positive effect of OR→EI ($\beta=0.069^{*}$), supporting H5. This result is reached through the indirect effect of

OR→PBC→EI (β=0.044***; 63.77% of total effect), accepting H5d. However, the other established indirect effects (OR→PA→EI, OR→SNs→PA→EI, and OR→SNs→PBC→EI) yielded non-significant results, ruling out H5a, H5b, and H5c.

- **H6:** About NT→EI, the findings reveal a positive and significant indirect effect (β=0.075**), supporting H6. This result is reached through NT→PBC→EI (β=0.025*; 33.33% of total effect), supporting H6d. However, the other indirect effects (NT→PA→EI, NT→SNs→PA→EI, and NT→SNs→PBC→EI) did not have significant results, and thus H6a, H6b, and H6c are rejected.

- **H7:** The findings show that RS→EI is positive and significant (β=0.096**), accepting H7. This is possible due to the fulfilment of three out of four proposed sub-hypotheses (H7a, H7b, and H7c). Thus, the following relations have been proven: RS→PA (β=0.044*; 45.83% of total effect), RS→SNs→PA→EI (β=0.020*; 20.83% of total effect), and RS→SNs→PBC→EI (β=0.012*; 12.50% of total effect). However, RS→PBC→EI is not significant, so H7d is rejected.

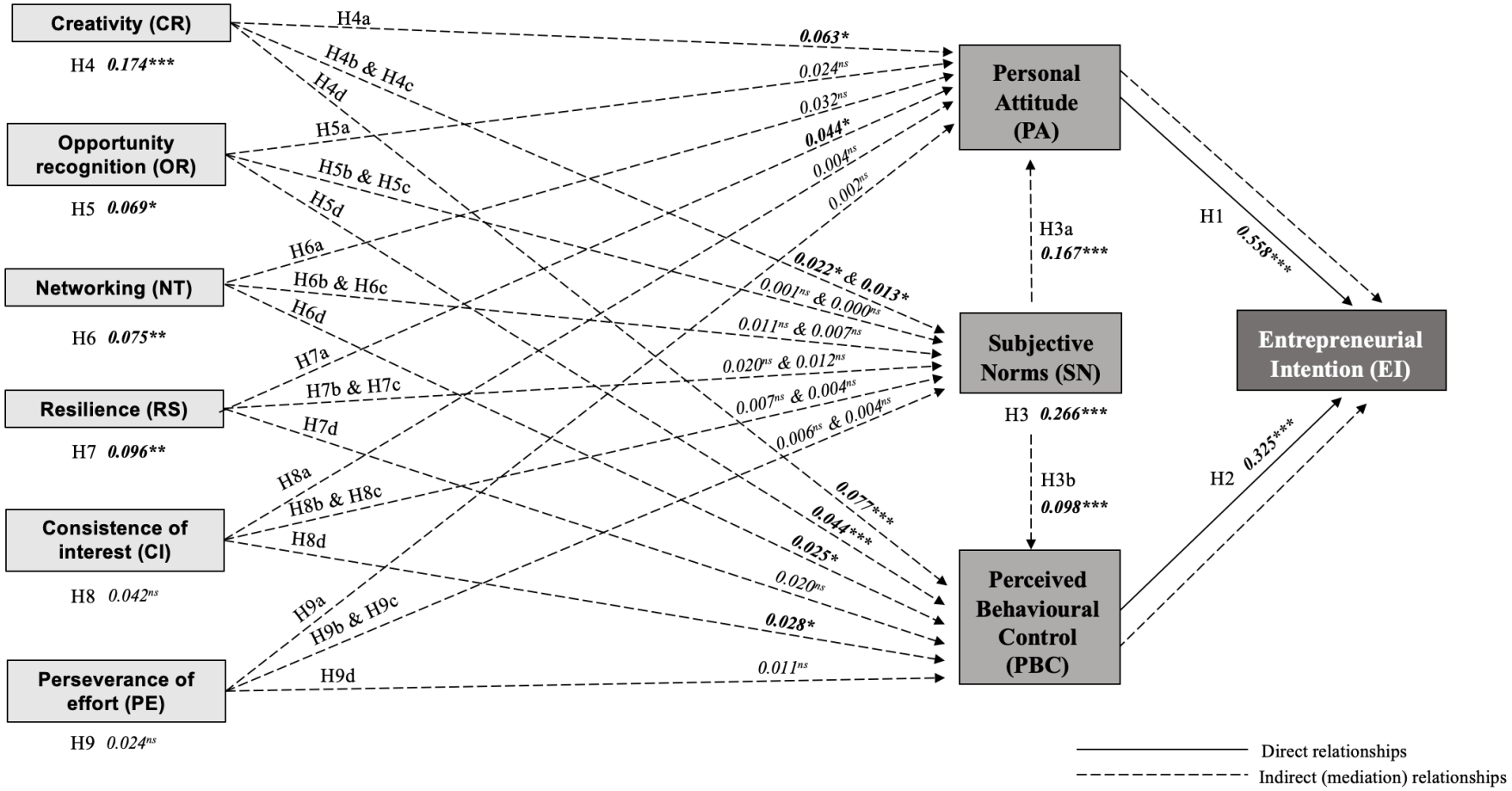
- **H8:** CI→EI is not significant (β=0.042^{ns}), thereby rejecting H8. It was only possible to verify an effect in the relation CI→PBC→EI (β=0.028*; 66.67% of total effect), supporting H8d. The rest of the indirect effects established (CI→PA→EI, CI→SNs→PA→EI, and CI→SNs→PBC→EI) yielded non-significant results, rejecting H8a, H8b, and H8c.

