UNIVERSIDAD POLITÉCNICA DE MADRID

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS

INDUSTRIALES

**Departamento de Ingeniería de Organización, Administración de Empresas
y Estadística**

**ENTREPRENEURSHIP EDUCATION: ANALYSIS OF MODELS,
INTENTIONS AND COMPETENCES**

TESIS DOCTORAL

AUTOR:	Cristina Armuña González Ingeniera de Telecomunicación
DIRECTORES:	Dr. Jesús Juan Ruiz Doctor Ingeniero Industrial Dr. Sergio Ramos Villaverde Doctor Ingeniero de Telecomunicación

2020

Tribunal nombrado por el Magfco. y Excmo. Sr. Rector de la Universidad Politécnica de Madrid, el día _____

Presidente/a:

Secretario/a:

Vocal:

Vocal:

Vocal:

Suplente:

Suplente:

Realizado el acto de defensa y lectura de la tesis el día _____ en la E.T.S. Ingenieros Industriales de la Universidad Politécnica de Madrid.

CALIFICACIÓN:

EL PRESIDENTE

LOS VOCALES

EL SECRETARIO

Motivación personal y agradecimientos

El emprendimiento ha cobrado una creciente relevancia como actividad económica vinculada a la generación valor y autoempleo en situaciones de crisis, cambios de paradigma económico o disrupciones tecnológicas. Las políticas públicas, tanto comunitarias como nacionales, han puesto mucho énfasis en su impulso, con medidas que no se traducen en datos realmente impactantes en la puesta en marcha de iniciativas emprendedoras sostenibles y viables.

El fenómeno emprendedor ha estado históricamente vinculado a la gestión empresarial y la creación de los denominados “ecosistemas emprendedores” ha ido en paralelo al estudio académico de la configuración más adecuada de éstos o de las medidas realmente necesarias en cada sitio.

Así ha habido una época en la que el emprendimiento se asociaba con empresas tecnológicas que triunfaban de la nada, generando cantidades ingentes de dinero e inspirando la idea de que es fácil hacerse rico mediante una aplicación en el móvil o la importación de productos a los que se aporta una mínima customización.

Esto ha generado una burbuja de emprendimiento aparente, con datos de valoración monetaria que en la mayoría de las ocasiones no se sostienen y sin una dinamización económica con impacto en la sociedad real, en generación de empleo, de transformación social o de creación de valor en sitios deprimidos. Una falsa apariencia de ecosistema sano que, al contrario, se aleja de la realidad y sólo acrecienta las diferencias en un mundo de postureo emprendedor que sencillamente vive de haber estado en el sitio adecuado en un momento en el que la burbuja comenzaba y no había referentes.

La realidad está lejos de que la trayectoria de empresas tecnológicas que aprovecharon una incipiente aparición de redes sociales o tecnologías cloud sea replicable. Emprender es mucho más que aspirar a crear algo que se revalorice rápidamente con métricas vanidosas para ser vendido y generar ingresos a nivel individual sin contribución económica real.

Cuando comencé la tesis me debatía en si quería contribuir a que todo el mundo tuviera oportunidades de estar en ese ecosistema, transformándolo en algo real, o luchar contra el mundo del postureo en el que el trabajo del día a día se diluye entre conferencias y huecos televisivos que reducen la magia del éxito a golpes de suerte disfrazados de estrategia.

Y comencé a participar como equipo docente en cursos para gente normal que quería emprender o que ya tenía un negocio. Las metodologías de las escuelas de negocio estadounidenses, progresivamente incorporadas en Masters de posgrado o escuelas de negocio de

prestigio de Europa, y en concreto de España, estaban muy lejos del alcance de la mayoría de las personas que luchan día a día por generar una actividad económica sostenible. Circunscritas a los mismos, sólo jóvenes cuyos padres tienen recursos o un recorrido que les hace tener una visión claramente diferencial de lo que es una estrategia profesional de vida, accedían a ellos. Y nuevamente se contribuía a un círculo en el que siempre son los mismos los que llevan ventaja. Sólo nacer en un sitio determinado, en unas circunstancias concretas y con unos padres concretos hace que realmente cuentes si quiera con el conocimiento de lo que debes estudiar o no, dónde y hacia dónde.

El capital humano es uno de dominios que constituyen lo que se denomina ecosistemas emprendedores. Y el capital humano lo forman las personas. Y las personas se hacen en base a tres elementos (haciendo una simplificación que sólo se permite en el apartado de motivación de una tesis): sus características innatas: raza, sexo, recursos familiares, lugar de nacimiento, el punto de partida, no cambiabile y que, de por sí, marca el principio de todas las brechas sociales y económicas de la historia de la humanidad. La serendipia, aquella sucesión de eventos no previsibles que hace que el rumbo de una vida pueda ser uno u otro, no inmutables, pero no predecibles. Y el conocimiento adquirido, esa parte de experiencia y formación que va configurando nuestra manera de decidir, de pensar y de hacer las cosas de una determinada forma. A priori área candidata a la intervención, algo que sí puede modificarse y que sí puede reducir las diferencias del contexto de partida: la educación. Pero nuevamente parece que el sistema sólo orienta la verdadera capacitación para aquellos que pueden permitírsela, desde las etapas de la educación primaria en colegios de categoría hasta formación profesional complementaria que, en el mundo del emprendimiento, se limita a escuelas de negocio inaccesibles por la mayoría de las personas y a la vez, sencillamente dirigidas a un foco de la población, cuando la mayoría ni siquiera sabe que los métodos que se enseñan también los necesitan, les harían mejores, con mayores posibilidades de triunfar.

Y me sumé a un pensamiento visionario y solidario, formando parte del equipo detrás de programas que incorporaban métodos de Escuelas Internacionales con el objetivo de democratizar este tipo de formación. Si la vida no te ha puesto en el sitio adecuado para tener unas condiciones de partida adelantada, una educación básica diferencial o una casuística de suerte que te haya impulsado, nuestra premisa era que podíamos contribuir dando esta formación como complementaria, para cualquier persona, para cualquier sector, para aquellos que realmente se estrellan cuando montan un negocio porque no han contado con información que les ayude a minimizar el riesgo, a probar con recursos controlados. Y lo hicimos en UNED, con un programa de formación permanente, para el que no necesitas título universitario y con un precio con el que nunca cubrimos los gastos del propio programa.

Y aprendimos mucho. Con un primer grupo de personas que realmente nunca olvidaremos, artesanos de la Sierra del Ampurdán, secretarías que querían explorar el trabajo multicliente online, diseñadores de moda con períodos de actividad estacional, jóvenes que querían cambiar la manera en que se transportan los productos de forma colaborativa...gente normal, con inquietudes, perdidos en las ganas de hacer algo y no saber por dónde empezar, gente que detectaba la necesidad de formarse un poco más en esto y no tenían hueco en los programas de negocio de las grandes escuelas y que, sobre todo, necesitaban apoyo en un mundo, el del emprendedor, extremadamente demandante y solitario.

Nuestro foco en el curso era que la formación no sólo era útil para gente con ideas de negocio, si no que los métodos nos ayudaban también a crecer profesionalmente en general. Este pensamiento se alineaba con la Recomendación del Consejo Europeo en la que en las ocho competencias clave para una Sociedad basada en el Conocimiento se encontraba el sentido del emprendimiento, definido como la habilidad de transformar las ideas en acción mediante la creatividad, la innovación y la asunción de riesgos, así como de planificar y gestionar proyectos. Esto fue ratificado como apuesta por parte de la Comisión Europea al lanzar el EntreComp, una propuesta de marco de competencias emprendedoras cuyo desarrollo favorecía todas las esferas de la vida: desarrollo personal y profesional, como empleado y como emprendedor para iniciar una actividad o para hacerla crecer, y que seleccioné como marco de referencia para los análisis cuantitativos en la tesis.

