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A HOLISTIC LITERATURE REVIEW ON ENTREPRENEURIAL INTENTION: A SCIENTOMETRIC APPROACH

Batista-Canino, R.M.
Santana-Hernández, L.
Medina-Brito, P.
Las Palma de Gran Canaria University

ABSTRACT

This paper reveals the scientific substrate underlying the literature on entrepreneurial intention (EI) tracking its diachronic evolution. It reviews the literature on EI from a holistic view over nearly 50 years (1970-2021), complementing previous reviews on this topic. We adopt a scientometric approach using bibliographic coupling, co-citation, and thematic strategic maps, enabling us to present the changing morphology of EI research over the years. Supported by *VOSviewer* and *Bibliometrix*, we analysed almost 2,000 documents, revealing how research on career choice, education, social psychology, and entrepreneurship have supported each other in developing this topic. The horizon for improving EI knowledge is still open. This paper invites researchers to add new issues to the research front and to break the ice of the intellectual base of this research field by contributing new research frameworks as well as offering ongoing improvements in psycho-social approaches to the individual.

KEYWORDS: Entrepreneurial Intention, Literature Review, Scientometric, VOSviewer, *Bibliometrix.*

1. Introduction[1]

The creation of new businesses remains one of the main ways to solve some of the growing problems generated by economic crises, unemployment, and a lack of innovation (Ács et al., 2008; Valliere & Peterson 2009; Xu et al. 2021), hence the efforts being made by regional development agents –*i.e.*, governments and other institutions- to promote business development policies and improvements in entrepreneurship education. This context explains

[1] This article actively uses the following acronyms: EI-Entrepreneurial Intention; EB-Entrepreneurial Behaviour; CCA-Co-citation Analyses; BC-Bibliographic Coupling; TSM-Thematic Strategic Mapping; TPB-Theory of Planned Behaviour; EEM-Entrepreneurial Event Model.

the growing interest of economics, business management, and human behaviour scholars in the study of Entrepreneurial Intention (hereafter EI).

The literature on EI is at the core of entrepreneurship research (Chandra, 2018; García-Lillo et al., 2023). It has attracted the attention of numerous researchers from different research areas whose interests have focused on predicting new venture creation behaviour (Kautonen et al., 2013) while considering intention as the best individual predictor of the same (Krueger & Carsrud, 1993).

Scientists should be seen as entrepreneurs (Callon et al., 1993) whose resources and aims are both defined in their interaction with other researchers, institutions, and key informants. This interaction in EI literature has been intense and prolific, leading to a significant volume of in-depth literature reviews and bibliometrics motivated by an interest in the progress of this research topic –see, for instance, Alferaih (2017); Al-Jarrasi et al. (2014); Batista-Canino et al. (2023); Dolhey (2019); Donaldson (2019); Ruíz-Alba et al. (2021); Liñán & Fayolle (2015); Neves & Brito (2020); Pérez-Macías et al. (2021); Schlaegel & Koenig (2014); Silva Martins et al. (2018); Tan et al. (2020)-. The approaches and methodologies of these reviews have been varied and some of them have been conducted at the intersection with other topics of interest -*e.g.*, self-efficacy (Santos & Liguori, 2019); entrepreneurs' personal values (Hueso et al., 2021); women's EI (Patra & Lenka, 2021)-. The published work of Donaldson (2019) is remarkable due to his manifest desire to resurrect an area of study for which other authors, ironically, suggested digging a grave (Krueger, 2009).

If we look at the standalone reviews of EI and their development as a singular topic –see Batista-Canino et al. (2023)-, both methodologically and chronologically, we can detect some gaps still unsolved by the bibliometric analyses and literature reviews that have been carried out. Their focus is limited to a short period and does not attempt sequential and co-citation evolving analyses. Particularly important is the scant attention paid to the intellectual structure

that supports the topic's development and evolution. These shortcomings are addressed here by analysing, in a holistic view, the research topic over time, connecting the foundational structure of this body of literature, using Co-citation Analyses (CCA), and the progress made in this domain helped by Bibliographic Coupling (BC) analyses and Thematic Strategic Mapping (TSM). To date, since EI became a research topic, this is the first study to use a scientometric approach by applying CCA, BC, and TSM together.

Extant literature reviews on EI show us less fragmentation and dispersion in the progress of this research than that we find in other topics of interest in the field of entrepreneurship – see for instance, entrepreneurial well-being (Contreras-Barraza et al., 2021), identity in entrepreneurship (Mmbaga et al., 2020) or entrepreneurial education (Loi et al., 2016), among others-. The strong concentration of the EI corpus of papers on a few approaches and theories has created a compact body of literature. It would seem we have reached a point of no return and one from which it may be impossible to advance on an issue that is critical to the field of entrepreneurship. This perception invites us to take another look at the progress of this topic using a scientometric approach to reveal the intellectual structure of the field and to visualise its diachronic evolution over nearly 50 years during which this literature has been developed. Because of our interest in building a comprehensive understanding of the dynamics of this research topic, this paper applies, in a convergent way, quantitative and qualitative analyses of the literature (Callon et al., 1986) useful for updating entrepreneurship scholars, trainers, and policymakers. Thus, the scientometric approach leads us not only to apply bibliometric analyses to the body of literature but also to delve deeper into the most essential papers in the field, to track knowledge, and to uncover future research paths (Callon et al., 1993). This approach aims to find previously unexplored opportunities for improvement in the study of EI. Furthermore, the research protocol applied in this scientometric research includes a multi-

step process that justifies the inclusion and exclusion criteria in each step adding increased robustness to this research.

To advance this work of synthesis and reflection, a systematic literature review has been carried out, uncovering almost 2,000 documents published in scientifically indexed journals on the topic retrieved from the *Scopus* database. Bibliometric analyses and other visualisation resources were applied throughout the stages studied. These analyses have been developed with the help of *VOSviewer* software (Van Eck & Waltman, 2010) to extract CCA, as well as the *Bibliometrix* tool to construct TSM based on BC (Aria & Cuccurullo, 2017).

The need to continuously update the accumulated knowledge (Ruíz-Alba et al., 2021) is justified not only to avoid dispersion in this field of research, given the unstoppable growth of publications, but also to provide useful information to those involved in solving economic crises or unemployment. Thus, after more than four decades of research on EI, this seems to be a good moment to carry out a retrospective evaluation applying recent advances in scientometric software packages. To identify the lines of thought underlying the development of the literature in this field, and consider a collective logic approach (Loi et al., 2016; Teixeira, 2011), we try to discover the invisible communities that have made this field of study grow. Thus, three main objectives are pursued in this paper: (1) to highlight the collective logic and scientific knowledge foundation in this area using CCA (Small, 1973); (2) to unveil the evolution of the research on EI from the seventies –the decade in which we found the first paper on EI- to 2021 using BC (Kessler, 1963) to distinguishing the ongoing scholarly discussions at each stage, and (3) to develop TSM in order to discover the morphology of this research field and its evolution over time (Callon et al., 1993). In doing so, we will connect the research front (conceptual structure) and its intellectual structure in a simple scheme that explains the progress of the research topic. The latter objective highlights the limited scientific substrate that supports the progress of EI research.

Therefore, there is still a horizon of opportunities that provides scope for broadening this scientific structure. To provide a framework for our purposes, we divide the long period into three broad stages, namely the discovery phase (1970-2000), the take-off phase (2001-2010), and the growth phase (2011-2021). The life cycle of the EI issue has still not entered a plateau phase, as the signs show that research has not yet been exhausted on this topic.

To this end, the paper is divided into seven sections headed by this introduction. In section two a literature background is presented followed by the methodology on which this research is built, which will lead us to the results that are subsequently discussed in section four. In section five we present the paths open to researchers interested in progressing in this research area shortly; section six highlights the limitations of the present study, and finally, we present the conclusions.

2. Literature Background

A brief overview of the literature background provides an initial picture of the topic studied in this review. The TCCM framework –*i.e.*, Theory, Context, Characteristics, and Methodology- (Paul & Rosado-Serrano, 2019; Paul & Criado, 2020), allows us to present the literature foundations and the main concerns of the researchers in this domain in a structured manner before addressing the technical issues of this literature review.

T*heoretical approaches:* A large number of theoretical approaches and models have attempted to explain and predict human behaviour in its many facets since behavioural psychology, led by John B. Watson (Mills, 1998), became concerned with the factors influencing human behaviour, and cognitive psychology shifted its focus to the important role of human cognition in shaping individual behaviour. Ajzen's Theory of Planned Behaviour (1991) -hereafter TPB-, undoubtedly one of the most popular, has been grounded in the instrumental theories of Dulany, Fishbein, and other social psychology scholars (Ryan & Bonfield, 1975). However, competing theories and approaches have been found in all areas

of human behavioural research. Interest in this topic begins in the entrepreneurship field with the work of Bird (1988) -Liñán & Fayolle (2015)-, although its progress is strongly rooted in studies on university students' career choice and human behaviour research, as we point out in this review. In this domain, the theory that most strongly has rivalled Ajzen's TPB is the Entrepreneurial Event Model -hereinafter, EEM- (Shapero & Sokol, 1982), but it has not broken the record of applied works and citations that Ajzen's seminal model has garnered (Batista-Canino et al., 2023). Other theories have been added to this effort but with even less luck.

***C**ontexts.* The study of EI has been undertaken mainly in the developed world. The countries that have dominated the scientific scene in this domain have been mainly the United States of America, Spain, the United Kingdom, Germany, Italy, Australia, and Sweden (Dohley, 2019; Neves & Brito 2020). Journals such as the *Journal of Entrepreneurship in Emerging Economies* have shown the non-centred role developed countries play in entrepreneurship, and that EI can be influenced by contextual factors that strongly affect individual attitudes, a key element in shaping intention. Thus, the research has opened to the comparison between countries and regions (Moriano et al., 2011), or the analysis of other contextual factors that influence it. Among these, the educational context (Bae et al., 2014; Loi et al., 2021) stands out for the transformative power that it exerts on individual cognition and behaviour.

***C**aracterístics.* Intention is forged on attitudes and these in turn are influenced by the context. In addition, intention has been considered the most potent predictor of behaviour (Bagozzi et al., 1989). The scheme seems simple, but the relationships between context, individual attitudes, intention, and behaviour, are not yet entirely clear, and which variables moderate or have a mediating effect on each of these relationships are still under study. That is why much of the scientific community, based mainly on TPB, continues to strive to find

the holy grail to explain entrepreneurial behaviour. Pérez-Macías et al. (2021) summarise much of this effort still in fervent debate.

***M**ethodologies.* The dominant models have tried to demonstrate the relationships between variables to explain how the intention toward entrepreneurship is formed. From the beginning, given the pre-eminence of socio-cognitive models from social psychology, the study of EI has been strongly quantitative (Alferaih, 2017). Regression models in their various versions, as well as, more recently, structural equation models, have dominated the scientific scene. Such dominance has meant that little attention has been paid to case studies and qualitative analyses, the natural course of research when we approach a new object of study. This can perhaps explain, as we shall see, the omnipresence of a theory not subjected to other tests that are entirely necessary when new behaviours are put under the magnifying glass.

3. Methods and Data

This paper goes beyond a systematic analysis of the literature (Gaur & Kumar, 2018; Kraus et al., 2020; Transfield, 2003) adopting a scientometric approach (Li et al. 2021). It explores and evaluates the scientific research (Mingers & Leydesdorff, 2015), showing the bibliometric macro-level indicators (Braun et al., 1995), and examining the knowledge production, its spatiality, and the relationship between the network of global actors of thematic co-authorship (Contreras-Barraza et al., 2021). These analyses imply a combination of different techniques that lead us to uncover the intellectual and conceptual structure, facts as well as figures of a specific domain (Boyack & Klavans, 2014; Chandra, 2018; Dolhey, 2019; Patra & Lenka, 2021). The following subsections show the key steps for those interested in replicating this research.

3.1. Scientometric Tools

This research is based on a convergent use of quantitative and qualitative analyses of the literature (Callon et al., 1986), thus relying on a bibliometric review and an in-depth analysis

of the documents. Text mining and visualisation will help us to identify regular patterns of research and the structure of the field, with two different software tools aiding us in this purpose that were chosen for their versatility: *VOSviewer* –v1.6.16, and *Bibliometrix* based on *R* package –v3.2.1. These software packages are useful for conducting scientometric analyses and plotting research maps, helping to reveal the structure and dynamics of a scientific area. Their results establish associations between different items, reveal the latent structure of the field, and help to explain the origin of the topic, its foundations, and its evolution over time (Boyack & Klavans, 2014). This introduces quantitative rigour into the subjective evaluation of the literature (Zupic & Čater, 2015), and helps us to share a clear and replicable review process (Kraus et al., 2020; Zupic & Čater, 2015) with the scientific community.

VOSviewer provides multiple analyses based on the Visualisation Of Similarities[2] (Van Eck & Waltman, 2010), mapping the existing networks between documents by using the association strength as a normalisation parameter between the units of analysis, assigning each document a weight and a position within the group. Nodes are mapped in a way that those closest to each other have a stronger association and the contrary for more distant nodes. The node size will depend on the number of normalised citations received and is connected to others by lines, with the line thickness indicating the strength of association (Gálvez, 2018). Thus, if an article is frequently cited together with others, a connection exists between them -*i.e.*, co-citation-. This reveals the existence of a similar structure of concepts or shared thoughts (Reis et al., 2021).

On the other hand, the *Bibliometrix* based on the *R* package[3] (Aria & Cuccurullo, 2017) offers a tool that enables a time-based evolution mapping of the selected unit of analysis –*i.e.*,

[2] For the introduction in *VOSviewer* see: https://www.vosviewer.com
[3] Analyse the procedures implemented by *Bibliometrix* in *Biblioshiny: Bibliometrix for no coders* available in https://bibliometrix.org/biblioshiny/assets/player/KeynoteDHTMLPlayer.html#0

documents in our analyses and their author's keywords-. When making this analysis we assume that each field of study is characterised by a list of keywords (De la Hoz-Correa et al., 2018). In this way, authors include similar words in their articles establishing a thematic relationship (Gálvez, 2018; Leung et al., 2017; Zupic & Čater, 2015) that builds a conceptual structure. This bibliometric package has recently introduced a scientific mapping tool that adds some improvements to the traditional centrality-density maps devised by Callon et al. (1993) and well implemented by software tools such as *Scimat* (Cobo et al., 2011; Cobo et al., 2012). *Bibliometrix*'s strategic mapping generates a useful impact-centrality map that we will use in this article to show changes in the morphology of this field of study. This map is made by first applying the BC –*i.e.*, linking two documents coupled by their references-, and then, labelling each cluster, considering the co-occurrence of authors' keywords[4] between the previously linked documents. Since keyword analysis has significant limitations in characterising the clusters, allowing us to barely scratch the surface of true cluster characterisation, to complete the qualitative analysis, the authors conducted an in-depth study of the key papers revealed in the clustering process.