H9: PE→EI was not verified, as the effect is not significant (β=0.024^{ns}), rejecting H9. In this case, no significant indirect effect was demonstrated in the established sub-hypotheses. Therefore, H9a, H9b, H9c, and H9d are rejected.

Potential endogeneity concerns related to omitted variables influencing the dependent variable were addressed in the data analysis phase. Following the approach suggested by Antonakis et al. (2014), sex, age, and area of knowledge were included as control variables. After incorporating these controls, the PLS algorithm was re-ran. The results remained unchanged compared to the original model without control variables. Specifically, the R^2 value for EI would amount to 61.8%. This consistency indicates that the model has effectively addressed omitted variable bias.

Figure 2 illustrates the results presented in Table 7 and described above.

Fig. 2 Results of the EI model with entrepreneurial competences



Numbers in bold allude to the accepted hypotheses. Level of significance: *: p < 0.05; **: p < 0.01; ***: p < 0.001; ns: not statistically significant.

4.3. Evaluation of the Predictive Performance

As stated by Shmueli et al. (2019), the predictive capacity of a model is its ability to generate new predictions. Thus, a certain variable can be predicted from a given set of measurements (Straub et al., 2004). This analysis is applied using PLS predict algorithm with SmartPLS.

The results shown in Table 8 reflect that, for both the variables and their items, all the values of Q^2 are positive. Similar results are obtained when comparing the results obtained by PLS for RMSE (since all items are symmetrical) or when applying a linear regression model (LM). Under most assumptions, the errors produced by PLS are smaller, implying a satisfactory predictive capacity of the model (Felipe et al., 2017).

Table 8 PLS predict assessment

Construct prediction summary							
	Q^2						
PA	0.079						
SN	0.060						
PBC	0.253						
EI	0.137						
Indicator prediction summary							
		PLS		**LM**		**PLS-LM**	
	Q^2	**RMSE**	**MAE**	**RMSE**	**MAE**	**RMSE**	**MAE**
PA1	0.018	1.939	1.655	1.919	1.616	0.020	0.039
PA2	0.097	1.721	1.450	1.737	1.431	-0.016	0.019
PA3	0.034	1.886	1.580	1.888	1.574	-0.002	0.006
SN1	0.045	1.367	1.083	1.378	1.080	-0.011	0.003
SN2	0.043	1.635	1.340	1.673	1.365	-0.038	-0.025
SN3	0.048	1.359	1.080	1.384	1.099	-0.025	-0.019
PBC1	0.175	1.314	1.041	1.313	1.043	0.001	-0.002
PBC2	0.085	1.556	1.250	1.579	1.248	-0.023	0.002
PBC3	0.141	1.334	1.054	1.345	1.059	-0.011	-0.005
PBC4	0.194	1.313	1.028	1.332	1.053	-0.019	-0.025
PBC5	0.067	1.476	1.196	1.499	1.203	-0.023	-0.007
PBC6	0.086	1.570	1.287	1.572	1.276	-0.002	0.011
EI1	0.084	1.469	1.289	1.555	1.268	-0.086	0.021
EI2	0.128	1.620	1.326	1.628	1.316	-0.008	0.010
EI3	0.126	1.679	1.378	1.697	1.388	-0.018	-0.010
EI4	0.064	1.724	1.394	1.733	1.398	-0.009	-0.004

PLS: Partial least squares path model; LM: Linear regression model; RMSE: Root mean squared error; MAE: Mean absolute error. Q2: PLS-predict index performed with 10 k-fold and 10 repetitions.