Y comenzamos a querer explorar cómo nuestros alumnos se percibían en estas competencias, cómo evolucionaban a lo largo de distintos cursos y cómo se vinculaban con distintos comportamientos emprendedores. A la vez, cuál era el punto de partida, qué edad tenían, cómo percibían el entorno, su actitud, etc., tratar de observar cuáles eran los factores que iban indicando los siguientes pasos, para ir adaptando las metodologías en función de la audiencia.

Es un proyecto de vida. Tuvimos la oportunidad de concentrar el esfuerzo de experimentación en el Programa ActúaUPM, y es en el que se centra la tesis, pero a lo largo de este tiempo hemos hecho encuestas en más de 20 programas y a personas en distintas fases, en la universidad en general, con empresas montadas, en cursos obligatorios, voluntarios...No quiero dejar de dar las gracias a las más de 3.500 personas que en total han respondido a nuestras encuestas, aunque la tesis se haya centrado en un segmento de individuos muy concreto. Seguiremos.

Y seguimos pensando cómo poder acercarnos a más gente, identificando las tres principales barreras que nos han motivado para seguir y seguir explorando: la primera el precio, la segunda el tipo de contenido y la tercera... todavía nos queda un poco por lograrla, pero hacer

llegar el mensaje de que todos necesitamos formaciones que nos ayuden a pensar mejor, pensar más rápido, no hundirnos ante el fracaso, ser capaces de reinventarnos y jugar con reglas de riesgo controlado. Y continuamos abordando programas que trataban de superar estas barreras.

Con la primera edición de 100 Emprendimiento en la UNED, hemos tratado de enfocar los contenidos de una forma en la que no sea necesario tener una idea de negocio, si no que las herramientas plantadas para las distintas competencias ayuden a tomar decisiones en todos los ámbitos. Seguiremos mejorando.

Y escribo esta parte de motivación, confinada en la crisis del coronavirus, que ha despertado la solidaridad de muchos grupos y que nos ha permitido abrir la plataforma de introducción al emprendimiento que estábamos construyendo de manera gratuita. Y más de 3.000 alumnos han pasado por una formación hecha con mucho cariño, tratando de explicar conceptos complejos en un lenguaje entendible, incluyendo metodologías que mezclan la gamificación con historias que todos conocemos.

El esfuerzo de la tesis ha hecho que conozcamos más y mejor a las personas que se acercan al mundo emprendedor, la evolución de una educación muy orientada a empresas que se ha girado progresivamente al desarrollo de competencias, la perspectiva de que hay mucho recorrido, pero quedan muchos retos, mucho por hacer para que desde la educación de verdad se reduzca una brecha que existe entre vencedores y vencidos. La necesidad de reinventarse es clara y con esta tesis, he querido aportar un mínimo granito de arena a que se contribuya a concebir la educación en emprendimiento como algo que debe orientarse a los objetivos que se persiguen, que deben adecuarse al target al que se orienta y que debe medirse, con instrumentos que seguro que se desarrollan más y que se perfeccionarán, pero abriendo una vía a la importancia de conocer quién está detrás de estas formaciones y cómo podemos hacerlas mejores.

Quería haber hecho mucho más, he llegado hasta donde he podido, pero seguiré. Se lo debo a todas las personas que han hecho posible este recorrido, a las personas cercanas que me han sufrido el sacrificio, a mis tutores, apoyando en todo momento, al equipo, incansable en la propuesta de más y más iniciativas y con quienes no me cansaré de hacer cosas, nada de esto sería posible sin vosotros. A todas las personas que han dedicado 15 minutos de su vida a responder a las encuestas de la investigación y a todos aquellos que nos dan la oportunidad y nos agradecen que pongamos nuestro esfuerzo en hacer que su formación y sus futuros proyectos, sean mejores y lleven un poco de nosotros.

Index

Tables.....	11
Figures	13
Resumen	15
Abstract.....	17
Resumen extendido.....	19
Extended abstract.....	25
1 Introduction. The relevance of entrepreneurial human capital and education	31
1.1 Motivation.....	31
1.2 Research in context	31
1.2.1 Definition: from economic activity to people competences.....	32
1.2.2 Context: entrepreneurship ecosystem and the relevance of human capital	34
1.2.3 The dynamic nature of entrepreneurship.....	38
1.2.4 The role of entrepreneurship education as a driver to foster entrepreneurship activity	40
1.3 Overview of the study	43
1.3.1 Research objectives	43
1.3.2 Research method	43
1.4 Thesis Outline	46
2 Theoretical Framework	47
2.1 Entrepreneurship Education: evolution and challenges	48
2.1.1 Concept	48
2.1.2 Historical Perspective: from business to competences.....	51
2.1.3 Current challenges of entrepreneurship education	55
2.2 Entrepreneurship lifecycle: entrepreneurs' stages.....	59
2.3 Entrepreneurship Intention: the preliminary step to start up and predictors ...	61
2.3.1 Models.....	62
2.3.2 Factors affecting Entrepreneurship Intention	64
2.3.3 Entrepreneurship Competences and Entrepreneurship Intention	65
2.3.4 Entrepreneurship Education and Entrepreneurship Intention.....	68
2.4 Entrepreneurship Competences: selecting a framework of reference	69

2.4.1	Concept.....	69
2.4.2	Overview of relevant frameworks of competences	70
2.4.3	EntreComp: definition, purpose and use in Academia	73
3	Operationalization of the Research Questions.....	81
4	Methodology	83
4.1	Theoretical models of reference	84
4.1.1	The Theory of Planned Behaviour.....	84
4.1.2	EntreComp.....	85
4.2	Self-assessment tool: design of the questionnaire	87
4.3	Data collection.....	92
4.3.1	Selection of samples	92
4.3.2	Procedure.....	93
4.4	Method of analysis	96
5	Results and Discussion.....	99
5.1	Factors affecting entrepreneurship intention of early stages entrepreneurs and the role of entrepreneurship competences.....	99
5.2	Exploring the most relevant entrepreneurship competences towards entrepreneurship intention	104
5.3	Understanding the evolution of the entrepreneurship competences self-perception and the entrepreneurship intention through an EEP	108
5.3.1	Entrepreneurship intention and entrepreneurship competences self-perceived: characterization of potential entrepreneurs joining ActuaUPM.....	108
5.3.2	Changes on entrepreneurship competences self-perceived and entrepreneurship intention after the program.....	114
6	Conclusions	120
6.1	Thesis contribution: answering research questions	120
6.2	Limitations and avenues for further research	125
	Annex I - Scientific impact & dissemination resulting from this thesis	128
	Annex II - Publications identified with research using the EntreComp.....	132
	Annex III – Questionnaire sent to Actúaupm participants	138
	References.....	144

Tables

Table 1. Entrepreneurial ecosystems frameworks description	35
Table 2. Categorization of domains included in the entrepreneurial ecosystem diagnostic tools (Ande, 2013).....	37
Table 3. Areas and competences proposed by the EntrComp	74
Table 4. Operationalization of the Entrepreneurship Intention construct	88
Table 5. Operationalization of the Attitude construct	88
Table 6. Operationalization of the Perceived Behavioural Control construct	88
Table 7. Operationalization of the Subjective Norms construct (City and Region environment)	89
Table 8. Operationalization of the Subjective Norms construct (Close environment)...	89
Table 9. Operationalization of the Subjective Norms construct (Close environment approval of the decision)	89
Table 10. Operationalization of the Subjective Norms construct (University environment)	90
Table 11. Operationalization of the Risk Perception construct	90
Table 12. Operationalization of Entrepreneurship Competences variables	91
Table 13. Demographics characteristics of the sample of potential entrepreneurs	94
Table 14. Demographics characteristics of the samples in the experiment and control groups.....	95
Table 15. Properties of dependent and independent variables considered in the models	101
Table 16. Pearson Correlations Variables Model 1	102
Table 17. Regression Models - Standardized beta coefficients.....	103
Table 18. Result of factor analysis for entrepreneurship competences	105