3.2. The Process to Create the Collection under Study

To compile the published papers that were valid for the study, we follow other authors' recommendations –see, Zupic & Čater (2015); Loi et al. (2016); Kraus et al. (2020)-. Our research unit is the document when CCA and BC are the purposes. We chose the *Sci-verse Scopus* database which contains the world's largest number of peer-reviewed documents and other publications (Moya-Anegón et al., 2004; Reis et al., 2021) in the field of Social Sciences, and allows for more accurate bibliometric research (Zupic & Čater 2015). This database also provides comprehensive bibliographic information enabling a complete analysis

[4] Although is not our research focus in this paper, for those interested readers can see in Appendix 1 the co-occurrence of author's keywords analysis in the different period analysed here, using *Scimat* bibliometric package to perform the words tree.

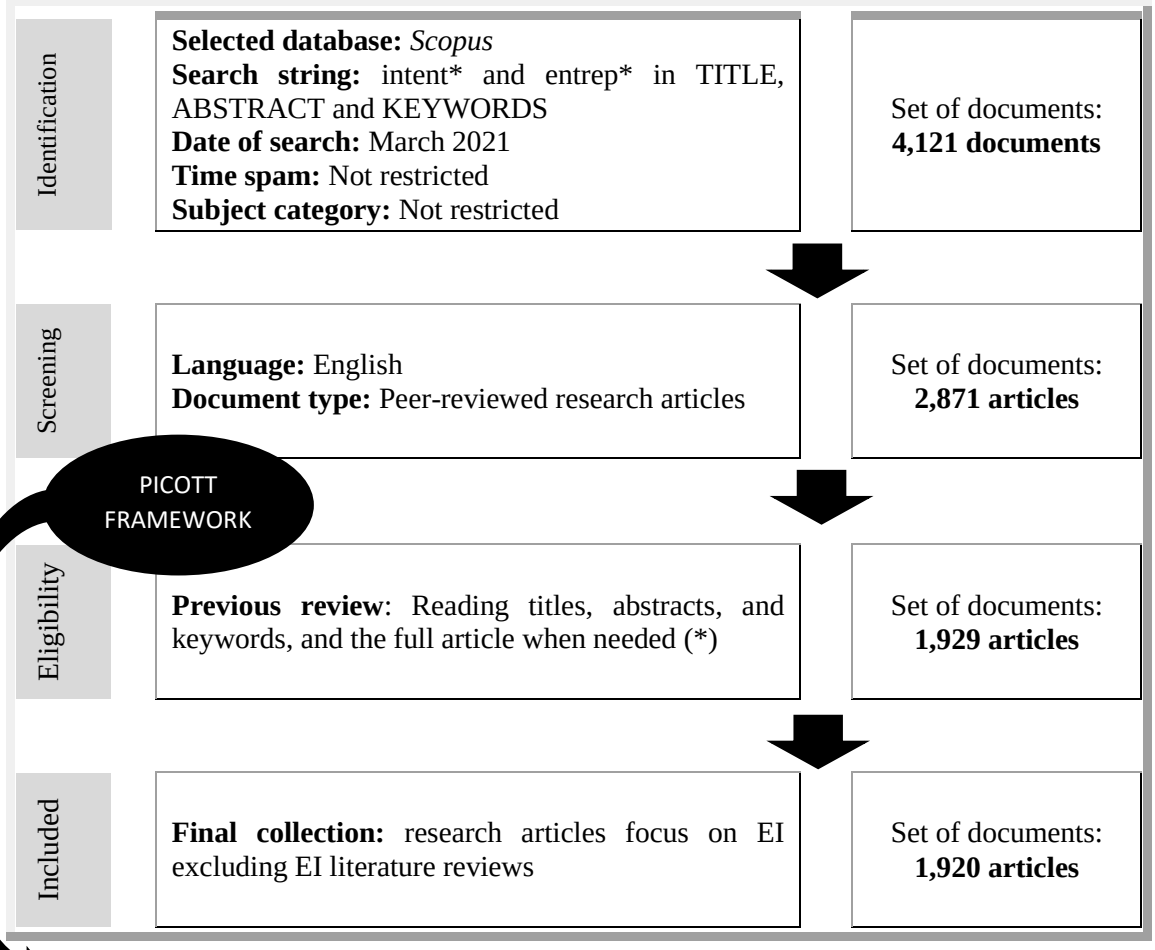
(Teixeira, 2011). Since the literature on EI is well bounded, we replicate other scholars with a similar purpose (Donaldson, 2019; Liñán & Fayolle, 2015; Loi et al., 2016). When searching we used Entrepr* Intent* together, which provided us with a comparable basis with previous reviews on this topic. These terms must be in the title, abstract, and/or keywords. Rather than focusing on grey literature, this search focused on research articles, written in English from all subject areas and in all years, as they are considered certified knowledge (Callon et al., 1993), *i.e.*, the result of the pressure exerted by the international review processes.

Figure 1 summarises the steps followed in the systematic literature review using the PRISMA protocol (Preferred Reporting Items for Systematic Reviews and Met-Analysis) – Liberati et al. (2009)-. To ensure the unbiasedness of our selection method, the AMSTAR 2 checklist helped us to minimise the risk of inclusion/exclusion bias (Shea et al. 2017; Turzo et al., 2022), while the PICOTT framework for evidence-based decision-making (Schardt et al., 2007) facilitated a better study design in line with our research objectives.

In the first step, the search resulted in a total of 4,121 documents downloaded in March 2021, which were reduced to 2,871 papers in the second phase due to our language and document type screening criteria. The third phase was focused on validating the results, to this end we read the abstracts and keywords, going back to the article to read it in-depth when meeting the criteria was unclear. A margin of error in the data validation and an associated bias to this analysis phase is feasible, however, two authors discussed the issues in depth to make a final decision, involving a third author for those papers in doubt. As a result of this first inspection, 942 articles were removed from the collection because they did not meet the PICOTT frame -*e.g.*, the central focus of the paper had no links to the study of EI, EI was only tangentially addressed in the paper, the paper did not justify either the theoretical or empirical study of EI…-. In a final step, given the possible endogenous effect of including literature reviews and meta-analyses in a literature review, 9 articles -reviews specifically

focused on EI- were removed to consider only theoretical and/or empirical contributions to this area of research. However, it should be borne in mind that these review articles are pillars on which the development of the research topic has evolved. This protocol led us to a reliable final sample of 1,920 documents provided as supplementary material.

Figure 1. PRISMA statement and search criteria used in the systematic literature review



Population under study	Would-be-entrepreneurs and entrepreneurs; organisations, institutions, communities, and territories fostering EI and EB
Intervention	Concept and theories of EI; explanatory factors of EI; diagnostic and measurement tools of EI; EI policies and strategies
Comparison	Other EI literature reviews to date
Outcome	To update and summarise the accumulated EI knowledge
Type of question being asked & to whom it is important	To explain the progress of EI research by highlighting its knowledge foundation (intellectual structure),

	unveiling the research front (conceptual structure) on EI, and discovering the morphology of this research field and its diachronic evolution. This review will help EI scholars, trainers, and policymakers in dealing with socio-economic crises, unemployment, fostering entrepreneurial mindset, and/or innovation.
Type of study design	Scientometric approach (quantitative and qualitative analyses)

3.3. Analytical Processes

For this study, we divided the time frame into three stages, which we have named the discovery phase (1970-2000), the take-off phase (2001-2010), and the growth phase (2011-2021). This division into periods, coinciding mainly with the last two decades, is carried out for the sole purpose of tracking the evolution of the field and recording the changes it has undergone. It is therefore of no interest other than to allow the effects of one phase to be drawn on the following one. Hence, the first period includes 20 documents in which the work of Krueger et al. (2000) acts as a trigger for a new stage; the second comprises 118 documents with Fayolle & Liñán's (2014, 2015) review, although not included in our scientometric procedures, being the driving force behind this stage; and finally, the third period includes 1,782 documents published up to the end of March 2021. To enable replicability, Table 1 shows the key figures and decisions made by the period in each analytic process performed. We use CCA thoroughly through *VOSviewer* and clustering by coupling using *Bibliometrix* to develop TSM.

Table 1. Key figures and selected thresholds by period	**1970-2000**	**2001-2010**	**2011-2021**
Number of documents in the collection by period	20	118	1,782
THEMATIC STRATEGIC MAPS BY BC (See Fig A 1.1, A 2.1, A 3.1)			
Number of clusters	3	5	5
Number of papers grouped per cluster*	7-5-3	30-26-24-20-16	509-454-351-337-98
Weighted average of NGCI** per cluster	1.6-1.0-1.8	2.6-4.5-2.0-1.8-0.6	3.5-2.8-3.1-2.1-2.6
Number of documents selected for the interpretation of the BC analyses	15	20*5	20*5
CO-CITATION ANALYSES (See Fig A 1.2; A 2.2; A 3.2)			
Cited references before applying thesaurus procedure	859	5,598	89,779
Cited references after applying thesaurus procedure***	67	4,711	88,914
Co-citing threshold criteria (Minimum number of citations of a co-cited reference)	3	10	100
Number of most co-cited papers analysed	20	20	30

***** Some papers are isolated after the clustering process and are not added to any cluster.

** We focus on global, rather than local, citation because of our interest in considering the morphology of the field resulting from the general interest in this research topic, even in other disciplines, and not just considering the hyper-specialized EI research.

*** The older the documents are, the less homogeneous their references are. With the standardisation of citation systems this problem has been solved considerably.

In applying CCA certain decisions were made to choose a representative number of references to be analysed per period. Although Lampe et al. (2020) remind us that there is a degree of subjectivity involved in this sort of decision, following their suggestions and

Chandra's (2018) view, and due to our interest in qualitative analysis and tracking the evolution of this research topic, we decided to apply what we have referred to here as the *rule of 20*, that is, in those papers concentrated on the hottest topics in this science area (Boyack & Klavans, 2014). This rule leads us to select the threshold of co-citations that show the 20 most important papers per cluster, in terms of normalised citation, for each period. This rule was only broken in the third period as 30 co-cited documents allowed us to interpret the period more coherently. When applying the BC analyses, no restrictions were considered in creating the map. However, in labelling each cluster we adopted the same rule, selecting the first 20 papers in Normalised Global Citation Impact (NGCI) in order to be studied and discussed in depth by the researchers. Thus, by applying this rule, 70 co-cited documents were studied in CCA, while in BC analyses 215 papers were thoroughly studied (Table 1). Due to the large number of articles, these figures represent the most crowded clusters having studied in-depth the upper 90th percentile of papers, and the entire cluster in the smallest ones. Once the papers were thoroughly read, a first step led each researcher to decide on the best label to represent each cluster. In the second step, an in-depth discussion helped to reach the final consensus on the central theme of each cluster.

3.3.1. Co-citation Analysis and Bibliographic Coupling

CCA is one of the best techniques for obtaining relational information on documents in trying to schematically represent the foundational image of a domain (Boyack & Klavans, 2014; Chandra, 2018; Gálvez, 2018; Lampe et al., 2020; Moya-Anegón et al., 2004). This analysis counts the frequency with which two documents are cited together in a third document (Small, 1973; Aria & Cuccurullo, 2017), and shows their relationship and the similarity of concepts shared by those documents (Chandra, 2018; Gálvez, 2018; García-Lillo et al., 2023). The focus of this analysis is the cited articles. In other words, when two documents are frequently cited together a link is created between these references, which

means that the same knowledge is shared by them (Gálvez, 2018). This procedure requires a previous step using the Thesaurus tool to match duplicated references due to different origins. Consequently, 792, 887, and 865 references were removed from the collated references for each period to compile the final co-cited references -original figures in Table 1.

On the other hand, BC links two or more documents that share very similar bibliographies, with the citing documents being the focus of analysis (García Lillo et al., 2023). This occurs when a third party is cited by two different authors in their papers, showing that their line of research follows the same direction (Zupic & Čater, 2015). So, while CCA is useful in unfolding the theoretical core of a topic, BC is adequate for investigating the recent trends and current discussion of scholars -*i.e.*, for gaining insight into the research front- (Li et al., 2021; Loi et al., 2016). These techniques applied over the studied period reveal the scientific achievements, showing the research path the EI topic follows (Crupi et al., 2020).

3.3.2. Thematic Strategic Map based on Bibliographic Coupling

To develop TSM, clustering by a coupling procedure was used, firstly by applying BC and then matching the author's keywords. In these maps, the size of the circles reflects the number of documents clustered by BC procedure, showing overprinted hot topics treated by them, while the position shows the cluster's impact-centrality in the research field. This position is set using the centrality of a cluster –*i.e.*, the closeness of the relationship between one cluster and another (Callon et al. 1993; Leydesdorff, 2007)- and impact, measured by NGCI of the clustered papers (Aria & Cuccurullo, 2017). This normalisation, when applied to a set of documents, in our case that of the EI collection, is obtained by the weighted average of the NGCI scores for all the documents contained in the collection, with this normalised index being calculated by *Bibliometrix* as follows:

$$\mathrm{NGCI}_i = \frac{GC_i}{e_{fdt}}$$

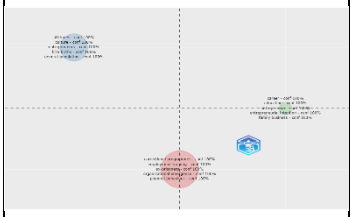
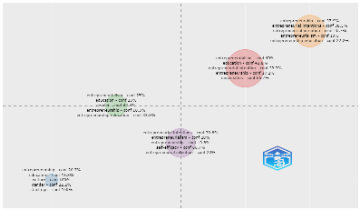
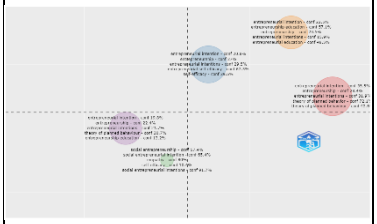
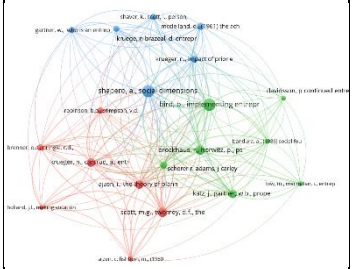
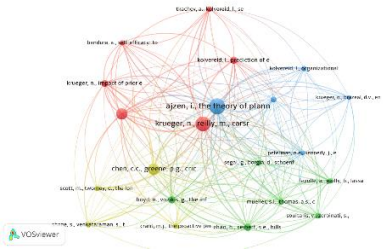
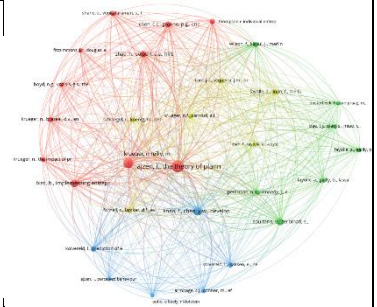
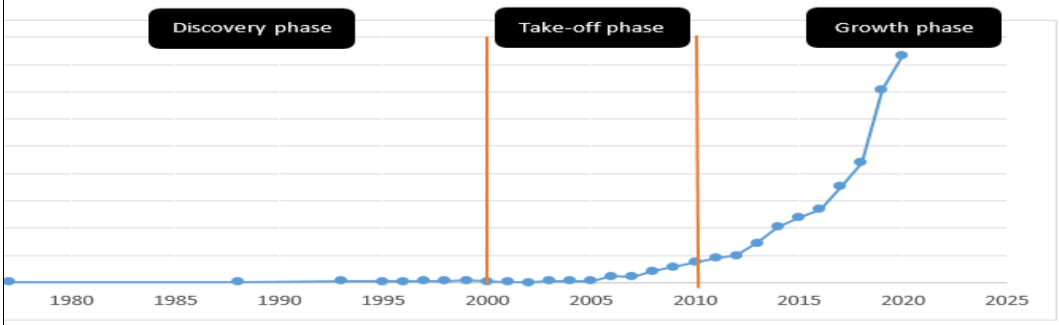
Where: $NGCI_i$= Normalised Global Citation Impact of the paper *i* included in the collected sample; GC_i= Total Global Citations -*i.e.*, in this work obtained by the paper *i* in *Scopus*-; e = expected citation rate; *f*=field of the subject area*; d*= type of document; *t*= year.