4.4 Importance-Performance Map Analysis

Finally, the Importance-Performance Map Analysis (IPMA) has been carried out to assess the relationship between the importance and perceived performance of latent variables (Avkiran & Ringle, 2018). This method helps to understand the extent to which an

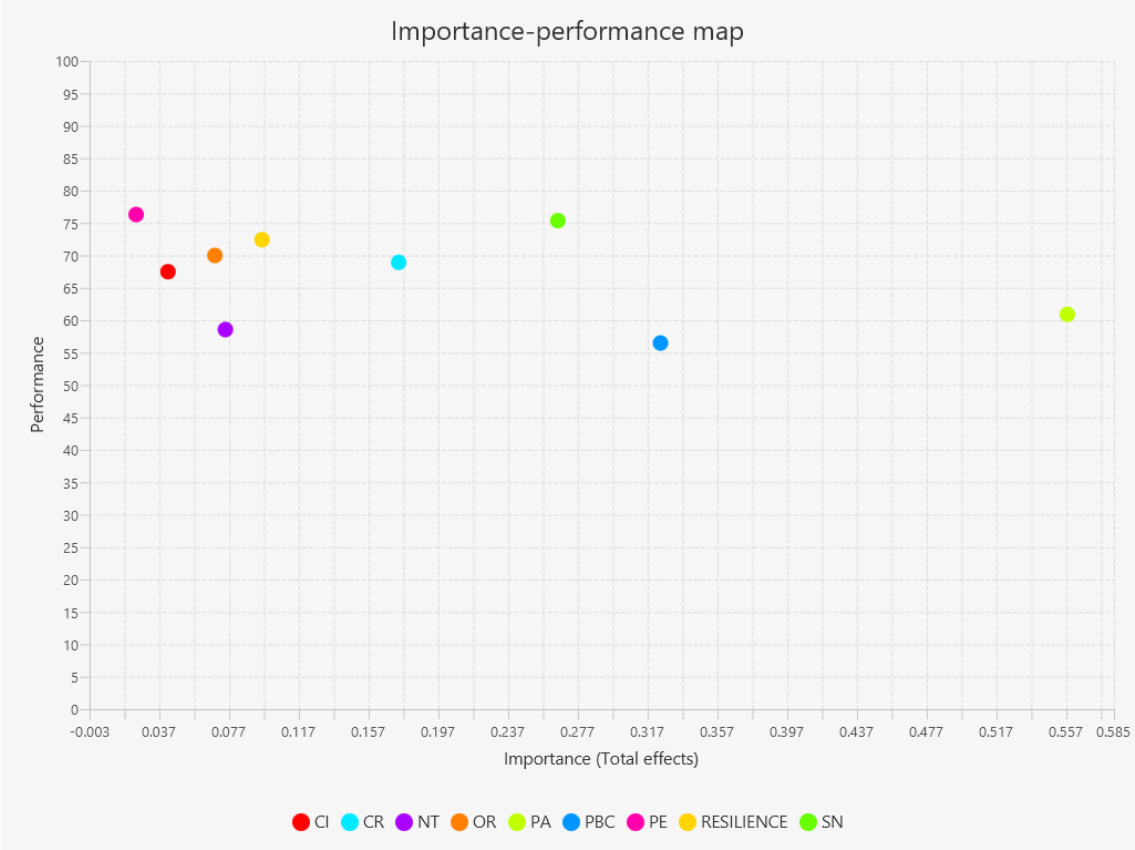
exogenous factor explains an endogenous factor (Ringle & Sarstedt, 2016). It juxtaposes the overall effects with the mean scores of latent variables and offers insights into the evolution of target variables, as well as the identification of pivotal variables influencing the target variable, indicating areas of focus or potential enhancement (Sohaib et al., 2019). IPMA also uncovers exogenous variables that may enhance an endogenous target variable, highlighting irrelevant variables. Therefore, IPMA can be applied to discover which independent variable is more relevant in determining the dependent variable (Gimeno-Arias et al., 2023). Utilizing SmartPLS, IPMA has been generated for EI. The findings are presented in both Table 9 and Figure 3. Ranging from the lowest to the highest value, the performance of attributes is depicted on the vertical axis while the perceived importance of these attributes is represented on the horizontal axis.