Table 19. Regression components of the sample towards intention.....	107
Table 20. EI Component Matrix. Extraction Method: Principal Component.....	110
Table 21. Self-perceived competences of the sample of potential entrepreneurs.....	113
Table 22. Pre-post treatment differences between control and treatment group	115
Table 23. Descriptive Statistics and Pearson Correlations-Competencies and Intentions for Total Sample (N=82)	116
Table 24. Means difference values between the Program and the Control Group. Anova one factor.....	118

Figures

Figure 1. Scheme of the entrepreneurs' characteristics related to the entrepreneurship activity path. Own elaboration from Kauffman Foundation research (Shah et al., 2016)	38
Figure 2. Entrepreneurship education and competences presence in Policy Agenda	42
Figure 3. Research methodology following the model proposed by Saunders et al. (2009)	44
Figure 4. Theoretical Framework Diagram.....	47
Figure 5. Generic teaching model in entrepreneurship education (Fayolle & Gailly, 2008)	48
Figure 6. Entrepreneurship education evolution representation (own elaboration)	54
Figure 7. Model proposed to design and measure entrepreneurship education programs	58
Figure 8. Representation of the mapping of competences that should guide Entrepreneurship Education programs according to the purpose and the audience.....	59
Figure 9. Conceptualization of the entrepreneurship stages.....	61
Figure 10. Entrepreneurship competences frameworks (non-exhaustive selection)	72
Figure 11. Academic references citing the EntreComp by year.....	78
Figure 12. Authors in the EntreComp database references per country of affiliation (accumulation of 85% of authors).....	79
Figure 13. Survey process (Bethlehem, 2009)	83
Figure 14. Theory of Planned Behaviour (Icek Ajzen, 1991)	84
Figure 15. The EntreComp wheel: 3 competence areas and 15 competences (McCallum E. et al., 2018)	86
Figure 16. Model considering the EntreComp as a predictor of intention	100

Figure 17. Principal Component plot. First Component 1 (Axis X) and Second Component (Axis Y).	111
Figure 18. Perception of competences in the sample of potential entrepreneurs (mean value).....	112
Figure 19. Graphical representation of the pre-post treatment differences between control and treatment group.....	116

Resumen

El objetivo de la presente tesis doctoral es explorar cómo los programas de educación pueden aumentar la intención emprendedora en las primeras etapas del proceso emprendedor mediante el desarrollo de competencias específicas.

El primer elemento a considerar en la definición de emprendimiento es su dimensión económica. En este sentido, se acepta comúnmente que el emprendimiento es una actividad clave dirigida a impulsar el crecimiento económico basado en la innovación. De hecho, los emprendedores son percibidos como creadores de valor en forma de nuevas empresas y como generadores de empleo mediante la movilización de recursos económicos, lo que, en conjunto, tiene un impacto positivo en términos de mayor productividad y crecimiento económico.

Este concepto económico ha evolucionado durante la última década situando el emprendimiento como una nueva competencia clave para todas las personas. En este sentido, la definición propuesta por la Danish Foundation for Entrepreneurship & Young Enterprise, y adoptada por la Comisión Europea, establece un paso adicional que no solo se aplica a las actividades económicas: *“Entrepreneurship is when you act upon opportunities and ideas and transform them into value for others. The value that is created can be financial, cultural, or social”*. Desde este punto de vista, se persigue una mentalidad emprendedora en todos los sectores y para todos los ciudadanos que tiene como objetivo generar valor en términos generales. En la práctica, el espíritu emprendedor se considera un conjunto de competencias que todos los ciudadanos deberían adquirir, aplicables en todos los ámbitos de la vida.

En este contexto, un aspecto fundamental a considerar es el entorno en el que se desarrolla la actividad emprendedora ya que se asume que la probabilidad de que los emprendedores tengan éxito se ve afectada por un gran número de factores, tales como la disponibilidad de capital y personal cualificado, la existencia de políticas gubernamentales favorables, o la disponibilidad de infraestructuras de comunicaciones y transporte adecuadas.

Entre estos elementos, cabe destacar el papel que la educación en emprendimiento debe desempeñar. La relevancia que las políticas públicas están otorgando a la educación en este ámbito es clara, pero surgen preguntas complejas todavía difíciles de responder: ¿Qué habilidades emprendedoras deberían enseñarse? ¿Cuál es la mejor metodología para enseñarlas? ¿El éxito está relacionado con estas habilidades? ¿Son las mismas competencias de igual relevancia en las diferentes etapas de un emprendedor? ¿Deberían ser parte de programas educativos en todas las edades y niveles?

Dado el número de desafíos en torno a la educación y las competencias, el objetivo de esta tesis es contribuir a este debate complejo y relevante, particularizando la exploración de cómo los programas de educación en emprendimiento podrían aumentar la intención emprendedora en las primeras etapas del proceso emprendedor mediante el desarrollo de competencias específicas.

Con estas premisas, la contribución de la presente tesis doctoral se estructura en cinco secciones principales:

- El Capítulo 1 proporciona una visión general introductoria del concepto de emprendimiento y algunos de los componentes principales para comprender su evolución desde una actividad económica a una habilidad personal que se puede enseñar y aprender.
- El Capítulo 2 proporciona el marco teórico para revisar la evolución de la educación en emprendimiento y la complejidad de enmarcarla en un mismo concepto para dar respuesta a diferentes objetivos y audiencias. Centrados en las primeras etapas del proceso emprendedor, se exploran predictores de la intención de emprender y la sección se completa con la influencia de las competencias emprendedoras en ella y los diferentes marcos propuestos por estudios previos.
- El Capítulo 3 incluye la operacionalización de las preguntas de investigación abordadas en la tesis y las hipótesis que guían los experimentos llevados a cabo.
- El Capítulo 4 detalla la metodología seguida, describiendo los marcos teóricos seleccionados para la investigación, la selección de la muestra, la operacionalización de las variables para la elaboración del cuestionario, el procedimiento para recopilar los datos primarios y el método de análisis utilizado.
- El Capítulo 5 recoge los resultados y trata el papel de las competencias emprendedoras como predictores de la intención empresarial, las competencias específicas que muestran los resultados como más relevantes, y su evolución en el programa de educación en emprendimiento seleccionado en el estudio.
- Finalmente, el Capítulo 6 presenta las principales conclusiones e implicaciones de la tesis, así como las limitaciones y futuras líneas de investigación.

En resumen, como uno de los resultados perseguidos para la mayoría de los programas de educación en emprendimiento, la tesis pretende avanzar en la comprensión de qué competencias están más estrechamente relacionadas con una mayor intención emprendedora. De este modo, los resultados pueden contribuir al diseño de programas de educación en emprendimiento, y a la personalización de contenidos y métodos adaptados a las necesidades reales de los estudiantes, y orientar las mejores prácticas que realmente impacten en su intención y comportamiento futuro.

Abstract

The aim of this research is to explore how entrepreneurship education programs could increase entrepreneurship intention in the early stages of the entrepreneurship process through the development of specific competences.

The first natural element to consider in defining entrepreneurship is its economic dimension. In this sense, it is commonly accepted that entrepreneurship is a key activity aimed at a renewed and innovation-based growth. In fact, entrepreneurs are perceived as value creators in the form of new business ventures and as generators of new jobs by mobilizing economic resources, which in combination have a positive impact in terms of increased productivity and economic growth.

This pure economic concept has evolved during the last decade to place entrepreneurship as a new core skill for people. In this sense, the definition proposed by the Danish Foundation for Entrepreneurship & Young Enterprise and adopted by the European Commission states a further step that does not only apply to economic activities: *“Entrepreneurship is when you act upon opportunities and ideas and transform them into value for others. The value that is created can be financial, cultural, or social”*. From this perspective, an entrepreneurial mindset is pursued in all sectors and for all citizens and is not only aimed to launch new business but to generate value in general terms. In practical terms, entrepreneurship is considered as a set of competences that everybody should acquire and practice in all spheres of life.