The position of a cluster in a map helps us to discover the morphology of the research field –Callon *et al.* 1993; Cobo et al. (2011, 2012); Aria & Cuccurullo (2017)-. When impact-centrality is measured, adapting the Callon et al. (1993) nomenclature, those positioned in the upper-right square (Q1) are considered motor themes (high centrality and high impact in the field). This quadrant groups together documents that achieve a position of impact in the field under the systematic and sustained supervision of many researchers. Those in the upper-left (Q2) of the diagram are clusters with high centrality but low impact, they are considered basic and general themes in the field. Lower-left (Q4) clusters are emerging or disappearing themes; while peripheral to the field, they are related to highly specialised topics of study, and themes with an important impact are set in the lower-right square (Q3). Then, the combined position of clusters in the TSM space allows us to identify the morphology of a research field, *e.g.*, clusters set in the bisector of quadrants Q2-Q3 show a field in progress –see Callon et al. (1993).

4. Results and Discussion

Figure 2 summarises the evolution of the study of EI. Section I in this figure shows the volume of articles published in the period analysed, showing its rising trend as well as its resistance to entering a plateau phase. Section II in the same figure allows observing the conceptual pillars of the field (CCA), highlighting the collective logic, and scientific knowledge foundation in this area (Objective 1). To unveil the research topic evolution, its morphology, and the ongoing scholarly discussion (Objectives 2 and 3), section III shows the strategic maps constructed by BC analyses and labelled by the co-occurrence of keywords. See detailed maps in Appendices 2 to 4.

Figure 2. Output of bibliometric processes in each phase*

	Discovery phase 1970-2000 Appendix 2	**Take-off phase** 2001-2010 Appendix 3	**Growth phase** 2011-2021 Appendix 4
III Morphology based on BC	 Fig. A.2.1	 Fig. A.3.1	 Fig. A.4.1
II Co-citations	 Fig. A.2.2	 Fig. A.3.2	 Fig. A.4.2
I Evolution in num of papers			

* When examining the map, remember that the colours in the different stages are not coordinated. The bibliometric software prevents you from manipulating this aspect according to the convenience of the inspection.

The clustering found at each stage related to the analyses carried out is shown in Table 2. As mentioned above, the description chosen summarises the concern and interest expressed by the authors of the clustered articles and was set following an intensive discussion and scrutiny of the papers by the research team. A nomenclature is used to summarise the content of each cluster (see Table 2). Appendix 5 shows the top three papers collected by BC in each

cluster, while Appendix 6 presents the research papers which are pillars of the topic in the different phases.

Table 2. Bibliographic coupling and co-citation analyses: Thematic description of clusters (Impact Score=Weighted average of NGCS)*

	Discovery phase 1970-2000	**Take-off phase** 2001-2010	**Growth phase** 2011-2021
I Bibliographic coupling	E: Impact of education on EI (3; 1.8) - GREEN	T, P_1: Fundamental technical analysis about scales, measures and models applied to EI (26; 4.5) -YELLOW	T, P_1: Analysis of TPB components and EI-EB relationship (509; 3.5) - RED
	T, P_1: Psychometric studies and EI models (7; 1.6) - RED	E: Design and components of entrepreneurial training for university students and the institutional framework of these teachings (30; 2.6) - RED	E: Entrepreneurial Education and effect on EI (351; 3.1) -YELLOW
	P_2, C: Influence of personal and contextual features on EI (5; 1.0) - BLUE	C: Institutional and cross-cultural framework and its effect on EI (24; 2.0) - PURPLE	C, P_2: Contextual effects on personal traits and individual EI (454; 2.8) - BLUE
	---	ST_1: Gender Studies and EI (20; 1.8) - GREEN	ST_2: Explanatory factors for EI in social entrepreneurship and sustainable entrepreneurship (98; 2.6) - GREEN
	---	P_2: Personal and psychological traits of the individual and their impact on EI (16; 0.6) - BLUE	ST_3: Institutional framework and regional entrepreneurial ecosystem affecting the EI-EB relationship, with special reference to entrepreneurship in scientists (337; 2.1) - PURPLE
II Co-	Cr: Career choice of individuals - RED	T: Theoretical or practical interest in models developed to explain EI (TPB, EEM and others) - RED	T, P_1: Main models and constructs of EI - RED

	Discovery phase 1970-2000	**Take-off phase** 2001-2010	**Growth phase** 2011-2021
	P_2: Psychological traits and demographic of entrepreneurs -BLUE	E: EI and antecedent factors in students' career choice using mainly TPB -BLUE	T: Key contributions to the TPB - BLUE
	EL: Literature on entrepreneurship that add organisational focus to EI - GREEN	P_2: Psychological, and demographic, and training factors influencing EI - GREEN	E: Impact of entrepreneurial education on EI - GREEN
	---	EL: Nature of entrepreneurship and its foundations giving special role to perceived self-efficacy and proactivity as the most valued characteristics - YELLOW	LR: Literature reviews and theoretical revision of EI research -YELLOW

* The colours are shown identifying each cluster found.

Nomenclature- TPB: Theory of Planned Behaviour; EEM: Entrepreneurial Event Model; EB: Entrepreneurial behaviour; E: Education; T: Theory; P_1: Psychometric tools; P_2: Psychological and demographic traits; C: Context; EL: Entrepreneurship literature; Cr: Career Choice; ST_1: Special Topic (Gender); ST_2: Special Topic S-ship (Social Entrepreneurship and Sustainable Entrepreneurship); ST_3: Context and academics; LR: Literature reviews.

4.1. Phases of EI Research: Topic Evolution, Collective Logic, and EI Scientific Foundation

An in-depth analysis reveals interesting aspects, whether each stage is analysed separately or in an integrated manner. Thus, considering the BC analysis, the research shows that, until 2000, the study of EI was indeed in its foundation stage. The large number of terms used as synonyms and interchangeable terms with EI, such as intentionality (Bird, 1988), new venture initiation (Krueger & Carsrud, 1993), interest in small firms ownership (Tan et al., 1996), entrepreneurial aspirations (Ross, 1998), or new enterprise formation (Forbes, 1999; Mazzarol et al., 1999), attests to this, as there is no consensus on the denomination of the central topic under study. At this first stage, scholars were beginning to generate *ad hoc* models to explain what moved individuals to define their professional career as self-employed by setting up their businesses. The first works moved very much in the orbit of those who

studied the career choice of university students, which strongly linked the empirical progress of the field to this target group. This seems to be the origin of the curiosity about EI, as a singular manifestation of the individual's career intention. Moreover, almost all the studies adopt an individual approach, with only four studies in this first stage that add the organisational level and one that does the same at the macro level. So, the empirical works of this stage show the incipient interest in students as the focus of analysis, with the others being reserved for the study of entrepreneurs or owners of small and medium-sized enterprises or other groups such as the general population in the work of Davidsson (1995), Jewish emigrants (Mesch & Czamanski, 1997) or delinquents and ex-convicts (Rieple, 1998).

Furthermore, the co-citation analyses of this first stage leave no room for doubt. It reveals that works related to individual career choice, which brings to the fore Ajzen's TPB model, will inspire much of the research developed in the following years. Bird (1988), with a genuine attempt within the field of entrepreneurship research, builds her model but fails to match the interest that the TPB has aroused in the field. This last theory led to the development of an abundant amount of research papers that have been published in this area in recent decades as Lorti & Castogiovanni (2015), and Patra & Lenka (2021) have also highlighted. The EEM of Shapero & Sokol (1982) similarly fails to arouse the same level of interest. However, Barbara Bird, Albert Shapero, and Lisa Sokol opened Pandora's box by revealing their specific interest in the study of EI around entrepreneurship.

We find the transition in the second stage (Figure 2 section I), from an embryonic phase (1970-2000) to another of consolidated growth (2011-2021). However, if we analyse in detail the first half of the second stage we can see a certain degree of disorder and a persistent lack of awareness of the EI topic. This issue dissipated in the second half of that same decade, to such an extent that the star psychometric measure emerged at the end of that decade to consolidate the progress of the field in the third stage around Ajzen's TPB and the Liñán &

Chen's EIQ -Entrepreneurial Intention Questionnaire- as Schlaegel & Koenig (2014) later reinforced in their meta-analysis. Nevertheless, researchers analysed in the third stage are still looking for ways to better adapt the TPB as a key research model in this area, so that EI is well explained by the genuine and proper antecedents of this behaviour. This idea, a decade ago, was advanced by Fayolle & Liñán (2014) who warned about the main interest of scholars in validating the model rather than using it to obtain real solutions applied to business creation. We cannot ignore the fact that the TPB emerges as a psychosocial model that explains the intention to act in practically all human activities, from the possibility of crime to the choice of a professional career. It is in the second stage of development in the study of EI, however, that a still incipient interest in how and why new firms are created bursts forth, an interest that has been consolidated in the research developed since 2011. The latter prevails over the understanding of the career choice of individuals, an issue that strongly fuelled the development of the first stage.

This difference is subtle but powerful at the same time and is the reason why it seems to reinforce, in the third period, the interest that the background of EI is well outlined and agreed upon by the academic community that develops entrepreneurship research. However, although not the same, both interests go hand in hand insofar as it is the individual, without a doubt, who is the protagonist of both the intention and the action of entrepreneurship. The individual is who makes a career choice but at the same time the artificer who lights the fuse for the future growth of a company as an organisation. This nuance is something that has not always been considered in the investigation of the topic, which would certainly have consequences in the way research is designed. However, as Liñán & Fayolle (2015) stated in their review, it is critical to open the individuals' black box, considering their psychological mechanism underlying the EI and action. This implies focusing in-depth on the

entrepreneurial mindset (Daspit et al., 2023) where the Socio-cognitive Learning Theory of Bandura (1986,1999) is highly useful.

On the other hand, the models and parameters associated with the core measure of EI in the second phase began in earnest and are still being discussed today, but progress is slow in uncovering the factors that transform intention into behaviour. The transition towards a more precise approach to this transformation will require a certain amount of self-criticism that is not always easy for the academic community to accept, but which seems to appeal to the conscience of some researchers in recent times -see, for instance, Brännback & Carsrud, 2018; Krueger, 2009; Newbert et al. 2022-. In this sense, we agree with Silva Martins et al. (2018) on the need to review the models and include new variables, theories, and methods to advance a better understanding of the topic, and to avoid the excess of dogmatism in the EI topic.

4.2. Morphology Evolution of EI Research

The research field morphology evolution is shown in Figure 2 section III, and detailed in Appendices A2.1, A3.1, and A4.1. From a bird's eye, the evolution of the TSM (Callon et al., 1993) allows us to observe in the first phase the existence of a field in progress –dominance of the bisector in quadrants Q2-Q3-, to pass in the second phase to show the typical morphology of an organised field –dominance of the Q1-Q4 bisector- which is reinforced in the third phase. This third phase shows a consolidated research field around three motor themes –*i.e.*, well-established knowledge- and in order of impact: (1) the development of the theoretical models that support the field –*i.e.*, TPB and EEM-, with a special interest in the EI-EB relationship; (2) entrepreneurship education and its effect on EI; and (3) the effect of context on EI. At the opposite pole, two emerging themes, and only time will tell if they achieve their consolidation, open important possibilities for those interested both (1) in the institutional context affecting the relationship between EI and EB, also for (2) those concerned with other variants of the entrepreneurial phenomenon (S-ship phenomenon): social

entrepreneurship and sustainable entrepreneurship, and the particularities of EI in these contexts.

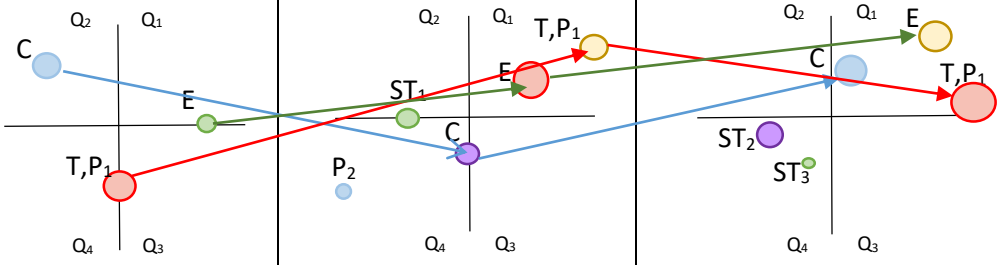
4.3. A Holistic View of EI Research Evolution

Two facts are surprising in this evolution: (1) taking into account the BC results, the evolution shown by some emerging topics in this field, and (2) considering CCA, the marginal place that the literature on entrepreneurship, as a pillar of the area of study, takes in this research area. Regarding the first issue is the case of the relationship between gender and EI, which emerged in the second stage but lost strength or merged with other topics in the third stage. Concerning this, Liñán & Fayolle (2015) detected the emergence of the gender theme, adding it to a catch-all cluster of new research areas, and later Donaldson (2019) included it as a theme related to his *Education* and the *Individuals* clusters. TSM allows for further refinement, relating gender to education (cluster GREEN) but also, to a lesser extent, to culture (cluster BLUE). In the third phase, it becomes a cross-cutting theme, *i.e.* related to several themes such as contextual effects on personal traits (Branchet & Křížková, 2015), social entrepreneurial intention (Dickel & Eckardt, 2021) or entrepreneurship in scientists (Roy & Das, 2020). It is also of interest the cross-cultural context in the second stage which later joined the studies on context and EI, consolidating as a motor theme of the field.

Figure 3 provides a schematic visualisation of the course that the field of study has taken in the period analysed, enabling the readers to draw their conclusions. In section II of this Figure it can be seen how topics that are trending at one stage feed the field in the next –see section III of the Figure-. This movement is in some way natural and logical indicating that the field is building on the achievements of the previous stock of knowledge in this field to make its progress in the following phases. However, it may hide a risk of endogamy. This is true if we consider that the study of EI is based on disciplines other than entrepreneurship

literature which support it and which continue to make progress in their knowledge. In this sense, there is a risk of sterilising the research field if these improvements are not incorporated into the EI knowledge base. In the following section, we add some examples that may illustrate how to overcome this risk.