The results reveal that several precursors play a significant role in determining EI. Among them, PA, SN, and PBC stand out. Additionally, their performance is not very high, so these precursors could be further encouraged. These results validate the relevance of the three TPB dimensions, supporting the usefulness of the model.

Table 9 IPMA results for the predecessors of EI

Predecessors of EI	**EI**	
	Total effect (Importance)	***Index Value (Performance)***
CI	0.042	67.484
CR	0.174	68.925
NT	0.075	58.558
OR	0.069	69.994
PA	0.558	60.913
PBC	0.325	56.485
PE	0.024	76.309
RE	0.096	72.426
SN	0.266	75.361
Mean	0.181	67.384

Fig. 3 IPMA



5. Discussion

5.1. Reinforcing TPB

Entrepreneurship is an intentional and planned behavior (Liñán & Chen, 2009; Shane & Venkataraman, 2000). The results of the present study offer support for using TPB to understand intention formation, as the three dimensions explain EI with the highest level of significance. They demonstrate the adequacy of the model and corroborate the results obtained by previous research (Gird & Bagraim, 2008; Liñán & Chen, 2009).

TPB has been used in multi-country studies, proving that the effect of its dimensions can vary depending on the context (Engle et al., 2010; Moriano et al., 2011). Liñán and Chen (2009) comparatively analyzed Spanish and Taiwanese students and demonstrated that PA was the strongest predictor of EI in the Spanish group, whereas PBC was the strongest predictor in the Taiwanese group. These results are verified by the present study, as, in the case of Malaga (Spain), PA is positioned as the most influential dimension of EI.

5.2. Determining the key entrepreneurial competences

Prior research has argued that including new variables in the TPB model is crucial for the advancement of knowledge concerning its application potential (Aloulou, 2016; Autio et al., 2001; Gird & Bagraim, 2008; Krueger et al., 2000; Liñán & Chen, 2009). Specifically, Karimi et al. (2016) highlighted the relevance of integrating competences into the model. Similarly, Gird and Bagraim (2008) stressed the importance of adding specific antecedents related theoretically to intention and behavior instead of studying the influence of demographic characteristics or situation variables, such as past experiences.

So, enabling the analyses of the indirect effects of competences, answers this need and the call on TPB research considering the role of human capital and personal-level variables in the study of EI (Entrialgo & Iglesias, 2020; Fayolle & Liñán, 2014; Nájera-Sánchez et al., 2022; Santos-Jaén et al., 2022).

The competence analysis addresses the first RQ: *Do the six entrepreneurial competences (CR, OR, NT, RS, CI, and PE) have the same effect on the formation of university students' EI?* The results suggest that the entrepreneurial competences should each be specifically treated, as their effects on EI differ both in relation to their total effects and in terms of individual indirect effects. CI and PE (Grit) do not significantly influence EI whereas CR, OR, NT, and RS have a positive significant effect. One key conclusion stands out here: Not all competences are useful in fostering EI. This result highlights the importance of considering the dynamic nature of competences, in line with the current trend of research focusing on dynamic capabilities (Zahra et al., 2006) and the relevance of analyzing their effect on the different stages of the entrepreneurial process (Reynolds et al., 2005). The results of the competences are discussed in detail below.

Grit

The concept of Grit (considering its two dimensions) has received serious attention in recent years. In this vein, the results showed that CI and PE do not indirectly influence EI, and they do not directly influence PA, SN, or PBC. Only CI has a slight effect on PBC. These results respond to the call of authors such as Mooradian et al. (2016), who recommended researching the concept of Grit to explore its effect on key entrepreneurial variables, like potential entrepreneurship. The non-influence of CI and PE on EI is not inconsistent with the results of past studies arguing for the relevance of Grit in business success, as competences related to the entrepreneurial activity itself (Mohand-Amar et al., 2022; Mooradian et al., 2016; Salisu et al., 2020). CI and PE are especially important to focus and persist in developing the complex and various tasks related to business creation and to overcome the setbacks that can appear during the entrepreneurial process (Mueller et al., 2017). This is consistent with Wolfe and Patel (2016), who found that, for self-employment, CI and PE should be enhanced in the second stage of the entrepreneurial process, when the venture is set up.