In this context, it must be considered that the environment influences the entrepreneurship activity of a place and the lifecycles of the business ventures that belong to it. Then, the likelihood of entrepreneurs to succeed is affected by a larger number of factors such as availability of capital, skilled personnel, governmental policies and the communications and transportation infrastructure.

Among these elements, the role entrepreneurship education must play is one of the core issues. The relevance policies are granting to entrepreneurship education is clear, but complex questions arise: What entrepreneurial skills should be taught? What is the best methodology to teach them? Is success related to these skills? Are the same competences of equal relevance in the different stages of an entrepreneur? Should they be part of educational programs at all ages and levels?

Given the number of challenges around entrepreneurship education and skills, the aim of this thesis is to contribute to this complex and relevant debate by particularizing the exploration

of how entrepreneurship education programs could increase entrepreneurship intention in the early stages of the entrepreneurship process through the development of specific competences.

As a response to these research challenges, the present thesis is structured in five main sections:

- Chapter 1 provides an introductory overview of the concept of entrepreneurship and some of the core constituents to understand its conception from an economic activity to a personal skill that can be thought and learned.
- Chapter 2 provides the theoretical framework for reviewing the evolution of entrepreneurship education and the complexity of cover, under the same concept, different purposes for different audiences. Focused on early entrepreneurship stages, entrepreneurship intention predictors are explored. The section is completed with a discussion about the influence of entrepreneurship competences and the different frameworks that previous studies have proposed.
- Chapter 3 includes the operationalisation of the research questions addressed in the thesis and the hypotheses that lead the experiments that are conducted.
- Chapter 4 details the methodology followed, describing the selected theoretical frameworks for the research, the sample selection, the operationalisation of the variables for the elaboration of the questionnaire, the procedure for gathering the primary data and the method of analysis that is used.
- Chapter 5 gathers the results and discusses the role of entrepreneurship competences as predictors of entrepreneurship intention, the particular competences that results show are the most relevant, and their evolution in the selected entrepreneurship education programs in the experiments.
- Finally, Chapter 6 compiles the main conclusions and implications of the thesis, as well as the identified limitations and further avenues for research.

In a summary, as one of the outcomes pursued for most of the entrepreneurship education programs, this research contributes to an understanding of which competences are more closely related to higher entrepreneurship intention. Therefore, results can contribute to the design of entrepreneurship education programs, tailoring contents and methods to actual students' needs, and orienting best practices that really impact in their intention and future behaviour.

Resumen extendido

La educación en emprendimiento está experimentando un proceso de reinversión en el que los elementos clave identificados en la presente tesis ofrecen múltiples perspectivas y materializaciones.

Aunque el primer elemento natural al definir el concepto de emprendimiento es la dimensión económica, la aproximación ha evolucionado a lo largo de la última década para situarlo como una competencia clave para los ciudadanos en general, considerando que aún las habilidades necesarias para transformar las ideas en valor.

Con el objetivo de generar un clima favorable hacia el emprendimiento, desde las políticas públicas se ha considerado a la educación en emprendimiento como un facilitador hacia la igualdad de oportunidades y el desarrollo de las competencias necesarias para un nuevo paradigma de profesionales dentro de la sociedad del conocimiento. Sin embargo, bajo los conceptos de educación en emprendimiento, educación empresarial, emprendimiento en educación, educación para el emprendimiento, educación a través del emprendimiento o las diferencias entre cursos, programas y prácticas, emerge un escenario complejo que trata de distinguir el propósito de las distintas iniciativas y el público al que se dirigen. La parte común de todos ellos es el objetivo de desarrollar determinadas habilidades, que contribuyen en cada caso a un propósito concreto y en la presente tesis se propone un modelo en el que las iniciativas especifiquen el objetivo perseguido y la audiencia a la que van dirigidos, tanto para definir los programas como para ser capaces de medir su impacto.

Esta aproximación permite seguir un flujo para mejorar los contenidos, las metodologías y los objetivos de aprendizaje que se pretenden, que no son los mismos dependiendo de los dos elementos que deberían acompañar a cualquier iniciativa de educación en emprendimiento: para qué y para quién. El desarrollo de competencias constituye el principal objetivo, pero, por un lado, el rol que se le da a la educación en las políticas públicas vincula objetivos de carácter económico que dificultan la medición del impacto de los programas en sí, y por otro, las competencias que deben desarrollarse dependiendo de las distintas necesidades, continúan siendo un debate.

Dado el número de retos identificados en la parte teórica de la tesis, tanto en materia de educación en emprendimiento como de competencias, el objetivo de la investigación es contribuir a este complejo y relevante debate particularizando la exploración en cómo los programas de educación en emprendimiento podrían contribuir a aumentar la intención de emprender en las etapas tempranas del proceso emprendedor a través del desarrollo de las competencias que más relacionadas estén con esa intención de emprender.

Los objetivos específicos que se abordan se resumen a continuación:

- Explorar el concepto de educación en emprendimiento, así como la evolución en cuanto a los modelos propuestos y a los objetivos perseguidos.
- Entender el ciclo emprendedor para explorar las necesidades de los individuos en cada fase para el paso siguiente.
- Enfocado en potenciales emprendedores, explorar cómo la intención emprendedora puede explicarse a través de modelos teóricos que permitan implementar análisis cuantitativos, así como revisar los resultados de investigaciones previas en cuanto a los principales precedentes de la intención emprendedora.
- Explorar modelos de competencias emprendedoras en investigaciones previas y su presencia en los marcos de educación en emprendimiento.
- Explorar cómo las competencias emprendedoras pueden ser medidas y su potencial relación con la intención emprendedora.
- Proponer un instrumento para testar cómo programas de educación en emprendimiento específicos impactan en la intención emprendedora y la percepción de competencias.

Tomando como referencia el Entrepreneurship Competences Framework propuesto por la Comisión Europea (EntreComp), que se concibe como una guía común para inspirar la educación en emprendimiento, la parte cuantitativa de la tesis analiza un grupo de potenciales emprendedores, participantes en un programa de educación en emprendimiento, en cuanto a su percepción de competencias emprendedoras y la relación con la intención de emprender.

Considerando como modelo de referencia para explicar la intención emprendedora la Teoría del Comportamiento Planificado (TPB), los resultados obtenidos muestran una relación positiva entre las competencias y la intención. Este resultado abre una vía de investigación para explorar si la aplicación del TPB en el campo del emprendimiento podría ser enriquecida considerando las competencias.

El análisis de la intención confirma que la muestra de potenciales emprendedores bajo estudio comparte el común interés de iniciar un negocio y revela que esta intención no es significativamente distinta entre hombres y mujeres, a pesar de la hipótesis generalizada de que es menor en mujeres que en hombres.

El análisis factorial realizado sugiere una agrupación de las competencias que difiere del modelo teórico propuesto en el EntreComp. Éste propone tres áreas que siguen una

conceptualización orientada al proceso de transformar ideas en acción (*Opportunities & Ideas, Resources and Into Action*). Sin embargo, una agrupación orientada al propósito alineada con marcos existentes como Man et al.(2002), ofrece un mejor ajuste desde el punto de vista estadístico y resulta un modelo con cinco áreas: *competencias para ideas y oportunidades (ID)*, *compromiso (CC)*, *toma de decisiones (DM)*, *organización (OC)* y *conocimiento específico (SK)*.

Las competencias del área de ideas y oportunidades, referentes a la habilidad de identificar oportunidades y evaluar el potencial de las ideas, resultan las más influyentes en una mayor intención de emprender. Las dimensiones que incluyen las competencias relacionadas con el compromiso de trabajo en el negocio, el proceso de toma de decisiones y la organización, también resultan significativamente relacionadas con una mayor intención emprendedora.