Figure 3. Thematic tracking of the research area

	Discovery phase 1970-2000	**Take-off phase** 2001-2010	**Growth phase** 2011-2021
III Morphology based on BC and co-word analysis			
II Bibliographic coupling	E	T, P_1	T,P_1
	T,P_1	E	E
	P_2, C	C	C, P_2
	—	ST_1	ST_2
	—	P_2	ST_3
I Co-citations	Cr	T	T,P_1
	P_2	E	T
	EL	P_2	E
	—	EL	LR

E: Education; T: Theory; P_1: Psychometric tools; P_2: Psychological and demographic traits; C: Context; EL: Entrepreneurship literature; Cr: Career Choice; ST_1: Special Topic (Gender); ST_2: Special Topic (S-ship: Social Entrepreneurship and Sustainable Entrepreneurship; ST_3: Context and academics; LR: Literature reviews.

Concerning the second fact mentioned above, it is important not to overlook that it is the literature on entrepreneurship, in the search for its own identity as a field of research (Gartner,

1988; Landström, 2008; Shane & Venkataraman, 2000), which brings the study of EI to the forefront in the 1980s. Bird's (1988) work uncovers the possibilities offered to this searched identity by modelling EI in an attempt to distinguish entrepreneurial work from managerial tasks. The special attention paid by the emerging field of study in entrepreneurship to EI reveals that it was looking for the cornerstone on which the development of this potpourri field (Low, 2001) would be based, to a large extent. Everything points to the fact that the EI is integrated to justify the urgent need to differentiate the field of entrepreneurship from other related fields with a longer trajectory and solid scientific bases. However, for the study of EI, the field has required the assistance of the literature on human behaviour, education, and career choice, which come to dominate the pillars of this research topic.

It is inspiring to analyse the dynamic patterns in the three periods which is the key contribution of this research (Figures 2 and 3). It is important not to lose sight of the fact that each period was affected by global socio-economic crises -the 70s Energy Crisis, the Great Recession in 2008, and the Covid-19 pandemic in 2020- and that the field of study in entrepreneurship began in the 1980s with a high sensitivity to the environmental events (Landström, 2008). This sensitivity has been maintained especially in the study of EI and explains how, after the 2008 crisis, researchers' interest in responding to crises problems and unemployment increased. The third stage takes the baton, building on the accumulated knowledge of the previous stages, to respond to the effects of the 2008 economic crisis and the recent health crisis, bringing unemployment and the need for innovation back to the forefront of public policy, with education and entrepreneurship being two key ways to solve the problem. Emerging issues such as intra-entrepreneurial intention, analysis of the identity of the individual, sustainability, social entrepreneurial intention or the cultural dimension of EI also arise as a response to the growing problems in this context.

4.1. Discussion in Light of Previous Reviews

To reveal the morphology of the field, an issue not yet addressed in the literature on EI, this review has strongly focused on analysing the thematic evolution of the research field, both on the EI research front and on its foundations. This purpose was partially addressed by other reviews. However, none of them considered the discovery period (1979-2000). Our analysis has a strong domain-based bibliometric profile (Mukherjee et al., 2022), closer to the study by Patra & Lenka (2021), than to other EI reviews which are mainly domain-based structured reviews (Paul & Criado, 2020). Nevertheless, the convergence between our review and previous ones is high, demonstrating a mutual triangulation between them. This helps, to some extent, to validate our results.

In Appendix 7 we present a comparison of our findings with those of previous reviews. The degree of convergence between our clusters compared to earlier reviews shows how the context and EI clusters are found in all of them when the third period is considered. In the second stage of our study, the cluster on the design and components of entrepreneurial training for university students and the institutional framework of these teachings is discovered and attributed to this stage before other reviews, which suggests its appearance in the stage we have called Growth Phase (2011-2021). However, the scientometric approach has provided us with more depth and detail than previous reviews. Thus, in stages 2 and 3 we were able to identify 5 key clusters in each stage, a few more than those found by our peers.

5. Future Research Paths

This work reveals that the area of study, from the perspective of entrepreneurship literature, has been based on different research areas, which have shaped the growth of interesting knowledge for entrepreneurship research but often ignore the fact that intention is a prior step for behaviour, which for this area of knowledge is the start-up of a new firm and the opportunity development. This fact has left out of the debate a good number of aspects that are key from an organisational and opportunity exploitation point of view. However, given

this topic's remaining growth potential and its resistance to entering a plateau phase, the evolution of this research issue could develop in two directions, and therefore the scientific effort in this area should look at both: (1) feeding the research front with new targets and contexts of study as a first step, and/or (2) by moving the research foundations as a second step, the latter being the rockier path.

On the one hand, if we look only at the research front and the current conceptual structure of the field, this can be substantially tempered by considering new contexts of study, as well as by moving away from the study of university students toward other groups of interest, in the direction indicated by the emerging clusters, such as gender studies or the incorporation of the analysis of scientists' EI, which provide a body of literature of interest due to its specificity. Firstly, it would be important to approach the study of EI by monitoring different age groups and by considering how EI is constructed at each stage of a person's life to give it a dynamic character. Particularly important is the study of EI in the senior population given the tireless vitality that the over-60s seem to show, or in young people in non-university vocational training. To deepen the dynamic nature of IE, it would be interesting to work with specific samples of serial and portfolio entrepreneurs in future research (Westhead & Wright, 1998). In addition, the volume of data collected by projects with an established track record such as the Panel Study of Entrepreneurial Dynamics (PSED) –Reynolds et al. (2004), Reynolds (2017)- would allow modelling of the EI-EB relationship to focus away from students and closer on entrepreneurs. But value can also be added at the macro level by using the GEM (Reynolds et al., 2005) and the GUESSS (Sieger et al., 2014) databases to advance a more precise understanding of its dynamics and effects, with these being especially useful for the study of this EI-EB relationship and the application of artificial intelligence and big data techniques (Obschonka & Audretsch, 2019), which is a very hot topic for the future of EI research. Moreover, an area of interest not yet sufficiently explored concerns EI in specific

contexts for the development of a digital economy and in the age of AI, where other factors may come into play in the construction of EI such as technological alertness or those related to technology acceptance (Davis, 1989; Yordanova, 2021).

Secondly, the over-zealous focus on the individual's role in intention has led to the predominance of a socio-psychological approach to the study of intention (Kautonen et al., 2015), and has overlooked the existence of other ways to enter an entrepreneurial career through new forms of leadership, more shared and less individual, provided by the group -see the approach of Brännback et al. (2018)-, and this is a promising future research line. Finally, it may also be time to delve, in future studies, into other perspectives not only those related to purely business entrepreneurship but along the lines of those focused on S-ship, going deeper into social entrepreneurship (Chell, 2007), sustainable entrepreneurship (Muñoz & Cohen, 2018) or sports entrepreneurship (González-Serrano et al., 2019), as well as cultural entrepreneurship (Gehman & Soublière, 2017), *i.e.*, in the direction already shown by the emerging cluster in the third period. Related to this, we should ask wether the EI of conscious entrepreneurs -*i.e.*, with a strong social and sustainable focus- differs from that of traditional entrepreneurs. Does entrepreneurial intent in specific sectors -*e.g.*, sports or culture industries- require different factors from those analysed in regular EI? The answers to these and similar questions undoubtedly offer new research opportunities.

But where the study of intention can make a 180-degree turn is by renewing the scientific pillars for the field, that is, by introducing new theories or specific advances from those related areas of knowledge that give corpus to EI literature. Thus, for example, studies on career choice have generated a generous body of literature on the topic of employability (Fugate et al. 2021). The reality is that these analyses present the career prospects of university students and other groups with professional experience as being rooted in the individual's perception of employability (Rothwell & Arnold, 2007), the main counterpoint of which lies in factors

external to the individual. These studies can complement measures of self-efficacy facilitating to capture of both the individual's perception of one's skills and the perception of the labour market in which these skills will be put into practice. Both the concept and the components of perceived employability, still under debate, may offer new possibilities for EI research, but also a way to explore solutions to the unemployment issue.

Similarly, researchers in education have reinforced their interest in the study of the development of individual competencies, giving a privileged place among them to the analysis of competencies for entrepreneurship (Reis et al., 2021). These entrepreneurial competencies may add interesting dimensions of analysis for a second-generation TPB-based model. But, related to this model is where moving the research foundations is key to improving our knowledge of EI, considering the review of other psychosocial models and methodological strategies, such as that proposed by Bandura (1986,1999). Related to those methodological issues, there is still room for improvement. We have found an absolute absence of the application of qualitative analyses that would allow us to investigate the process in depth, especially how EI becomes EB. In this sense, although it is easy and quick to count on students for the quantitative analysis of EI, the abuse of this resource to compose the study samples has taken its toll on the progress in the knowledge of the topic. As a result, it is important to also count on entrepreneurs who have gone through the process of setting up a company. To this end, and given that it is often difficult to access the entrepreneur at this stage, the introduction of enquiry techniques such as that of reminiscence (Bluck & Levine, 1998), for use from both a qualitative and quantitative perspective, is important and so far underexplored research path. These techniques allow the individual to be taken back to past activities, experiences, and events and would help to complement existing theories or build new ones, approaching the study not forwards but backwards.

However, we should not lose sight of the fact that EI is important because it reflects the magnitude of the effort that an individual must exert (Ajzen, 1991) to achieve EB. However, the latter behaviour is usually the object of study for the entrepreneurship field, not so much the intention itself. But still, the relationship between intention and behaviour is widely contested in general terms (Ajzen, 2011; Wiedemann et al., 2009). In this sense, Ajzen's (2011, 2020) reflections on the goodness of the model generated by the TPB, the most widely accepted in the literature to predict human social behaviour, and the growing number of papers that reveal its low level of explanation of the variance of EB (Schlaegel & Koenig, 2014), continue to cast important doubts on the efficiency of EI as a predictor of action. In this way, researchers in the field have other possible avenues of advancement in this area so as not to overuse Ajzen's model to exhaustion. It is precisely the overexploitation of this model and the author's self-criticism of his theory (Ajzen, 2011, 2020) that encourages this area of study to experiment with new theories such as the Action Phase Theory (Heckhausen & Gollwitzer, 1987) or the Goal-Directed Behaviour Model (Perugini & Bagozzi, 2001) already recommended, with little success, by Schlaegel & Koenig (2014) or Donaldson (2019). In addition, it would be desirable to incorporate advances and self-criticism from other theoretical frameworks on human behaviour.

Although EI is a necessary condition, it is not sufficient to trigger the materialisation of EB (Fayolle & Liñán, 2014; Schlaegel & Koenig, 2014). Some research explains the gap between intention and action by alluding to important nuances that add new constructs to the original model. For example, the difference between motivation and volition has been alluded to (Adam & Fayolle, 2015; Gollwitzer, 1990; Heckhausen & Gollwitzer, 1987; Hikkerova, Ilouga & Sahut, 2016; Kautonen et al., 2015; Van Gelderen et al., 2008), while others draw on the difference between target intention and intention to implement (Adam & Fayolle, 2015), highlighting the need for a Theory of Trying (Esfandiar et al., 2019; Krueger, 2009).

Therefore, even if the EI exists, if there is no commitment to the implementation (Gollwitzer & Sheeran, 2006; Sherkat & Chenari, 2020) there would be no behaviour. However, the intention to implement does not develop without a strong commitment to the goal (Gollwitzer & Brandstätter, 1997; Loi et al., 2021; Linder & Nippa, 2019; Sherkat & Chenari, 2022), which has also brought this variable into the debate, leading to the consideration of different types of commitment -affective, normative, continuance- and levels of commitment (Adam & Fayolle, 2015; Kautonen et al., 2015; Sherkat & Chenari, 2022). Recently, Meoli et al. (2020) invite us to study the transition from EI to EB looking at the individual's socio-cognitive traits. However, for Ajzen (2011) the problem lies strongly in the perception of control, as a proxy measure of the individual's own control over behaviour.

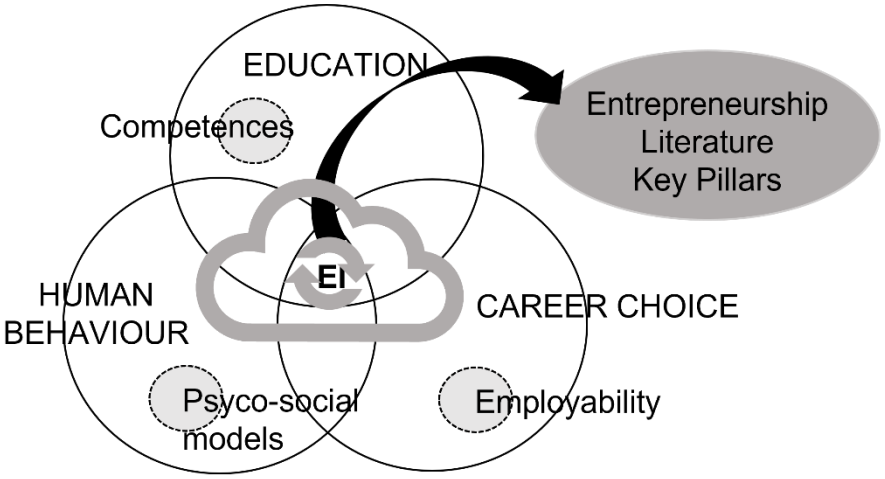
Thus, behaviour can be negatively affected by other important emotions that hinder the transition from intention to action: aversion, fear, and doubt about action (Foo et al., 2009) that contribute to procrastination (McMullen & Shepherd, 2006) or avoidance of action (Foo et al., 2009; Welpe et al., 2012). Thus, TPB has been seen as an overly rational model that takes little account of the cognitive and affective processes that have been shown to significantly affect human judgement and behaviour. Perhaps the limit of reasoned action has been reached (Ajzen, 2011, 2020).

However, the prediction of behaviour depends in part on factors beyond individual control (Ajzen, 2011). What should not be forgotten is that entrepreneurial initiative is conditioned by circumstantial determinants that many authors already revealed more than two decades ago, since the profit margins of the industry (Dunne et al., 1988), the life cycle of technology (Utterback, 1994), the stage of economic growth (Reynolds et al., 1995) or the cost of capital (Shane, 1996), among others, affect entrepreneurial initiative at an individual level. Such relationships are highly dependent on national, regional, and local conditions, associated with economic, institutional, and sociocultural factors (Amorós et al., 2012; Valliere & Peterson,

2009; Wennekers et al., 2010) that should not be overlooked to study both intention and behaviour from a macro perspective in the way the blue and purple clusters in the third period do (BC analysis).

Figure 4 shows the different paths explained before, related to renewing the scientific pillars to overcome the risk of sterilising EI research. A quick look at the evolution of the field in the months between March 2021 and February 2023 has allowed us to observe that there is still a significant risk of sterilisation of the field of study if we do not intentionally invest in a necessary renewal of both its scientific substratum and the research front in the sense discussed above. In Appendix 8, and just to check the materialisation of this risk, the thematic map of the literature published till the first quarter of 2023 shows the strengthening of the core areas, led by the studies on entrepreneurial education and the TPB model, highlighting now the study of self-efficacy as a general and basic theme due to its important role as an antecedent of EI.