Some authors have made a great effort to distinguish the concepts of Grit and RS (Meyer et al., 2020). In addition, the results of this study empirically demonstrate the different impacts of those variables on EI. In contrast to CI and PE, RS significantly influences EI and directly affects PA and SNs. This answers the call of Karaman et al. (2019) concerning the need to examine how Grit and RS affect other constructs.

In relation to the competences that significantly impact EI (i.e., CR, OR, NT, and RS), some differences can be observed. Indeed, not all competences have the same influence or the same path through TPB dimensions. CR has the highest total effect (β: 0.174) and is the only competence influencing all dimensions. This means that the second research question is answered in the affirmative *(Is it possible to distinguish any key entrepreneurial competence in the EI formation of university students?).* All four competences are considered relevant, but CR is critical to foster potential entrepreneurship among students.

CR

Existing literature has highlighted the relevance of CR for entrepreneurship and, particularly, for EI (Hamidi et al., 2008; Martín-Navarro et al., 2023), but the present paper goes one step further, incorporating the TPB dimensions. It demonstrates that CR is useful for growing PA, which can be explained because CR provides guidance in changing scenarios and decreases the perceived risk associated with venture creation, as it is related to high risk-taking tendencies (Tyagi et al., 2017). As CR is the ability to discover and create new formulas (Anjum et al., 2021), it provides individuals with a wide range of mechanisms to face the entrepreneurial process. In addition, as CR is a self-perceived competence, it increases the positive assessment of the perceived consequences of conducting an entrepreneurial activity, thereby boosting the influence of PA on EI (Entrialgo & Iglesias, 2020). According to these authors, "creative individuals (more prone to creation) develop more favorable attitudes toward creative activities such as entrepreneurship" (Entrialgo & Iglesias, 2020, p. 531). Of all competences analyzed, CR is the only one that influences SNs, i.e., the perception of social influence. This can be explained by the fact that CR is a social process based on direct and indirect interactions with other people (Elisondo, 2016).

OR

According to Hoang et al. (2022), "Opportunity recognition plays a vital role in enhancing an individual's self-confidence and improving their positive attitude toward creating a new business, which is in line with the TPB" (p.4). Applying TPB, this study demonstrates that OR only influences EI significantly through PBC. PA is not a significant mediator. Karimi et al. (2016) argued that OR is related to the perceived controllability of any given situation. Thus, the ability to identify an opportunity increases self-confidence and the perception of easiness or difficulty in becoming an entrepreneur. Existing studies have also analyzed CR and OR jointly, arguing for their relevance in business creation and entrepreneurial success (Chang & Chen, 2020). Lim et al. (2021b) demonstrated the positive relationship between them and EI, but the present research goes a step further and reveals the different impacts of CR and OR. CR influences EI through all TPB dimensions, whereas OR only influences EI via PBC.

NT

The social capital generated through NT, representing resources embedded in interpersonal relations and accessed through social connections, is an instrumental and enabling factor of entrepreneurship (McKeever et al., 2014). Former studies have related NT with an enhanced entrepreneurial spirit (Chen et al., 2018), as the accessibility of resources is linked with the self-efficacy of being an entrepreneur (Sulistyani et al., 2022). As stated by Bratkovič et al. (2012), individuals who perceive that they have access to the resources and information needed to start a business through their social ties feel more confident about becoming an entrepreneur. The results of the present study show that NT indirectly influences EI through PBC. This pattern is the same as the one exhibited by OR, which is consistent with previous studies indicating that OR and NT have similar effects (Lans et al., 2015).

RS

Supporting the argument that entrepreneurial competences influence EI differently, it can be observed that RS does not affect EI through PBC, which is the case for the other competences, but through a positive effect on PA and SNs. This difference could be explained by the distinct nature of the competences analyzed, RS is a quality close to the psychological sphere, whereas CR, OR, and NT are instrumental competences (Martínez-

Martínez & Ventura, 2020). The observed positive indirect effect of RS on EI supports the results of previous studies stating that RS increases EI and serves "as a shield that protects intentions from the negative impact of fear of failure" (Monllor & Murphy, 2017, p. 628).

Finally, once the effect of the competences has been analyzed, it is worth mentioning that differences between mediators are also noted. Through a comparative view of the indirect effects, PBC is the mediating dimension that most captures the antecedents' influence on EI, in line with the result of other authors (Villanueva-Flores et al., 2023). This construct has been likened to self-efficacy (Nishimura & Tristán, 2011), as the central feature of both concepts is the sense of one's ability to perform an activity (Ajzen, 2002). In this vein, Aparicio et al. (2021) highlight perceived self-efficacy as a critical feature for entrepreneurial potential. CR and OR are the two variables that influence PBC with the highest levels of significance, results in line with former studies that demonstrate their joint relevance for entrepreneurship (Chang & Chen, 2020).