Al contrario, el efecto de una mayor percepción en las competencias de conocimiento específico no ha sido validada en esta muestra. Este escenario está alineado con la tendencia evolutiva de la educación en emprendimiento, en la que el desarrollo de competencias “soft” ha empezado a jugar un papel mayor que los conocimientos puros de gestión y sugiere reforzar métodos que contribuyan al desarrollo de habilidades personales y a una mentalidad emprendedora, más que a conocimientos específicos de management.

Esta relación entre la percepción de competencias y la intención no resulta moderada por el género en esta muestra, a pesar de que la revisión de literatura realizada concluye que, en general, una percepción menor a nivel de competencias es más relevante para la intención de emprender en el caso de las mujeres, en el sentido de considera tener conocimientos, habilidades y experiencia.

Los resultados del análisis al principio del programa indican que esta muestra de potenciales emprendedores se percibe como perfiles multidisciplinarios con capacidad para “aprender haciendo”, trabajar en equipo, resolver problemas y sacar ventaja de los fracasos.

Al finalizar el programa, los resultados muestran que el programa ActuaUPM bajo análisis tuvo un impacto positivo en su intención emprendedora y en relación con las competencias, la muestra se puntúa por encima de la media en todas, y se obtienen diferencias significativas entre el grupo del experimento y el de control. La mayoría de las competencias resultan positivamente relacionadas con la intención, y las relaciones más significativas se centran en aquellas referentes a la habilidad de desarrollar nuevos productos y servicios y la determinación de transformar ideas en realidad, siendo resistente ante la presión, la adversidad y el fracaso temporal. Ambas resultan significativamente distintas al finalizar el programa entre el grupo del experimento y el de control, por lo que este programa, orientado al desarrollo de ideas

de negocio y su puesta en marcha, tiene un efecto positivo sobre aquellas competencias que efectivamente parecen estar más relacionadas con la intención.

De esta forma, el conjunto de la investigación teórica y cuantitativa realizadas responde a las siguientes cuestiones planteadas:

¿Puede la autopercepción de competencias emprendedoras contribuir a explicar la intención emprendedora?

La parte teórica revisa distintos modelos que han sido utilizados para explicar los precedentes de la intención emprendedora. La mayoría de las investigaciones concluyen que la Actitud es el principal factor, mientras que la percepción sobre una aceptación positiva o negativa del entorno ha sido parcialmente demostrada en algunos estudios y la percepción de tener capacidad para iniciar una actividad emprendedora (PBC) muestra una relación positiva, pero es abordado en menos estudios. Esta línea se sigue en esta tesis porque, aunque las características personales han sido el foco de la mayor parte de las investigaciones, el rol que la educación puede desempeñar es a través del desarrollo de competencias y la auto-percepción de éstas también está relacionada. El análisis desarrollado sobre la muestra de potenciales emprendedores bajo estudio confirma la Actitud como el parámetro con mayor influencia, pero valida la relevancia de la auto-percepción de competencias, contribuyendo a explicar la intención emprendedora de una manera similar al PBC del modelo original.

¿Cuáles son las competencias más relacionadas con la intención de emprender?

La tesis contribuye a apoyar estudios previos que apuntaban una relación positiva entre la percepción de competencias y la intención emprendedora. Particularmente, en esta muestra de potenciales emprendedores, las competencias del área de Ideas y oportunidades (ID), relativa a la capacidad de identificar oportunidades y evaluar su potencial valor resulta la más influyente hacia una mayor intención de emprender. Las dimensiones relativas al compromiso de trabajo en el proyecto (CC), el proceso de toma de decisiones (DM) y la organización (OC), también resultan positivamente relacionadas. Al contrario, el efecto de percibir un mayor conocimiento específico, como habilidades financieras o legales, no ha sido validado en esta muestra. Este escenario de relación competencias-intención está alineado con la evolución que han tenido los modelos de educación en emprendimiento, dando cada vez un mayor peso al desarrollo de habilidades personales frente a los conocimientos de gestión, y sugiere reforzar métodos que contribuyan a su desarrollo más que impartir conocimiento específico en las fases iniciales.

¿Cuál es el impacto de los programas de educación en emprendimiento sobre las competencias y la intención de emprender?

Como uno de los principales objetivos perseguidos por la mayoría de los programas de educación en emprendimiento, esta tesis contribuye al conocimiento de las competencias emprendedoras percibidas por un grupo de potenciales emprendedores, explorando diferencias por género y cuáles están más significativamente relacionadas con la intención de emprender, lo que puede contribuir a orientar las iniciativas.

Como contribución del análisis, la inclusión de métodos que promuevan competencias orientadas a la identificación de oportunidades, compromiso con el proyecto, toma de decisiones y organización, pueden contribuir a que los programas sean herramientas que promuevan la intención emprendedora en las fases iniciales. La incorporación de métodos que enseñen el uso de prototipos y la experimentación puede impactar en esta línea. El aprendizaje experiencial, la propuesta de soluciones a problemas, aprender haciendo y vinculando situaciones de la vida real, puede ser promovido en las clases mediante experiencias emprendedoras y observación de entornos reales para identificar oportunidades.

La incorporación de herramientas prácticas como la metodología Design Thinking, puede favorecer la evaluación del potencial de las ideas. Esta metodología establece una aproximación para testarlas, reflexionando e identificando problemas, con un conocimiento profundo de los potenciales usuarios, así como evaluar el valor generado para otros. El impacto de la metodología Design Thinking está actualmente infra estudiado a pesar de su potencial para desarrollar competencias emprendedoras.

Los resultados obtenidos pueden contribuir a diseñar programas de educación en emprendimiento, ajustando contenidos y métodos a las necesidades de los estudiantes y orientando mejores prácticas que realmente impacten en su intención y comportamiento futuro.

Palabras clave: educación en emprendimiento, competencias emprendedoras, EntreComp, intención emprendedora.

Extended abstract

Entrepreneurship education is experiencing a reinvention process in which the identified core elements in the present thesis offer multiple perspectives and materialisations.

Although the first natural element to consider in defining entrepreneurship is its economic dimension, the concept has evolved during the last decade to place entrepreneurship as a new core skill for people, considering it is desirable that all citizens have the ability to transform ideas into action.

With the goal of providing a positive climate towards entrepreneurship, policy efforts have been addressing entrepreneurship education as a progressively wider driver that contributes to equalise opportunities and increase skills needed for the new paradigm of professionals in a knowledge-based society. However, under the various concepts of entrepreneurship education, entrepreneurial education, enterprise education, entrepreneurship in education, education for entrepreneurship, education through entrepreneurship and the differences between programs, or trainings, emerges a paradigm that tries to distinguish the purposes of this type of education and the audience to it is aimed. The commonality about the different initiatives is the objective to develop particular skills, which contribute in each case to a specific purpose. In this research, a model to define the initiatives on entrepreneurship education is proposed, by specifying the purpose pursued and targeted audience targeted to both, define the programs and measure their impact.

This approach allows to follow a traceable flow to improve and adapt contents, methodologies and the outcomes pursued, which are not the same depending on the two elements that should accompany any reference to the entrepreneurship education initiative: for whom and for what. In this scheme, the development of skills is established as the main objective of entrepreneurship education but, economic indicators are usually linked to it in public policies which makes the impact difficult to measure and the competences that should be pursued based on the different needs, continue to be debated.

Given the number of challenges surrounding entrepreneurship education and the skills reflected in the theoretical review, the aim of this thesis is to contribute to this complex and relevant debate by particularizing the exploration of how entrepreneurship education programs could increase entrepreneurship intention in the early stages of the entrepreneurship process through the development of the specific competences most related to entrepreneurship intention.

Specific objectives addressed are:

- To explore the entrepreneurship education concept, evolution, models and outcomes pursued.
- To understand what the entrepreneurship activity lifecycle is and to explore the needs of individuals in each stage.
- Focused on potential entrepreneurs, to explore how entrepreneurship intention can be explained through theoretical models that allow the implementation of quantitative research and a review of previous research results about antecedents of entrepreneurship intention.
- To explore models of entrepreneurship competences in previous research and their presence in entrepreneurship educational frameworks.
- To explore how entrepreneurship competences can be measured and their potential relation with entrepreneurship intention.
- To propose an instrument in order to test how specific entrepreneurship education programs affect entrepreneurship intention and the perception of competences.