Figure 4. Overcoming the risk of sterilising EI research: Three examples of the research pathway to update EI research foundations



However, for a better understanding of EI, and its subsequent materialisation in EB, more interdisciplinary research is required, in line with what Thurik et al. (2023) propose in entrepreneurship. Thus, for example, the study of AI-assisted emotions, the analysis of the effects of pathologies such as ADHD or other disabilities, as well as the contributions of

genetic epidemiology or neuroscience to the study of EI should be incorporated as a priority, as some leading researchers are already exploring. The opening up of these avenues of study, together with the progress already made in the area of EI research, would be of value to public policymakers interested in promoting entrepreneurship. Thus, the advances that can be developed on these fronts will be especially useful at times of uncertainty generated by crises of a socio-economic origin, as well as the most recent health crisis, for which the maintenance of people trained in entrepreneurial skills and ready for action is critical. Moreover, it is important not to lose sight of the fact that any effort in advancing knowledge of EI is key to the reconstruction of the productive network after these turbulent periods. In this sense, and given that improvisation is not good, any progress made in this area is an advance in terms of facing future crises, especially if we bear in mind that the socio-labour scenario in the medium term will undergo unpredictable changes due to massive automation of hitherto complex tasks.

6. Limitations

This work draws interesting conclusions that are based on a research study that may be affected by biases and subjectivities to which no research, even if we strive to the contrary, is immune. Thus, the review of the topic, far from being complete, still requires new approaches. The *Scopus* database was used to retrieve works, which, although it is one of the most profuse in terms of the number of references and journals, does not always capture the totality of the scientific production relevant to the study. The lack of scholars interested in entrepreneurship before the 1980s when this research area emerged, and the fact that scientific production was scarcely globalised and hidden in databases that are not indexed and difficult to access, prevent this review from accessing the raw and original knowledge. Undoubtedly, an additional effort in systematic literature reviews including other data sources and grey literature would shed light on the current progress in this research field. However, to ensure

the unbiasedness of our selection method, the research protocol applied in this scientometric research included a multi-step process that justifies the inclusion and exclusion criteria in each step. Furthermore, in this paper, we use Entrepr* Intent* as searching terms previously used by all key reviews in this field, even though some studies may use other terms as synonyms. This issue is not fully captured in this research, although it was overcome to some extent when searching for EI in the keywords, title, and abstract. Then we are aware that some contributions that might be relevant do not fit our search and inclusion criteria and are therefore hidden from our analysis.

In another vein, we have adopted here the *rule of 20* to facilitate the interpretation and qualitative analysis of such a huge number of documents. Although it ensures that we work with the most influential papers in the literature on the topic, it isolates us from research that is produced with less success in terms of the number of citations received as well as from those recently published. Finally, this field of study has been rapidly increasing in number of publications, where the highest percentage of papers is concentrated in the growth phase. New relevant papers in terms of NGCI may be emerging that could be hidden in our search, and changes in the research field morphology are likely to reshape the growth phase in the years to come. As for the following research steps, these limitations give room for replication and new research challenges.

7. Conclusion

The number of works available on the topic of EI is increasing rapidly, and it is not easy to connect their findings (Maalaoui et al., 2018). This work has been conducted from a scientometric approach, paying special attention to the diachronic evolution of the field, and considering quantitative and qualitative aspects of this scientific production to study its dynamic. This provides a logical framework of the intellectual structure, evolution, and a deeper comprehension of the topic dynamics. To date, this is the first study that jointly

considers CCA, BC, and TSM since EI inception as a subject, to connect the research front and the foundational structure. This addresses the research gaps identified in previous reviews. Even though the effort involved, both in time and human capital, it is a valuable analysis in terms of the details, the wealth of information, and the research track.

This review has found, both on the research front and on its scientific substrate, opportunities to renew the study of EI. By taking on the challenges described above, we would be making a quantum leap towards achieving a more precise knowledge of the factors that feed EI, but also of those that allow it to become a behaviour. However, to open up the future path two fundamental prerequisites are required: researchers committed to this progress and fearless in their aims, who are determined to break the status quo and survive the peer review process (Brännback & Carsrud, 2018), and editors who will support the necessary refocusing of EI research.

This study provides a holistic view of the EI research topic evolution inspiring other scholars, trainers, and policy makers. For academics the research front evolution is particularly useful in identifying the trending topics –*e.g.*, S-ship topics, scientists' EI, intrapreneurship intention…-, and the research foundation. For educators, the motor themes in the third phase, play a guiding role in the further development of educational programmes that foster entrepreneurship. Finally, policymakers can easily find in the pillars –*i.e.* highly co-cited papers- the qualified and consolidated knowledge on which to build their policies to promote business creation and strengthen entrepreneurship. Complementary studies and a continuous track of the EI topic growth will be necessary to strengthen their knowledge.

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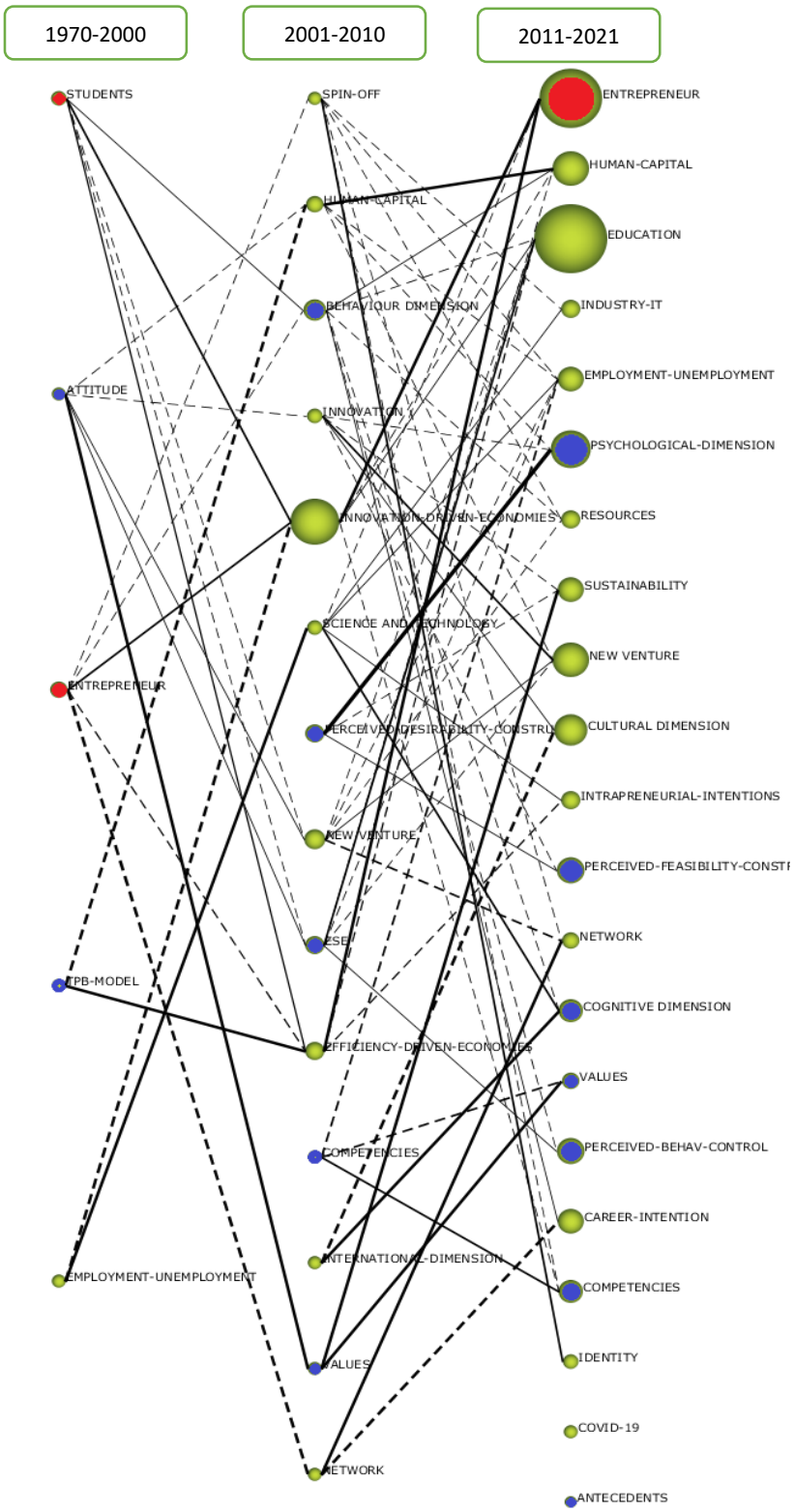
Appendix 1. Co-occurrence of author keywords* of papers published by period (1970-2021): Evolution map

Source: Own elaboration based on the documents published in the period and using *SciMat*

* To simplify the analysis, different words on the same topic have been grouped under the same descriptive label



1st period themes

Students
Attitude
Entrepreneur
TPB model
Employment-unemployment

2nd period themes

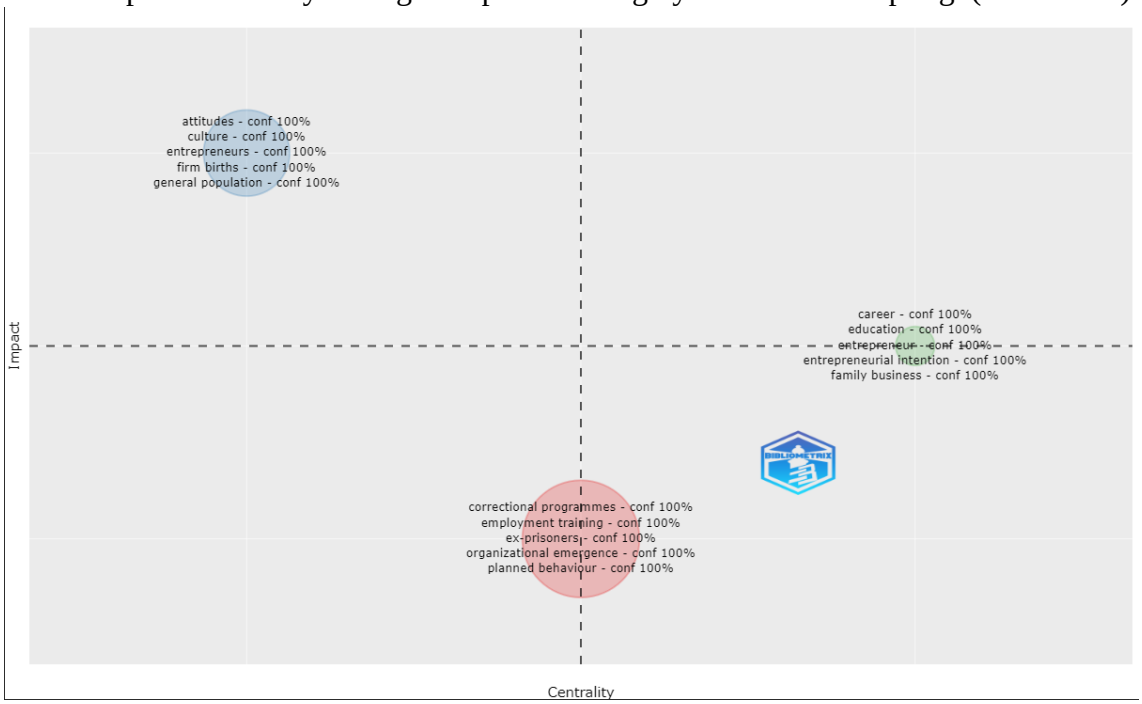
Spin-off
Human-capital
Behaviour dimension
Innovation
Innovation-driven economies
Science and Technology
Perceived desirability construct
New venture
ESE
Efficiency-driven economies
Competencies
International dimension
Values
Network

3rd Period themes

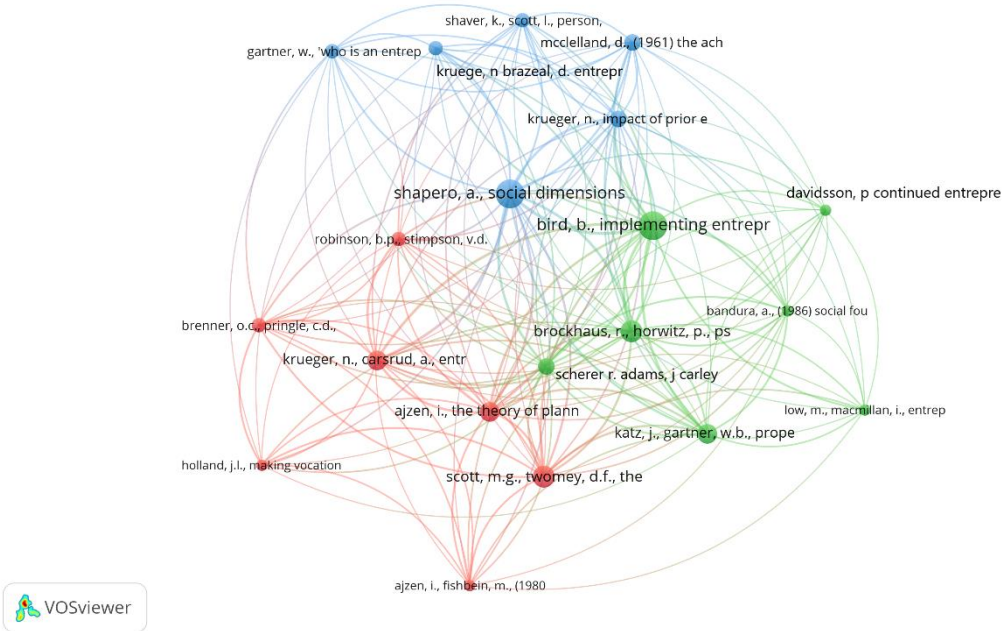
Entrepreneur
Human capital
Education
Industry-IT
Employment-unemployment
Psychological dimension
Resources
Sustainability
New venture
Cultural dimension
Intrapreneurial-intention
Perceived feasibility construct
Network
Cognitive dimension
Values
Perceived behavioural control
Career-intention
Competencies
Identity
COVID-19
Antecedents

Appendix 2. Papers published on EI in the period 1970-2000: Strategic Map and Co-citation network

A 2.1. Impact-Centrality strategic map: Clustering by documents coupling (1970-2000)

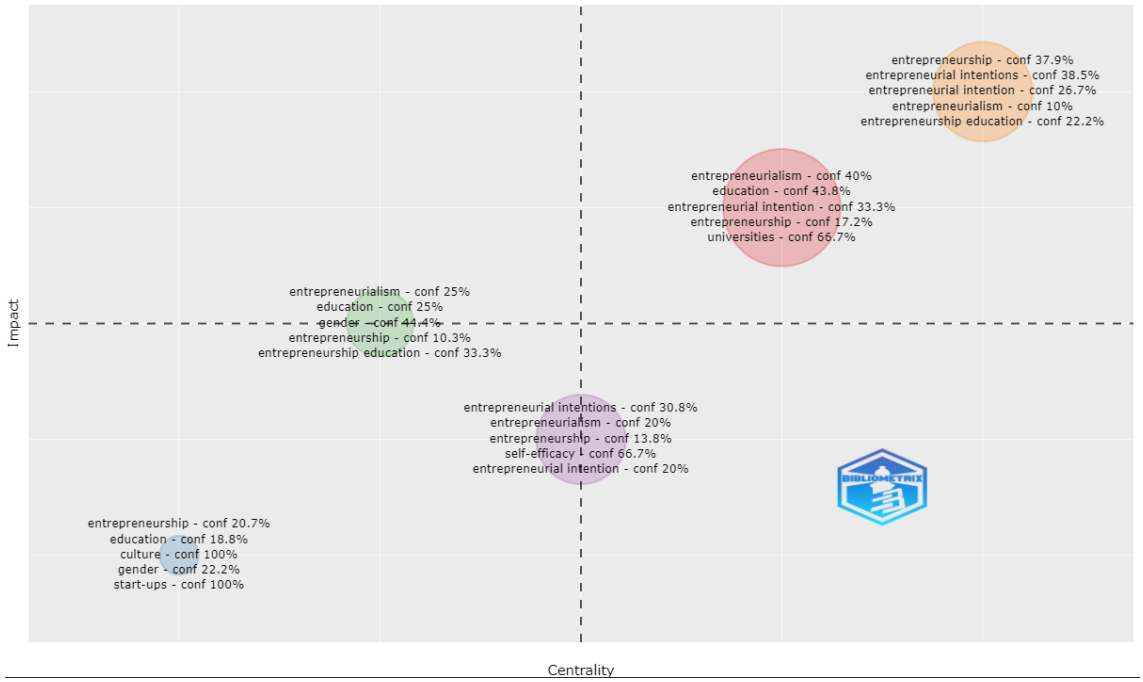


A 2.2. Theoretical foundations of the period 1970-2000: Co-citation network map of the 20 most cited papers of this period