6. Conclusion and contributions

This research analyzes the influence of six entrepreneurial competences through the three TPB dimensions, broadly proven relevant for EI formation. The competences' direct effect on EI was not considered, as the influence through the three TPB dimensions provides a better understanding and leads to greater practical contributions. The results provide affirmative answers to both research questions. It is possible to identify differences in the effect of entrepreneurial competences on EI: Not all of them affect EI, and those with an influence do not operate in the same manner. In addition, there are two highlights essential for EE design: CR is a key competence for potential entrepreneurship and Grit (CI and PE) has no influence of in this first phase of the entrepreneurial process. Thus, the findings of this research lead to the advancement of both theory and practice. Three main theoretical contributions can be distinguished: contributions to the theoretical model, to EI and to entrepreneurial competences.

First, this study advances knowledge on the extension of the theoretical model, reinforcing TPB and supporting the model's suitability for measuring EI in the context of the Entrepreneurial University. The results validate the relationships even incorporating new antecedents, such as entrepreneurial competences, following the trend of recent studies focusing on integrating EI antecedents (Patricio & Ferreira, 2023; Villanueva-Flores et al., 2023). The results obtained from the Importance-Performance Map Analysis suggest that focusing on strengthening SN, PA, and PBC could be crucial for fostering EI. Moreover, the significative indirect effects show that competences influence EI through the three mediating dimensions and permit the detection of differences between them, advancing the theoretical model from a competency-based approach.

Second, he results also contribute to the field of EI. In this study, EI was not used as a proxy for entrepreneurial behavior, but was considered by its nature as indicator of the first stage of the entrepreneurial process. In doing so, the research answers the call of recently published studies emphasizing the need to focus on antecedents to understand EI (Del Brío et al., 2022; Iwu et al., 2021), addressing the need to "explore the construct EI in new directions" as it is one of "the most significative constructs" in the entrepreneurship domain (Singh & Mehdi, 2022, p.2).

Third, theoretical contributions on entrepreneurial competences are also drawn. This study enhances the value of CR as a core competence for EI while revealing the non-influence of Grit. None of its dimensions (CI and PE) are relevant for the formation of EI, though previous studies position Grit as a determining factor for entrepreneurship. So, Grit may be relevant at another phase of the entrepreneurial process, revealing the importance of distinguishing which competences should be reinforced at each stage.

Results also lead to relevant practical contributions in the educational field. First, considering the increasing attention given to the link between EE and potential entrepreneurship (Al-Qadasi et al., 2024; Do Nguyen & Nguyen, 2023; Otache et al., 2024) as "education stimulates EI and improves entrepreneurs' ability to manage and grow new ventures" (Zhang et al., 2014, p. 639), the results provide insights for training planning. Former studies have shown the positive impact of EE on competence development (Okolie et al., 2021) and the relevance of competence training to increasing students' entrepreneurial potential (Hou et al., 2023; Patricio & Ferreira, 2023; Sánchez, 2011). Focusing on individual-level characteristics, such as competences, is especially relevant with respect to designing truly effective entrepreneurship education (Entrialgo & Iglesias, 2020; García-Cabrera et al., 2023).

7. Pedagogical implications

The specialized literature has analyzed a wide range of pedagogical aspects to characterize EE, addressing topics such as the complexity of teaching entrepreneurship (Haase & Lautenschläger, 2011; Blenker et al., 2008); the teaching process according to the stages of the entrepreneurial process (Politis, 2005); the experiential and social nature of learning (Politis, 2005; Kassean et al., 2015); the importance of context (Thomassen et al., 2020; Ventura & Quero, 2017; Quero & Ventura, 2022); the relevance of spaces for teaching (Pittaway & Aissaoui, 2020); the content of EE (Tiberius & Weyland, 2024); or the methodologies employed in teaching entrepreneurship (Bennett, 2006; Fiet, 2001).