Taking as reference the Entrepreneurship Competences Framework proposed by the European Commission, which has emerged as a common guide to inspire entrepreneurship education, the quantitative part of the thesis analyses a paradigmatic group of potential entrepreneurs in an entrepreneurship education program with regard to their perceptions of competences and the link with entrepreneurial intentions.

Considering as model of reference the Theory of Planned Behaviour (TPB) to explain entrepreneurship intention, results obtained show that entrepreneurship competences are positively related to entrepreneurship intention. This result opens a path of research to explore if the particular application of the TPB model to entrepreneurship could be enriched by taking into account entrepreneurship competences

The analysis of entrepreneurship intention in this case study confirms that the sample of potential entrepreneurs share the common interest in initiating a business venture and reveals that entrepreneurship intention for both female and male profiles is not significantly different, despite the widespread hypothesis that entrepreneurship intention is lower in women than in men.

The factor analysis that was conducted suggests a clustering of competences that does not follow the theoretical groups proposed by the *EntreComp*. The *EntreComp* proposal offers a grouping on a process-based conceptualization to transform ideas into action (Opportunities & Ideas, Resources and Into Action). Nevertheless, a purpose-behaviour classification aligned with previous frameworks such as Man et al. (2002) fits a better statistical model and the resulting analysis considers five areas: *Opportunity and Ideas competences (ID)*, *Commitment competences*

(CC), *Decision making competences (DM)*, *Organising competences (OC)* and *Specific knowledge (SK)*.

The competences area of *opportunities and ideas*, which relates to the ability to identify opportunities and value the potential of ideas, results the most influential towards the entrepreneurship intention. The dimensions that include those competences related to the *commitment* to work on the business, the *decision-making* process and the *organisation*, also result significantly related to a higher entrepreneurship intention.

On the other hand, the effect of higher levels of *specific knowledge* on intention, such as financial or legal skills, has not been validated in this sample. This scenario of the relationship of competences-intention is aligned with trend in entrepreneurship education model, in which the development of soft skills plays a higher role than business or management contents and suggests the reinforcement of methods that contribute to the development of personal skills and an entrepreneurial mindset more than specific management knowledge.

Results show that this relation between competences perceived and entrepreneurship intention is not moderated by gender in this sample, despite previous research find the lack of competence perceived to be more important for women than men, in the sense of having the necessary knowledge, skills, and experience to be an entrepreneur.

Results from the analysis at the beginning of the program show these potential entrepreneurs perceived themselves as multidisciplinary profiles able to learn by doing, work in teams, solve problems and take advantage of mistakes.

After the program, results show that the ActuaUPM entrepreneurship program under study had a positive impact on the increase in their entrepreneurship intention.

With regard to entrepreneurship competences perceptions, the sample in the program rates themselves highly on all of them, and significant differences are found between the program and control groups. Most competences result significantly related to entrepreneurship intention; in particular, the higher correlations are found with those focused on the ability of *developing new products and services* and the *determination to turn ideas into action, being resilient under pressure, adversity and temporary failure*. Both competences result significantly different between the program and the control group. Thus, this program, oriented to the development of business ideas and their effective launch, has an effect on those competences that seem to be linked to a higher entrepreneurship intention.

Based on this discussion, the entire theoretical and quantitative research that has been developed, addresses the initial research questions:

Can self-perceived entrepreneurship competences contribute to explain entrepreneurship intention?

The theoretical part reviews different models that have been used to explain the antecedents of entrepreneurship intention. Most of the previous research has noted the Attitude as the main factor influencing the intention to become an entrepreneur, while the perception of the positive or negative acceptance of entrepreneurship in the environment has been partially supported in some studies and the perceived capability to perform the behavior (PBC) has shown a positive relation but is undertaken in fewer studies. This line of research is followed in this thesis because, although personal traits have been the main focus of previous research, the role that education can play is mainly through the development of competences, and the self-perceived skills also influence the entrepreneurship intention. The analysis performed over the sample of potential entrepreneurs under study confirms Attitude as the main factor of influence but also validates the relevance of self-perceived competences, contributing to explain entrepreneurship intention in a similar way to that of the Perceived Behavioral Control construct in the original TPB model.

Which competences are more related to entrepreneurship intention?

The thesis contributes to the support of previous studies that have noted a positive relationship between self-perceived competences and entrepreneurship intention. In particular, among the study's sample of potential entrepreneurs, results show that the competences area of *opportunities and ideas* (ID), which relates to the ability to identify opportunities and value the potential of ideas, is the most influential towards the entrepreneurship intention. The dimensions that include those competences related to the *commitment* to work on the business (CC), the *decision-making* process (DM) and the *organization* (OC), also result significantly related to a higher entrepreneurship intention. On the other hand, the effect of higher levels of *specific knowledge* (SK) on intention, such as financial or legal skills, has not been validated in this STEM sample. This scenario of the relationship competences-intention is aligned with trend in entrepreneurship education model, in which the development of soft skills plays a higher role than business or management contents and suggests the reinforcement of methods that contribute to the development of personal skills and an entrepreneurial mindset more than specific management knowledge in the early stages.

What is the impact of an entrepreneurship education program on competences and entrepreneurship intention?

As one of the outcomes pursued for most of the entrepreneurship education programs, this research contributes to an understanding of the entrepreneurship competences held by a group of potential entrepreneurs by identifying differences based on gender and exploring which ones are more closely related to higher entrepreneurship intention, which can contribute to orienting education initiatives.

Overall, as a contribution from the analysis, the inclusion of methods that promote competences oriented to the *identification of opportunities, commitment, decision-making* and *organisation* can contribute to entrepreneurship education programs as a tool that fosters entrepreneurship intention. Incorporating methods that teach the use of prototypes and experimentation in order to identify an opportunity in entrepreneurship education programs could positively affect entrepreneurship intention. Experiential learning, proposing solutions to problems, learning by doing and engaging in real-life situations can be promoted by the incorporation of entrepreneurship experiences in classes and real environment observations to identify opportunities.

The inclusion of practical tools such as Design Thinking methodology can favor the evaluation of the potential of ideas. The design thinking methodology sets an approach to test ideas, reflecting and identifying problems, deepen the understanding of potential users and evaluate the potential value for others. The impact of the Design Thinking methodology in entrepreneurship education is currently understudied in spite of its potential to develop entrepreneurship competences.

Results can contribute to the design of entrepreneurship education programs, tailoring contents and methods to actual students' needs, and orienting best practices that really impact in their intention and future behaviour.

Keywords: entrepreneurship education; entrepreneurship competences; EntreComp; entrepreneurship intention.

1 Introduction. The relevance of entrepreneurial human capital and education

1.1 Motivation

After five years of intense work, I would summarise a Ph.D. thesis as the process of nurturing a research novelty in a specific field in which the candidate offers new insights, perspective, reflections and results that contribute to guide the way forward in the corresponding scientific discipline. From my modest opinion, such a big challenge is only worth working on it if it can make us dream big too.

My Ph.D. started (2014-2015) with a reflection that soon led to a dream: if entrepreneurship is so important, it would be great to extend it to as many people as possible. If education is typically considered as the vehicle for knowledge acquisition, entrepreneurship education should play a central role at all levels. At that time, I started to dive into the topic of entrepreneurship revealing its complexity in terms of scope, definition, structure, methodologies, outputs, impact, etc. In addition, I realised the limited connection between entrepreneurship dynamics and people's needs and demands, and the offer of educational programs in entrepreneurship, which served to reinforce my interest in the topic.