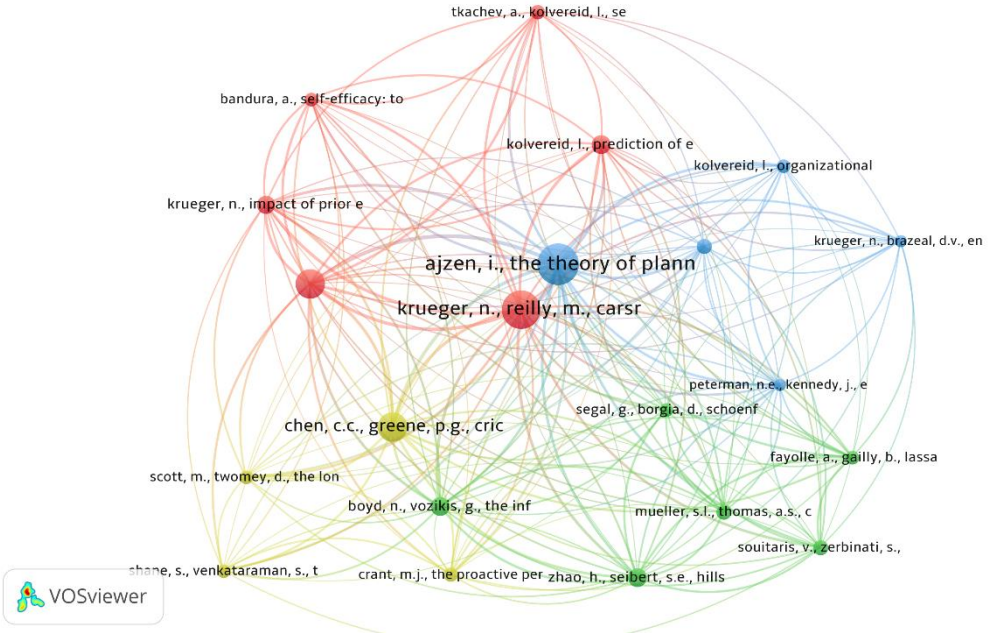


Appendix 3. Papers published on EI in the period 2001-2010: Strategic Map and Co-citation network

A 3.1. Impact-Centrality strategic map: Clustering by documents coupling (2001-2010)

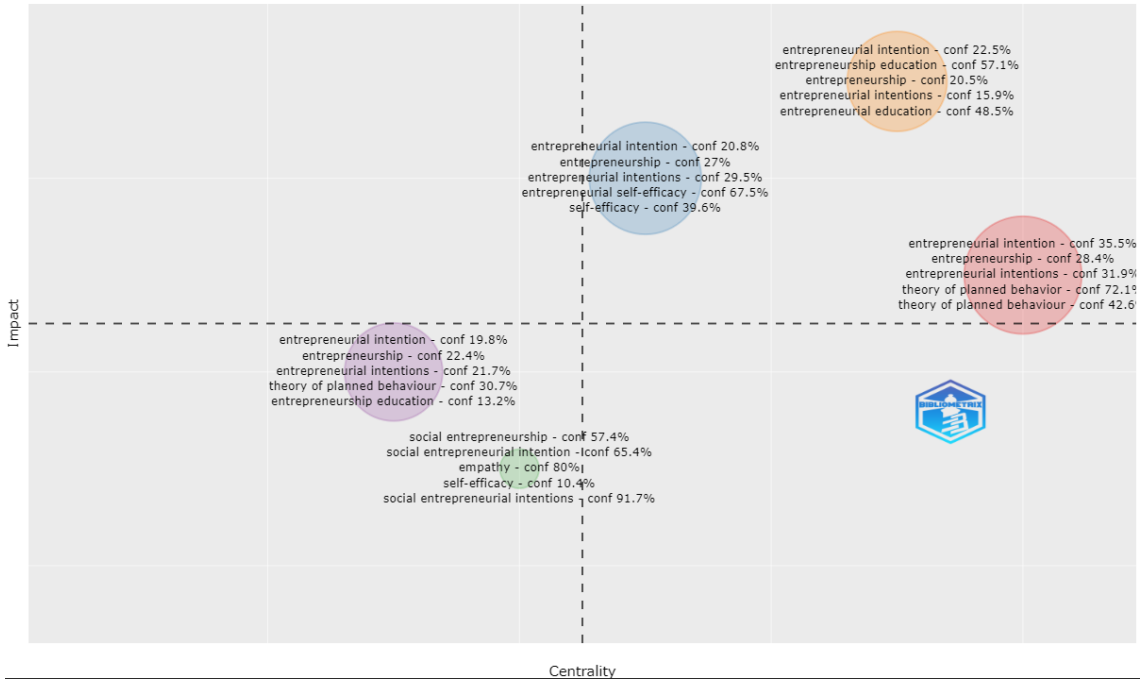


A3.2. Theoretical foundations of the period 2001-2010: Co-citation network map of the 20 most cited papers of this period

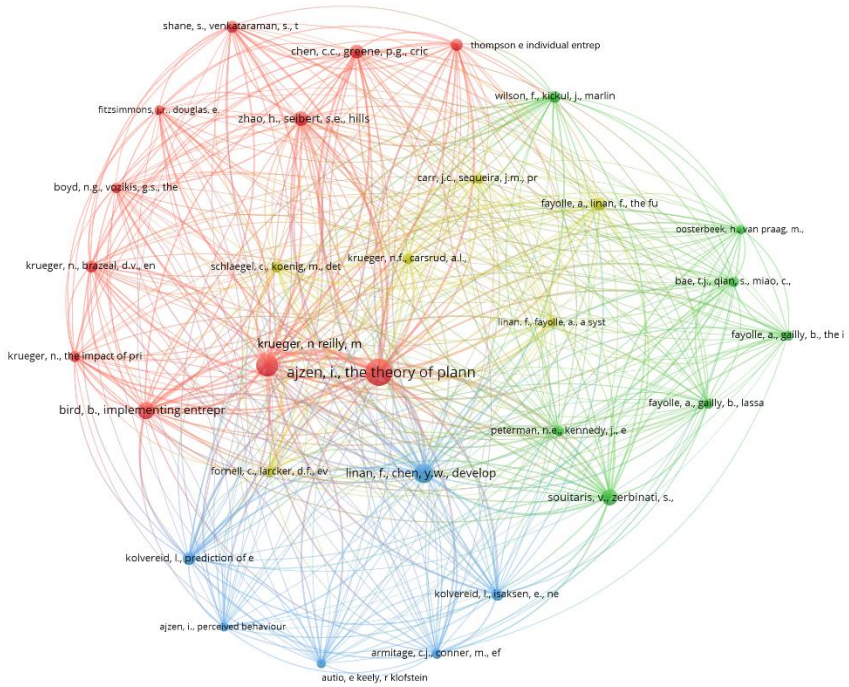


Appendix 4. Papers published on EI in the period 2011-2021: Strategic Map and Co-citation network

A 4.1. Impact-Centrality strategic map: Clustering by documents coupling (2011-2021)



A 4.2. Theoretical foundations of the period 2011-2021: Co-citation network map of the 30 most cited papers of this period



Appendix 5. Top three papers clustered by Bibliographic Coupling considering Normalized Global Citation Impact (NGCI)

1970-2000			2001-2010			2011-2021		
CLUSTER NCS*	**YEAR**	**Authors**	**CLUSTER NCS***	**YEAR**	**Authors**	**CLUSTER NCS***	**YEAR**	**Authors**
RED 1.9798	**2000**	Krueger, Reilly, & Carsrud	**RED** 5.72287	**2006**	Fayolle, Gailly, & Lassas-Clerc	**RED** 12.6219	**2015**	Kautonen, van Gelderen, & Fink
RED 1.6586	**1996**	Tan, Long, & Robinson	**RED** 4.43862	**2010**	Von Graevenitz, Harhoff, & Weber	**RED** 11.4206	**2019**	Esfandiar, Sharifi-Tehrani, Pratt, & Altinay
RED 0.6365	**1993**	Krueger & Carsrud	**RED** 3.6347	**2007**	Souitaris, Zerbinati, & Al-Laham	**RED** 9.3598	**2020**	Meoli, Fini, Sobrero, & Wiklund
BLUE 2.9866	**1998**	Chen, Greene, & Crick A.	**BLUE** 1.33833	**2010**	Gurel, Altinay, & Roberto	**BLUE** 9.3973	**2018**	Bacq & Alt
BLUE 1.4581	**1995**	Davidsson	**BLUE** 1.19139	**2008**	Harris & Gibson	**BLUE** 8.1182	**2020**	López-Núñez, Rubio-Valdehita, Aparicio-García, & Díaz-Ramiro
BLUE 0.9832	**1999**	Mazzarol, Volery, Doss, & Thein	**BLUE** 0.93126	**2006**	Choo & Wong	**BLUE** 7.766	**2020**	Hernández-Sánchez, Cardella, & Sánchez-García
GREEN 2.1488	**1999**	Tkachev & Kolvereid	**GREEN** 3.28712	**2007**	Wilson, Kickul, & Marlino	**GREEN** 10.6692	**2017**	Hockerts
GREEN 1.9715	**1997**	Kolvereid & Moen	**GREEN** 1.72346	**2010**	Packham, Jones, Miller, Pickernell, & Thomas	**GREEN** 5.4082	**2018**	Vuorio, Puumalainen, & Fellnhofer
GREEN 0.5419	**1995**	Matthews & Moser	**GREEN** 1.10228	**2009**	Schwarz, Wdowiak, Almer-Jarz, & Breitenecker	**GREEN** 4.1211	**2017**	Tiwari, Bhat, & Tikoria
—	—	—	**PURPLE** 3.14708	**2009**	Gupta, Turban, Wasti, & Sikdar	**PURPLE** 9.2645	**2021**	Iwu, Opute, Nchu, Eresia-Eke, Tengeh, Jaiyeoba, & Aliyu
—	—	—	**PURPLE** 3.08318	**2009**	Thompson	**PURPLE** 5,826	**2012**	Goethener, Obschonka, Sibereisen, & Cantner
—	—	—	**PURPLE** 2.50334	**2010**	Díaz-García & Jiménez-Moreno	**PURPLE** 5,6124	**2013**	Solesvik, Westhead, Matlay, & Parsyak

1970-2000			2001-2010			2011-2021		
—	—	—	YELLOW 8.32299	**2009**	Liñán & Chen	YELLOW 12.3343	**2020**	Ahmed, Chandran, Klobas, Liñán, & Kokkalis
—	—	—	YELLOW 7.09601	**2010**	Oosterbeek, van Praag, & Ijsselstein	YELLOW 12.2647	**2019**	Nowiński & Haddoud
—	—	—	YELLOW 3.68762	**2010**	Kuckertz & Wagner	YELLOW 10,2992	**2018**	Nabi, Walmsley, Liñán, Akhtar, & Neame

*NCS: Normalized citation score

Appendix 6. Scientific foundations of the published documents on EI in the period 1970-2021

Year	Authors	Document title	1970-2000 Cluster[1]	2001-2010 Cluster[1]	2011-2021 Cluster[1]	Total co-citations	Global citations	% Local citation/Global citation[2]
1961	McClelland	The achieving society, Princeton: van Nostrand	B (5)	* (9)	* (23)	37	4,775	**0.8**
1973	Holland	Making vocational choices: a theory of careers (1983) theories of career development, Osipow, S. H. (ed.), Englewood cliff: Prentice-hall	R (3)			3	4,756	**0.1**
1977	Bandura	Self-efficacy: toward a unifying theory of behavioral change (1977) Psychological Review, 84, pp. 191-215		R (11)	* (157)	168	24,394	**0.7**
1980	Ajzen & Fishbein	Understanding attitudes & predicting social behavior, Prentice-hall, Englewood cliffs (1980)	R (3)		* (48)	51	17,777	**0.3**
1981	Fornell & Larcker	Evaluating structural equation models with unobservable variables & measurement error (1981) Journal of Marketing Research, 18, pp. 39-50			Y (122)	122	39,874	**0.3**
1982	Shapero	Social dimensions of entrepreneurship (1982) the encyclopedia of entrepreneurship, Kent, c., sexton, d. & vesper, k. (eds). Englewood cliffs: Prentice hall	B (10)	* (13)		23	1,460	**1.6**
1986	Bandura	Social foundations of thought & action: a social cognitive theory, Englewood cliffs: Prentice-hall (1986)	G (3)	* (4)	* (32)	39	28,303	**0.1**
1986	Brockhaus & Horwitz	Psychology of the entrepreneur (1986) the art & science of entrepreneurship, pp. 25-48., in D. Sexton & R. Smilor, eds., Cambridge: Ballinger	B (7)	* (1)		8	360	**2.2**