This study adopts the view of entrepreneurship as a process with distinct stages and agrees that EE must address the different training needs that arise at each stage. In this vein, Politis (2005) states that the entrepreneurial learning process cannot be understood from a static perspective, highlighting the dynamic nature of entrepreneurial learning and defining the concept of the "entrepreneur's career". Jesselyn Co and Mitchell (2006) argue that EE targets current and potential entrepreneurs. Also, Heinonen and Poikkijoki (2006) highlight the relevance of EE for EI, stating that "if we succeed in the earlier phases in fostering a strong enough intention and a satisfactory knowledge level, we can move on to the experiential stage" (p.86).

From this perspective, university students should be considered potential entrepreneurs who may or may not develop EI. In this evolution, the EE they receive at the university level plays a critical role. Previous studies give guidelines on how to do this effectively. Politis (2005) recommends that EE begin early in the educational system and should be oriented towards how potential entrepreneurs can progress along their career paths. Considering the entrepreneurial journey, Heinonen and Poikkijoki (2006) identify three types of EE goals: learning to understand entrepreneurship, learning to become entrepreneurial, and learning to become an entrepreneur. The second objective is crucial to encourage EI, but the current EE fails in most cases in successfully addressing it.

Taking the above into account, the competency-approach applied in this study leads to conclude that not all entrepreneurial competences have the same impact on the formation of EI, with CR standing out as a core competence. Identifying which competences have greater impact on EI allows educators to design more targeted and efficient programs, avoiding generic strategies that may dilute resources and efforts.

According to the results of this study, first-stage EE programs should prioritize activities that foster CR thinking and OR, such as idea-generation workshops, interdisciplinary projects, and problem-based business simulations rooted in real-world challenges. CR particularly boost PA towards entrepreneurship, while OR enhances PBC. This is in line with the TPB rationale presented by Ajzen (2020), as OR can be understood as a facilitator factor, acting on control beliefs and encouraging entrepreneurial engagement. The relevance of NT is linked to the results of previous EE studies that highlight the social aspect of education. Learning, in addition to its experiential nature, also has a social dimension (Thomassen et al., 2020), involving interaction among participating actors (students, teachers, and other potential external stakeholders). Entrepreneurship is also an activity that requires interaction with a variety of stakeholders. In this context, collaboration and the exchange of ideas are essential for an effective EE. NT can be fostered through teamwork activities and settings that favor negotiation abilities and communication, such as pitching competitions.

The findings can also be linked with the current challenges of teaching entrepreneurship identified by former studies. Haase and Lautenschläger (2011) highlight the difficulty of teaching certain entrepreneurial competences, particularly those related to the entrepreneurial "know-how", such as CR. These competences are considered challenging to deliver through traditional educational methods. For this reason, training programs often focus more on technical competences, which are easier to teach, such as strategic planning or business feasibility analysis. In this vein, Kassean et al. (2015) adopt a critical view toward conventional methods of EE, stating that linear methodologies that focus on providing competences for developing business plans fail to foster a critical mindset in students, limiting their ability to recognize opportunities. This research reveals the importance of competences that require experiential learning methodologies, an educational approach aligned with Politis (2005) and Heinonen and Poikkijoki (2006). Thus, the results encourage the inclusion of innovative educational methodologies in curricular and extracurricular training.

Moreover, the limited influence of the psychological dimensions of Grit (CI and PE) at the first entrepreneurial stage calls for reconsidering their role in the curriculum. It may be more effective to focus on developing these competences in the later stages of the entrepreneurial journey, e.g., during EE actions for business implementation and management, where challenges and setbacks are common. The findings lead to the recommendation that educators should tailor pedagogical strategies to suit the specific phases of the entrepreneurial process, targeting the most relevant competences for each stage. In this sense, the commitment of educators to curriculum design stands out. As Patricio and Ferreira (2023) state, "facilitating the acquisition of entrepreneurial competences in students necessitates the commitment of the teaching faculty" (p.3). This paper calls for a more conscious and competency-based EE design and offers insights to guide and inspire educators involved in both the planning and delivery of EE.

8. Limitations, future directions and trends

The limitations identified throughout the research are considered future research opportunities to advance knowledge on EI and competences. First, the identified gap that underpins this study is addressed with a quantitative methodological approach, which allows measuring the influence of the different competences on EI through three dimensions. Data are collected through personal questionnaires, i.e. self-assessment tools, which by nature can lead to potential bias of self-assessment or respondent bias. To reduce this possibility, potential endogeneity concerns related to omitted variables influencing the dependent variable have been addressed, including control variables. Furthermore, to ensure the robustness of the data collection process, the chosen instruments are widely validated and have been applied by numerous research published in leading journals, the variables are defined with multi-item constructs and the sample is large and diverse. Even so, the potential existence of a bias must be considered. Future research could extend these results through another approach, e.g., qualitative interviews that could provide more in-depth information on the relation of the competences with EI, between the competences and even consider the effect of EE in this process. Even if EE has usually been considered as an antecedent of PA, PBC and SN (Wijayati et al., 2021; Duong, 2021), future studies could delve into the possibility that PA, PBC and/or SN in turn increase the willingness to participate in EE, boosting a virtuous circle (Lim et al., 2021a).