These reflections are still relevant, as entrepreneurship education is experiencing a reinvention process for which the identified core elements of the present thesis offer multiple perspectives and materialisations, as will be explained. In turn, I decided to follow the research road to start pursuing the dream: I would like to contribute to a transformation of entrepreneurship education as a tool to empower people, making it universally accessible and, above all, fun.

1.2 Research in context

A first step to understand the implications of the present research work, is to introduce the notion of entrepreneurship to identify some of the constituent elements that characterise it as a complex phenomenon. Therefore, the definition and scope of entrepreneurship, the relevance of the context in entrepreneurial activity, and the inner dynamism of entrepreneurship are relevant features that affect the analysis and a further understanding of entrepreneurship education.

1.2.1 Definition: from economic activity to people competences

The first natural element to consider in defining entrepreneurship is its economic dimension. In this sense, it is commonly accepted that entrepreneurship is a key activity aimed at a renewed and innovation-based growth (Acs, Audretsch, Braunerhjelm, & Carlsson, 2012; Ács, Autio, & Szerb, 2014; D. B. Audretsch, Bönte, & Keilbach, 2008). In fact, entrepreneurs are perceived as value creators in the form of new business ventures and as generators of new jobs by mobilizing economic resources, which in combination have a positive impact in terms of increased productivity and economic growth (IEG World Bank, 2013).

International institutions like the United Nations (United Nations University, 2011) or the Organization for Economic Cooperation and Development (OECD, 2014) agree that innovation and entrepreneurship contribution are important for sustainable economic growth and for the material and non-material general welfare of society. Some authors have gone even further noting that the 21st century has implied a paradigm shift from the “managed economy”, based on large-scale and standardised production into the “entrepreneurial economy”, in which knowledge and innovation are the dominant elements (Thurik, 2009a; D. Audretsch & Thurik, 2004).

In this context, a lot of effort has been put into the promotion of entrepreneurship as an activity to generate positive economic dynamics, and on the study of entrepreneurs and their capabilities in the sense of generating value for others. Furthermore, both areas have emerged as key topics within public policies and educational initiatives.

As a research field, political economy views on the influence of entrepreneurship in economic development began to turn around in the 1970s–1980s, and entrepreneurs and venture creation gained more and more consideration (Thurik, 2009b). Although it is commonly considered a specific discipline in economics and management that has not yet matured (Landström, Harirchi, & Åström, 2012; L. W. Busenitz, Plummer, Klotz, Shahzad, & Rhoads, 2014; Ferreira, Reis, & Miranda, 2015), its scientific production has corresponded to a limited and fragmented research discipline until the early 2000s, due to the late attention paid to it by academia and the permeable boundaries of other fields (Schildt, Zahra, & Sillanpää, 2006; L. Busenitz, 2003).

Historically, entrepreneurship has been addressed from diverse disciplines such as psychology, anthropology, social sciences, and, obviously, economics and management studies (Carlsson et al., 2013; Shane & Venkataraman, 2000) but the lack of a unique conceptual framework, due mainly to the absence of a comprehensive and unanimous definition of the topic has been identified as one of the main gaps in research (Shane & Venkataraman, 2000).

For the purpose of this research, the framework drafted by the OECD-Eurostat Entrepreneurship Indicators Programme (EIP; Ahmad & Hoffmann, 2008) is considered as a comprehensive reference to the concept of entrepreneurship from an economic perspective. Therefore, according to EIP, the following definitions apply:

- Entrepreneurs are those persons (business owners) who seek to generate value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes or markets.
- Entrepreneurial activity is enterprising human action in pursuit of the generation of value, through the creation or expansion of economic activity, by identifying and exploiting new products, processes, or markets.
- Entrepreneurship is the phenomenon associated with entrepreneurial activity.

As stated before, the concept has evolved during the last decade to place entrepreneurship as a new core skill for people. In this sense, the definition proposed by the Danish Foundation for Entrepreneurship & Young Enterprise and adopted by the European Commission states a further step that does not only apply to economic activities “*Entrepreneurship is when you act upon opportunities and ideas and transform them into value for others. The value that is created can be financial, cultural, or social*”. From this perspective, an entrepreneurial mindset is pursued in all sectors and for all citizens and is not only aimed to launch new business but to generate value in general terms. In practical terms, entrepreneurship is considered as a set of competences that everybody should acquire and practice in all spheres of life.

The promotion of entrepreneurial mindsets as part of the core set of skills for future professionals’ profiles seems to be a must (European Council, 2006). A lot of policy efforts have been focused on fostering entrepreneurship activities however, the entrepreneurship intention rates are generally low. Despite the vibrant interest in building an entrepreneurial capability among citizens, there is not a common and clear definition about what entrepreneurial competences are (Bacigalupo, Kampylis, Punie, & Van den Brande, 2016).

Although entrepreneurship competences have usually been linked to management skills, it is assumed that entrepreneurship activities involve a wider range of competences than the management of businesses (Bird, 1995; Lerner & Almor, 2003; Man, Lau, & Chan, 2002). Entrepreneurship education has evolved following this approach, from when it was initially not considered a specific discipline that required a different methodology to that of standard business and management programs (Jones & English, 2001), now it addresses an alternative path through innovative teaching methods, contents and scope, particularly promoting abilities rather than

specific management knowledge (Boyles & College, 2012; Haase & Lautenschläger, 2011; Rae, 2005; Thrane, Blenker, Korsgaard, & Neergaard, 2016; Vesper & Gartner, 1997).

In particular, the EC adopted the concept of entrepreneurship competences as a set of abilities with the potential of shaping society through value creation at social, cultural or financial level (Bacigalupo et al., 2016), with the sense of entrepreneurship as one of the eight key competences necessary for a knowledge-based society¹. In this context, entrepreneurship education has acquired a natural growing relevance as a driver to promote entrepreneurship mindsets and activities by complementing the backgrounds of the different disciplines with business oriented methodologies, although the role that entrepreneurship education plays also continues under debate (Lorz, Mueller, & Volery, 2013; Rideout & Gray, 2013), as it will be presented.

1.2.2 Context: entrepreneurship ecosystem and the relevance of human capital

It is recognized that the environment influences the entrepreneurship activity of a place and the lifecycles of the business ventures that belong to it (Lundvall, 1992; Nelson, 1993; Freeman, 1995; Cooke, Uranga, & Etxebarria, 1997; Asheim & Isaksen, 2002; Cohen, 2006; Bernardez, 2009; Isenberg, 2010). The likelihood of entrepreneurs to succeed is affected by a larger number of factors such as availability of capital, skilled personnel, governmental policies and the communications and transportation infrastructure (Guterman, 2015).

Some scholars (Prahalad, 2004; Cohen, 2006; Bernardez, 2009) have coined the term “entrepreneurial ecosystem”, which gained popularity after the Harvard Business Review published Daniel Isenberg’s article *How to Start an Entrepreneurial Revolution?* (Isenberg, 2010). In that article, Daniel Isenberg defined the entrepreneurship ecosystem as “*the set of individual elements [...] that combine in complex ways*” and proposed a set of nine principles for creating an entrepreneurship ecosystem from the point of view of governments, insisting on the need for comprehensive strategies that take into account local conditions.

Since then, the entrepreneurial ecosystem has become an increasingly widespread concept and a number of scholars have defined and referred to the concept, such as Eduard J. Malecki (2011), Colin Mason and Ross Brown (2014), Peter Vogel (2013), Erik Stam (2014), Zoltan Acs, Saul Estrin, Tomasz Mickiewicz and László Szerb (2014) and Zoltan Acs, Erko Autio and László Szerb (2014). The concept have been also received remarkable contributions

¹ Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32006H0962>

by practitioners as Brad Feld (2012), or international institutions such as the World Economic Forum (2011,2014).

In this context the specific concept of “entrepreneurial ecosystem” arises fundamentally to illustrate the impact of framework conditions, such as public policies, culture or access to finance, to promote or disincentivise risky innovative initiatives in a given place and time.