Year	Authors	Document title	1970-2000 Cluster[1]	2001-2010 Cluster[1]	2011-2021 Cluster[1]	Total co-citations	Global citations	% Local citation/Global citation[2]
1988	Bird	Implementing entrepreneurial ideas-the case for intention (1988) Academy of Management Review, 13 (3), pp. 442-453 (454)	G (10)	R (29)	R (324)	363	1,185	**30.6**
1988	Scott & Twomey	The long-term supply of entrepreneurs: students' career aspirations in relation to entrepreneurship (1988) Journal of Small Business Management, 26 (4), pp. 5-13	R (7)	Y (11)		18	210	**8.6**
1988	Katz & Gartner	Properties of emerging organizations (1988) Academy of Management Review, 13 (3), pp. 429-441	G (6)	* (8)	* (10)	24	656	**3.7**
1988	Low & Macmillan	Entrepreneurship: past research & future challenges (1988) Journal of Management, 14, pp. 139-151	G (3)	* (6)		9	1,029	**0.9**
1988	Gartner	Who is an entrepreneur?' is the wrong question (1988) American Journal of Small Business, 13, pp. 11-32	B (4)	* (1)		5	1,323	**0.4**
1989	Scherer, Adams, Carley, & Wibe	Role model performance effects on development of entrepreneurial career preference (1989) Entrepreneurship Theory & Practice, 13 (3), pp. 53-81	G (5)	* (4)	* (5)	14	263	**5.3**
1991	Ajzen	The theory of planned behavior (1991) Organisational Behavior & Human Decision Processes, 50 (2), pp. 1-63 50, pp. 179-211	R (6)	B (45)	R (800)	851	36,102	**2.4**
1991	Shaver & Scott	Person, process, choice: the psychology of new venture creation (1991) Entrepreneurship: Theory & Practice, 16, pp. 23-45	B (4)	* (9)	* (5)	18	654	**2.8**
1991	Brenner, Pringle, & Greenhaus	Perceived fulfilment of organizational employment versus entrepreneurship: work values & career intentions of business college graduates (1991) Journal of Small Business Management, 29 (3), pp. 62-74	R (4)	* (2)		6	81	**7.4**
1991	Robinson, Stimpson, Huefner, & Hunt	An attitude approach to the prediction of entrepreneurship (1991) Entrepreneurship Theory & Practice, 15 (4), pp. 13-31	R (4)	* (1)	* (46)	51	507	**10.1**
1991	Davidsson	Continued entrepreneurship: ability, need, & opportunity as determinants of small firm growth (1991) Journal of Business Venturing, 6 (6), pp. 405-429	G (3)	* (3)		6	351	**1.7**

Year	Authors	Document title	1970-2000 Cluster[1]	2001-2010 Cluster[1]	2011-2021 Cluster[1]	Total co-citations	Global citations	% Local citation/Global citation[2]
1993	Krueger	Impact of prior entrepreneurial exposure on perceptions of new venture feasibility & desirability (1993) Entrepreneurship Theory & Practice, 18 (1), pp. 5-21 18 (1), pp. 5-22	* (5)	R (16)	R (140)	161	1,165	**13.8**
1993	Krueger & Carsrud	Entrepreneurial intentions: applying the theory of planned behavior (1993) Entrepreneurship & Regional Development, 5 (4), pp. 315-330	R (6)	* (15)	Y (145)	166	753	**22.0**
1994	Boyd & Vozikis	The influence of self-efficacy on the development of entrepreneurial intentions & actions (1994) Entrepreneurship Theory & Practice, 18 (4), pp. 63-77	* (2)	G (17)	R (117)	136	869	**15.7**
1994	Krueger & Brazeal	Entrepreneurial potential & potential entrepreneurs (1994) Entrepreneurship Theory & Practice, 18 (3), pp. 91-104	B (4)	B (10)	R (164)	178	1,165	**15.3**
1996	Kolvereid	Prediction of employment status choice intentions (1996) Entrepreneurship: Theory & Practice, 21(1), pp. 47-57	* (2)	R (17)	B (189)	208	617	**33.7**
1996	Crant	The proactive personality scale as a predictor of entrepreneurial intentions (1996) Journal of Small Business Management, 34, pp. 42-50	* (2)	Y (12)	* (104)	118	429	**27.5**
1996	Kolvereid	Organizational employment versus self-employment: reasons for career choice intentions (1996) Entrepreneurship Theory & Practice, 20, pp. 23-31	* (2)	B (11)	* (5)	18	334	**5.4**
1998	Chen, Greene, & Crick	Does entrepreneurial self-efficacy distinguish entrepreneurs from managers? (1998) Journal of Business Venturing, 13, pp. 295-316		Y (29)	R (210)	239	1,274	**18.8**
1999	Tkachev & Kolvereid	Self-employment intentions among russian students (1999) Entrepreneurship & Regional Development, 11, pp. 269-280.		R(12)	* (108)	120	318	**37.7**
2000	Krueger, Reilly, & Carsrud	Competing models of entrepreneurial intentions (2000) Journal of Business Venturing, 15 (2), pp. 411-432	B	R (41)	R (557)	598	2,159	**27.7**

Year	Authors	Document title	1970-2000 Cluster[1]	2001-2010 Cluster[1]	2011-2021 Cluster[1]	Total co-citations	Global citations	% Local citation/Global citation[2]
2000	Shane & Venkataraman	The promise of entrepreneurship as a field of research (2000) Academy of Management Review, 25(1), pp. 217-226		Y (11)	R (172)	183	5,846	**3.1**
2001	Mueller & Thomas	Culture & entrepreneurial potential: a nine country study of locus of control & innovativeness (2001) Journal of Business Venturing, 16 (1), pp. 51-75		G (13)	* (14)	27	807	**3.3**
2001	Armitage & Conner	Efficacy of the theory of planned behaviour: a meta-analytic review (2001) British Journal of Social Psychology, 40 (4), pp. 471-499		*** (3)**	B (124)	124	5,122	**2.4**
2001	Autio, Keeley, Klofsten, & Parker	Entrepreneurial intent among students in scandinavia & in the usa (2001) Enterprise & Innovation Management Studies, 2 (2), pp. 145-160		*** (12)**	B (108)	120	126	**95.2**
2002	Ajzen	Perceived behavioural control, self-efficacy, locus of control, & the theory of planned behaviour (2002) Journal of Applied Social Psychology, 32 (4), pp. 665-683		*** (1)**	B (101)	102	3,238	**3.2**
2003	Luthje & Franke	The 'making' of an entrepreneur: testing a model of entrepreneurial intent among engineering students at mit (2003) R&D Management, 33, pp. 135-147		B (13)	* (90)	103	493	**20.9**
2003	Peterman & Kennedy	Enterprise education: influencing students' perceptions of entrepreneurship. Entrepreneurship Theory & Practice, 28(2), pp. 129-144		B (10)	G (122)	132	810	**16.3**
2005	Zhao, Seibert, & Hills	The mediating role of self-efficacy in the development of entrepreneurial intentions (2005) The Journal of Applied Psychology, 90 (6), pp. 1265-1272		G (17)	R (252)	269	1207	**22.3**
2005	Segal, Borgia, & Schoenfeld	The motivation to become an entrepreneur. International Journal of Entrepreneurial Behaviour & Research, 11 (1), pp. 42-57		G (11)	* (83)	94	408	**23.0**
2006	Fayolle, Gailly, & Lassas-Clerc	Assessing the impact of entrepreneurship education programmes: a new methodology. Journal of European Industrial Training, 30 (9), pp. 701-720		G (11)	G (130)	141	572	**24.7**

Year	Authors	Document title	1970-2000 Cluster[1]	2001-2010 Cluster[1]	2011-2021 Cluster[1]	Total co-citations	Global citations	% Local citation/Global citation[2]
2006	Kolvereid & Isaksen	New business start-up & subsequent entry into self-employment (2006) Journal of Business Venturing, 21 (6), pp. 866-885		* (9)	B (169)	178	438	**40.6**
2007	Souitaris, Zerbinati & Al-laham	Do entrepreneurship programmes raise entrepreneurial intention of science & engineering students? the effect of learning, inspiration & resources. Journal of Business Venturing, 22(4), pp. 566-591		G (13)	G (282)	295	976	**30.2**
2007	Wilson, Kckul, & Marlino	Gender, entrepreneurial self–efficacy, & entrepreneurial career intentions: implications for entrepreneurship education. Entrepreneurship Theory & Practice, 31 (3), pp. 387-406		* (8)	G (155)	163	852	**19.1**
2007	Carr & Sequeira	Prior family business exposure as intergenerational influence & entrepreneurial intent: a theory of planned behavior approach. Journal of Business Research, 60, pp. 1090-1098			Y (116)	116	336	**34.5**
2009	Thompson	Individual entrepreneurial intent: construct clarification & development of an internationally reliable metric. Entrepreneurship: Theory & Practice, 33 (3), pp. 669-694			R (175)	175	417	**42.0**
2009	Liñan & Chen	Development & cross–cultural application of a specific instrument to measure entrepreneurial intentions. Entrepreneurship: Theory & Practice, 33 (3), pp. 593-617		* (1)	B (415)	416	1098	**37.9**
2010	Oosterbeek, van Praag, & Ijsselstein	The impact of entrepreneurship education on entrepreneurship skills & motivation. European Economic Review, 54, pp. 442-454			G (108)	108	556	**19.4**
2011	Fitzsimmons & Douglas	Interaction between feasibility & desirability in the formation of entrepreneurial intentions (2011) Journal of Business Venturing, 26, pp. 431-440			R (109)	109	303	**36.0**
2014	Bae, Qian, Miao, & Fiet	The relationship between entrepreneurship education & entrepreneurial intentions: a meta-analytic review (2014) Entrepreneurship Theory & Practice, 38 (2), pp. 217-254			G (128)	128	516	**24.8**

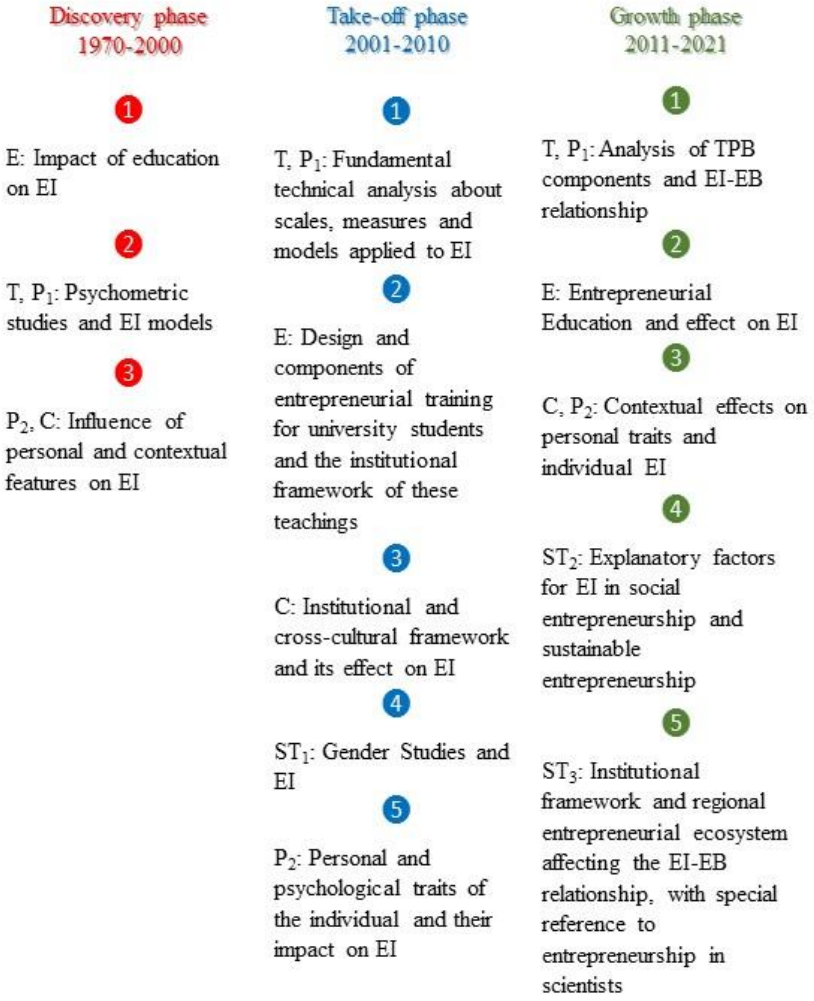
Year	Authors	Document title	1970-2000 Cluster[1]	2001-2010 Cluster[1]	2011-2021 Cluster[1]	Total co-citations	Global citations	% Local citation/Global citation[2]
2014	Fayolle & Liñan	The future of research on entrepreneurial intentions (2014) Journal of Business Research, 67, pp. 663-666			Y (183)	183	370	**49.5**
2014	Schlaegel & Koenig	Determinants of entrepreneurial intent: a meta-analytic test & integration of competing models (2014) Entrepreneurship Theory & Practice, 38 (2), pp. 291-332.			Y (148)	148	413	**35.8**
2015	Fayolle & Gailly	The impact of entrepreneurship education on entrepreneurial attitudes & intention: hysteresis & persistence (2015) Journal of Small Business Management, 53 (1), pp. 75-93.			G (116)	116	338	**34.3**
2015	Liñan & Fayolle	A systematic literature review on entrepreneurial intentions: citation, thematic analyses, & research agenda (2015) International Entrepreneurship & Management Journal, 11 (4), pp. 907-933.			Y (106)	106	403	**26.3**

[1] R: Red cluster; B: Blue cluster; G: Green cluster; Y: Yellow cluster; P: Purple cluster. The number referred to in brackets refers to the total number of co-citations in the document in the period.

[2] Local citation rate: Percentage of citations received in the EI literature (Local Citation) out of the Global Citations received by the document. The higher the percentage, the more genuine the paper is in the EI research topic (see Batista-Canino et al. 2023).

*Papers not included in any cluster studied in the period, but co-cited in that period.

Appendix 7. The degree of convergence between the thematic clusters highlighted in this research and other EI literature reviews



EI Literature Reviews Analysed period	Discovery phase 1970-2000	Take-off phase 2001-2010	Growth phase 2011-2021
Liñán & Fayolle (2015) 2004-2013	---	1 3 5	1 2 5
Donaldson (2019) 2014-2018	---	---	1 2 3
Tan et al. (2020)* 2010-2018	---	1 3 5	1 3 4 5
Pérez-Macías et al. (2021) 1994-2017	---	3 5	3 5
Patra & Lenka (2021) 1987-2019	---	4 5	3

* Social entrepreneurial intention review

Nomenclature- TPB: Theory of Planned Behaviour; E: Education; T: Theory; P_1: Psychometric tools; P_2: Psychological and demographic traits; C: Context; ST_1: Special Topic (Gender); ST_2: Special Topic S-ship (Social Entrepreneurship and Sustainable Entrepreneurship); ST_3: Context and academics

Appendix 8. Thematic Strategic Map by Clustering by Coupling procedure (March 2021 to February 2023)