Another limitation-opportunity of this study is related to the integration of certain entrepreneurial competences. Extending TPB by incorporating new EI antecedents requires a selection of competences. This selection has been justified throughout the study as the most convenient for the research objective. However, other entrepreneurial competences that have not been included in this model could be integrated into future research to further develop the extended TPB model from a competency-based approach.

Also, this study's results recognize that not all competences are important in the first phase of the entrepreneurial process, i.e., potential behavior. Following the statement of Morris et al. (2013) “that different competences are necessary for venture success at different stages in their life cycles” (p.354), the next step could be to replicate the study with students who are engaged in entrepreneurial activity, both in nascent and consolidated stages, to observe the differences. In this vein, according to González-López et al. (2021), “the perception by an individual of possessing entrepreneurial competences significantly reinforces the step from EI to carrying out gestation activities” (p. 1408).

Even the application of this model considering other educational contexts (e.g., incorporating the effect of culture as Yousaf et al. (2022) propose) or samples (e.g., studying the effect of lecturers' competence levels as Iwu et al. (2021) suggest), could help to enrich knowledge on competence development. Specifically, when looking at diverse contexts, the role of competences could be measured in the virtual domains, considering cyber entrepreneurship or e-EI (Al Halbusi et al., 2023; Tseng et al., 2022), as the development of new technologies demands a rethinking of entrepreneurial competence studies (Toniolo et al., 2020). In this sense, a growing research trend is identified as "the development of entrepreneurial competences is moving toward digital contexts and emerging patterns have to be identified" (Reis et al., 2021). This approach could provide insights for the entrepreneurial university of the digital era, in online and offline environments, even integrating a very useful institutional lens (Guerrero & Urbano, 2021; Zhuang & Sun, 2023).

There is a growing awareness of how to enhance the entrepreneurial mission of higher education through EE (Adelaja et al., 2023; Hou et al., 2023; Salamzadeh et al., 2022) and entrepreneurship research focused on the university context is at a peak. The present

study aligns with this trend and encourages further exploration to foster and facilitate universities' role as generators of qualified entrepreneurial human capital.

Appendix A. Common Method Bias Analysis

Table A1 Harman's single-factor test

	Initial Eingvalues		
Factor	**Total**	**% of variance**	**Cumulative %**
1	19.40	41.28%	41.28%
2	3.85	8.19%	49.47%
3	2.74	5.82%	55.29%
4	1.95	4.14%	59.43%
5	1.74	3.70%	63.13%
6	1.38	2.93%	66.06%
7	1.18	2.51%	68.57%
8	1.07	2.27%	70.84%

Extraction methods: Varimax

Table A2 PLS marker variable Approach

Path coefficients	**Baseline Model without marker variable**		**CMB Test Model with marker variable**	
	Path	**T-value**	**Path**	**T-value**
PA -> EI	0.558	19.371***	0.527	18.676***
PBC -> EI	0.325	10.297***	0.319	10.478***
SNs -> EI	0.266	9.085***	0.214	9.214***
CR -> EI	0.174	4.667***	0.193	3.978***
OR -> EI	0.069	1.959*	0.072	2.239*
NT -> EI	0.075	2.394*	0.069	2.574*
RS -> EI	0.096	2.757**	0.103	2.115*
CI -> EI	0.042	1.187	0.049	1.234
PE -> EI	0.024	0.741	0.019	0.689
Marker variable -> PA		N/A	0.015	0.944
Marker variable -> SN		N/A	-0.009	0.715
Marker variable -> PBC		N/A	0.058	1.234
Marker variable -> EI		N/A	0.038	1.144
Explanatory power (R^2)				
PA	17.5%		16.9%	
SNs	7.3%		7.5%	
PBC	35%		35.2%	
EI	62.4%		61.4%	

*: $p < 0.05$; **: $p < 0.01$; ***: $p < 0.001$

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