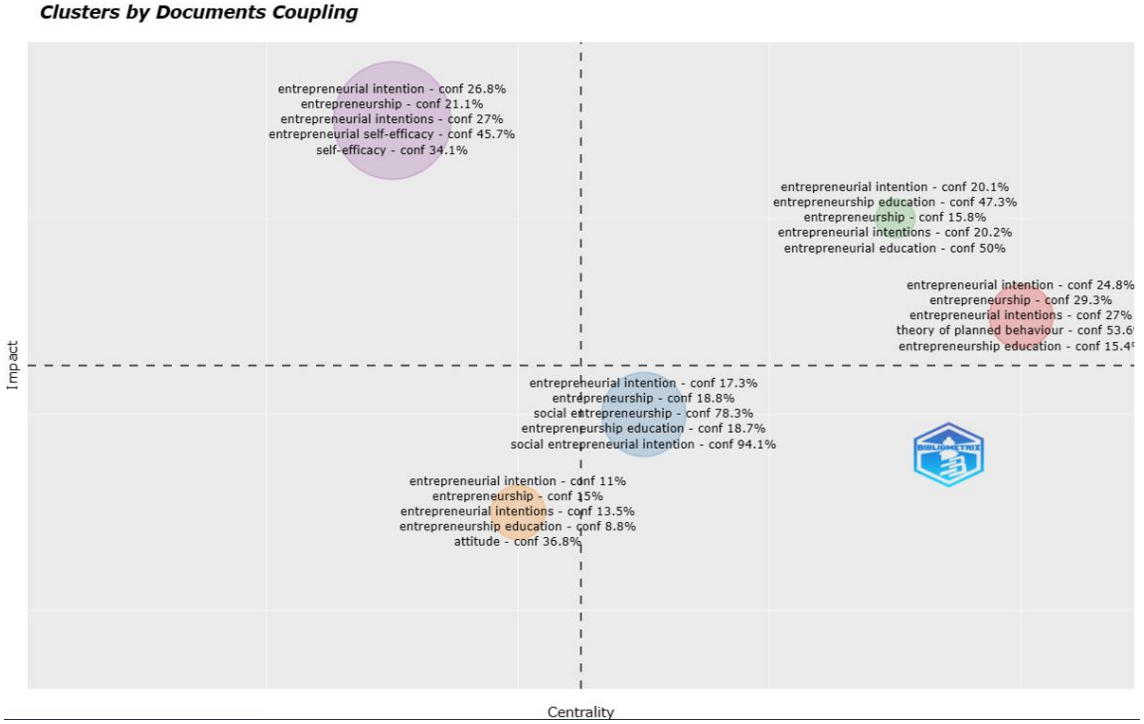


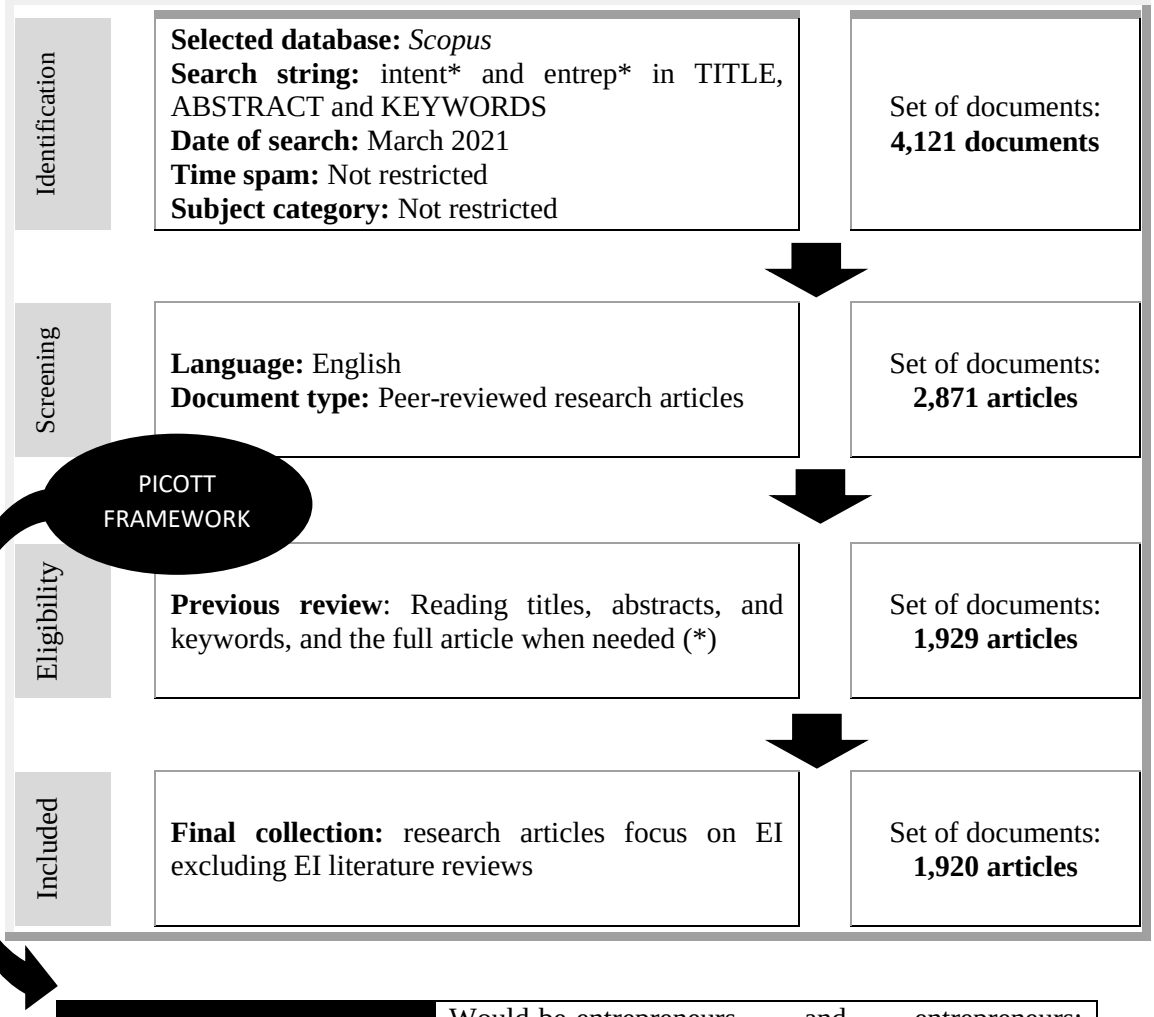
Table 1. Key figures and selected thresholds by period	**1970-2000**	**2001-2010**	**2011-2021**
Number of documents in the collection by period	20	118	1,782
THEMATIC STRATEGIC MAPS BY BC (See Fig A 1.1, A 2.1, A 3.1)			
Number of clusters	3	5	5
Number of papers grouped per cluster*	7-5-3	30-26-24-20-16	509-454-351-337-98
Weighted average of NGCI** per cluster	1.6-1.0-1.8	2.6-4.5-2.0-1.8-0.6	3.5-2.8-3.1-2.1-2.6
Number of documents selected for the interpretation of the BC analyses	15	20*5	20*5
CO-CITATION ANALYSES (See Fig A 1.2; A 2.2; A 3.2)			
Cited references before applying the Thesaurus procedure	859	5,598	89,779
Cited references after applying the Thesaurus procedure***	67	4,711	88,914
Co-citing threshold criteria (Minimum number of citations of a co-cited reference)	3	10	100
Number of most co-cited papers analysed	20	20	30

***** Some papers are isolated after the clustering process and are not added to any cluster.

** We focus on global, rather than local, citation because of our interest in considering the morphology of the field resulting from the general interest in this research topic, even in other disciplines, and not just considering the hyper-specialised EI research.

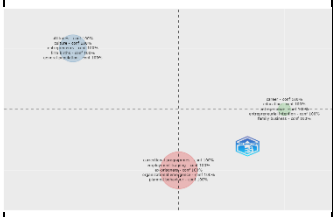
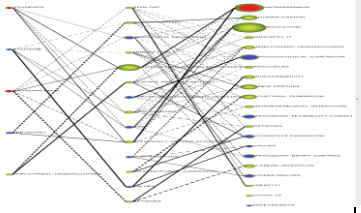
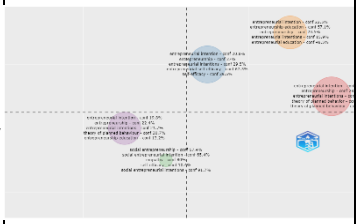
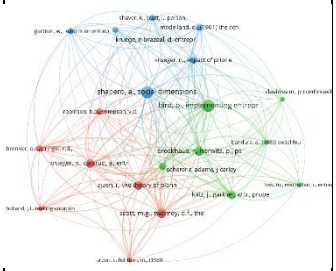
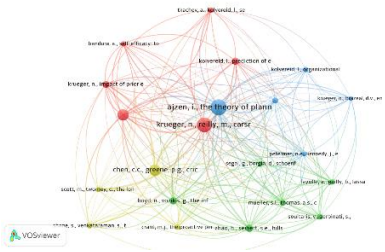
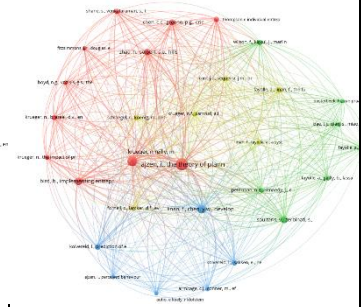
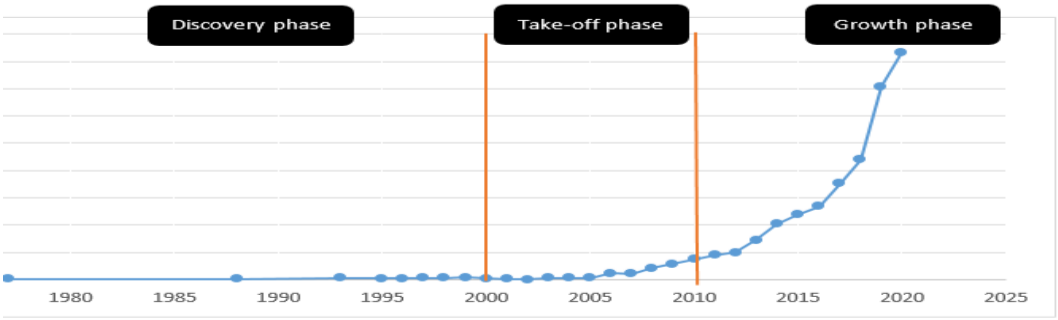
*** The older the documents are, the less homogeneous their references are. With the standardisation of citation systems, this problem has been solved considerably.

Figure 1. PRISMA statement and search criteria used in the systematic literature review



Population under study	Would-be-entrepreneurs and entrepreneurs; organisations, institutions, communities, and territories fostering EI and EB
Intervention	Concept and theories of EI; explanatory factors of EI; diagnostic and measurement tools of EI; EI policies and strategies
Comparison	Other EI literature reviews to date
Outcome	To update and summarise the accumulated EI knowledge
Type of question being asked and to whom it is important	To explain the progress of EI research by highlighting its knowledge foundation (intellectual structure), unveiling the research front (conceptual structure) on EI, and discovering the morphology of this research field and its diachronic evolution. This review will help EI scholars, trainers, and policymakers in dealing with socio-economic crises, unemployment, fostering entrepreneurial mindset, and/or innovation.
Type of study design	Scientometric approach (quantitative and qualitative analyses)

Figure 2. The output of bibliometric processes in each phase*

	Discovery phase 1970-2000 Appendix 2	**Take-off phase** 2001-2010 Appendix 3	**Growth phase** 2011-2021 Appendix 4
III Morphology based on BC	 Fig. A.2.1	 Fig. A.3.1	 Fig. A.4.1
II Co-citations	 Fig. A.2.2	 Fig. A.3.2	 Fig. A.4.2
I Evolution in num of papers			

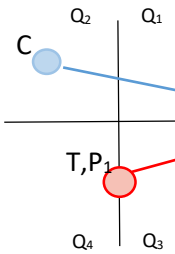
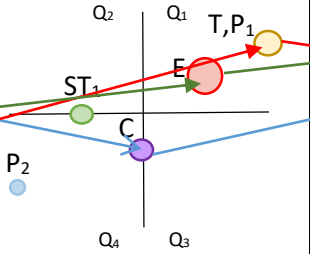
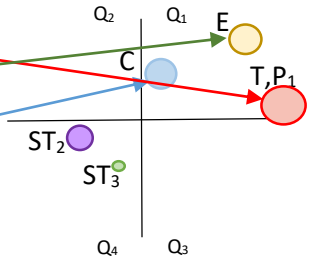
* When examining the map, remember that the colours in the different stages are not coordinated. The bibliometric software prevents you from manipulating this aspect according to the convenience of the inspection.

Table 2. Bibliographic coupling and co-citation analyses: Thematic description of clusters (Impact Score=Weighted average of NGCS)*

	Discovery phase 1970-2000	**Take-off phase** 2001-2010	**Growth phase** 2011-2021
I Bibliographic Coupling	E: Impact of education on EI (3; 1.8) - GREEN	T, P_1: Fundamental technical analysis about scales, measures, and models applied to EI (26; 4.5) - YELLOW	T, P_1: Analysis of TPB components and EI-EB relationship (509; 3.5) - RED
	T, P_1: Psychometric studies and EI models (7; 1.6) - RED	E: Design and components of entrepreneurial training for university students and the institutional framework of these teachings (30; 2.6) - RED	E: Entrepreneurial Education and effect on EI (351; 3.1) - YELLOW
	P_2, C: Influence of personal and contextual features on EI (5; 1.0) -BLUE	C: Institutional and cross-cultural framework and its effect on EI (24; 2.0) - PURPLE	C, P_2: Contextual effects on personal traits and individual EI (454; 2.8) -BLUE
	---	ST_1: Gender Studies and EI (20; 1.8) - GREEN	ST_2: Explanatory factors for EI in social entrepreneurship and sustainable entrepreneurship (98; 2.6) - GREEN
	---	P_2: Personal and psychological traits of the individual and their impact on EI (16; 0.6) -BLUE	ST_3: Institutional framework and regional entrepreneurial ecosystem affecting the EI-EB relationship, with special reference to entrepreneurship in scientists (337; 2.1) -PURPLE
II Co-citations	Cr: Career choice of individuals - RED	T: Theoretical or practical interest in models developed to explain EI (TPB, EEM and others) - RED	T, P_1: Main models and constructs of EI - RED
	P_2: Psychological traits and demographic of entrepreneurs -BLUE	E: EI and antecedent factors in students' career choice using mainly TPB -BLUE	T: Key contributions to the TPB - BLUE
	EL: Literature on entrepreneurship that adds organisational focus to EI - GREEN	P_2: Psychological, demographic, and training factors influencing EI - GREEN	E: Impact of entrepreneurial education on EI - GREEN
	---	EL: Nature of entrepreneurship and its foundations giving a special role to perceived self-efficacy and proactivity as the most valued characteristics - YELLOW	LR: Literature reviews and theoretical revision of EI research -YELLOW

* The colours are shown identifying each cluster found.
Nomenclature- TPB: Theory of Planned Behaviour; EEM: Entrepreneurial Event Model; EB: Entrepreneurial behaviour; E: Education; T: Theory; P_1: Psychometric tools; P_2: Psychological and demographic traits; C: Context; EL: Entrepreneurship literature; Cr: Career Choice; ST_1: Special Topic (Gender); ST_2: Special Topic S-ship (Social Entrepreneurship and Sustainable Entrepreneurship); ST_3: Context and academics; LR: Literature reviews.

Figure 3. Thematic tracking of the research area

	Discovery phase 1970-2000	**Take-off phase** 2001-2010	**Growth phase** 2011-2021
III Morphology based on BC and co-word analysis			
II Bibliographic coupling	E	T, P_1	T,P_1
	T,P_1	E	E
	P_2, C	C	C, P_2
	—	ST_1	ST_2
	—	P_2	ST_3
I Co-citations	Cr	T	T,P_1
	P_2	E	T
	EL	P_2	E
	—	EL	LR

E: Education; T: Theory; P_1: Psychometric tools; P_2: Psychological and demographic traits; C: Context; EL: Entrepreneurship literature; Cr: Career Choice; ST_1: Special Topic (Gender); ST_2: Special Topic (S-ship: Social Entrepreneurship and Sustainable Entrepreneurship; ST_3: Context and academics; LR: Literature reviews.

Figure 4. Overcoming the risk of sterilising EI research: Three examples of the research pathway to update EI research foundations