Table 1. Entrepreneurial ecosystems frameworks description

Framework	Description
Babson College — Babson Entrepreneurship Ecosystem Project (BEEP)	An ecosystem as a dozen of elements gathered in six domains that interact in complex ways. It provides high-level definitions of relevant agents/elements per domain and permits the representation of any geographical level but does not provide specific indicators.
Organisation Economic Co-operation and Development (OECD) – Entrepreneurship Measurement Framework	The concept of ecosystem as the combination of three factors (opportunities, human capital and resources) affected by two transversal themes (culture and regulation). This is gathered in six key determinants. It is conceived at the national level and provides a range of indicators (comparability).
The Global Entrepreneurship and Development Institute (GEDI Institute) - Global Entrepreneurship and Development Index	Based on the theory of National System of Innovation, it is focused on the relevance of institutional frameworks and the key role of institutions. It is an index of indexes that allows comparability at the national level.
World Economic Forum (WEF) – Entrepreneurial ecosystem pillars	Focused on the enablers of entrepreneurial success from a theoretical point of view, categorising four main areas (personal, financial, business, environmental), and eight pillars, without specifying geographical level.
Council of Competitiveness (CoC) - Asset Mapping Roadmap	Noted eight categories to promote economic development at the local/regional level, with a focus on the role of networks.
World Bank - Doing Business project:	It provides objective measures of business regulations for local firms in 189 economies and selected cities at the subnational level.

As shown in Table 1, the rising interest in entrepreneurial ecosystems has been accompanied by several characterisations and evaluative frameworks provided by institutions of very different nature².

It is commonly accepted that the departing point for the research on entrepreneurial ecosystems is based on the models proposed by Daniel Isenberg and the Babson College in its “Babson Entrepreneurship Ecosystem Project (BEEP)”, and on the framework developed by the OECD’s Statistics Directorate within the context of the OECD-Eurostat Entrepreneurship Indicators Programme (EIP; Ahmad & Hoffmann, 2008; OECD, 2008). The model suggested by BEEP outlined six domains (policy, finance, culture, supports, human capital and markets) that include twelve elements (Leadership, Government, Financial Capital, Success Stories, Societal norms, Non-Government institutions, Support professions, Infrastructure, Educational institutions, Labour, Networks, Early Customers). EIP-OECD aims to assess policy makers and to create a consistent and comparable database of entrepreneurship indicators. The OECD framework considers three linked aspects when evaluating an entrepreneurial ecosystem: entrepreneurship determinants, those factors that affect the entrepreneurial performance in the ecosystem, which are classified in six themes (access to capital, R&D & technology, entrepreneurial capabilities, market conditions, regulatory framework and culture); the entrepreneurial performance, the status of the entrepreneurship in the considered area; and the impacts, the ultimate value created for the economy of the area derived by entrepreneurial activities.

Focused on the specific domains of the ecosystem frameworks, human capital typically refers to the education system and the skill level of the workforce. Therefore, human capital is the central domain in the context of the present research work. The following table resumes the areas and domains in which the different frameworks structure the entrepreneurial ecosystem. In particular, human capital is considered as one of the influencers’ domains in the entrepreneurial ecosystem by eight out of the nine models under review and the scientific literature shows that there is broad consensus that human capital matters for entrepreneurship (Shah, Burton, & Chin, 2016).

² Among different studies, the Aspen Network of Development Entrepreneurs (ANDE) elaborated one of the most comprehensive reviews about these frameworks. ANDE published in 2013 a methodological guide conceived with the aim of supporting the labour of practitioners in charge of assessing the entrepreneurial ecosystem in developing areas (ANDE, 2013). Before its completion, ANDE conducted an effective comparative study of nine evaluative frameworks from a broad range of scopes, including educational and research institutions (Babson College, George Mason University), international organizations (World Bank, Organisation Economic Co-operation and Development –OECD-) and institutions (World Economic Forum), private firms (Koltai and Company), associations (Council on Competitiveness, GSM Association) and even practitioner approaches (Victor Hwan).

Table 2. Categorisation of domains included in the entrepreneurial ecosystem diagnostic tools (Ande, 2013)

DOMAIN	BABSON	CoC	GEDi	RAINFOREST	6+6	GSMA	OECD	DOING BUSINESS	WEF
POLICY	√	√	√		√	√	√	√	√
FINANCE	√	√	√	√		√	√		√
INFRASTRUCTURE	√	√				√	√	√	√
MARKETS	√		√			√	√		
HUMAN CAPITAL	√	√	√	√	√	√	√		√
SUPPORT / SERVICES / CONNECTIONS	√	√	√		√	√	√		√
CULTURE	√	√	√	√	√	√	√		√
R&D / INNOVATION	√	√	√	√		√	√		
QUALITY OF LIFE		√							
MACROECONOMIC CONDITIONS							√		

The relation between human capital and entrepreneurship can be observed from the inputs of the entrepreneurial activity (capital investment, such as education or experience) and from the outcomes of human capital investments (knowledge and skills; Unger, Rauch, Frese, & Rosenbusch, 2011). In general terms, the research that is focused on causality effects among the background founders and the entrepreneurial success is split into two broad approaches: on the one side, the emphasis is on individual characteristics and, on the other side, the relevance of situational characteristics (Shah et al., 2016). Among the former, it is possible to distinguish those innate characteristics such as race, gender, religion, ethnicity, nationality, family background, personality or genetics and those achieved characteristics (product of choices and investment such as education and experience). Regarding situational characteristics, everything related to environmental factors (from cultural values, political climate and the regulatory environment to industry and organizational competitiveness and population demography) is included. Figure 1

schematizes from the personal perspective of entrepreneurs both lines of main factors affecting the entrepreneurship activity.

Figure 1. Scheme of the entrepreneurs' characteristics related to the entrepreneurship activity path. Own elaboration from Kauffman Foundation research (Shah et al., 2016)

Aimed to provide a positive climate towards entrepreneurship, the two variables in which it is possible to act from the human capital perspective are, therefore, the knowledge achieved by individuals and the environmental supporting opportunities. Policy efforts have been addressing both, but the education line of action has acquired a progressively wider relevance as an asset that contributes to equalise opportunities and increase skills needed for the new paradigm of professionals in a knowledge-based society (World Economic Forum, 2018). However, it is relevant to specify the outcomes pursued through entrepreneurship education initiatives, because the whole ecosystem affects the entrepreneurship activity and behaviour.

1.2.3 The dynamic nature of entrepreneurship

One fundamental attribute to redefine the concept of entrepreneurship and its connection to the context and the role of education, is the notion of dynamism. The conceptualisation of ecosystem frameworks as dynamic entities is a key topic given the lack of a specific time dimension in the current existing frameworks. This time dimension is directly linked to the natural

process of evolution of every entrepreneurial venture and the way startups and individuals build relations with other ecosystem agents that evolve over time.

One of the issues to be addressed is how to approach a dynamic representation of the ecosystem linked to the phases of the maturation process of innovative ventures and, consequently, to the evolution of individuals' needs. Furthermore, the set of skills and competences required for each individual evolve over time, and this is one of the central elements to frame the research objectives of the present thesis.

It is initially necessary to acknowledge the stages that individuals face in terms of the specific competences that they might require when they are involved in the entrepreneurship process of creating value. Drawing a parallel with the evolution of startups, there are a large number of classifications of the stages that can illustrate the dynamic nature of entrepreneurship. For example, the Global Entrepreneurship Institute proposes a roadmap called the Entrepreneurial Life Cycle that includes seven stages: Opportunity Recognition, Opportunity Focusing, Commitment of Resources, Market Entry, Full Launch and Growth, Maturity and Expansion and Liquidity Event.

In the same sense, Paul Graham establishes three phases of a successful startup from the perspective of growth patterns (Graham, 2012): (i) initial period to figure out their product with no growth, (ii) rapid growth reaching customers; and (iii) transformation into a big company where the growth is slow due to the limits of the market it serves.

Another commonly accepted model is the Life Cycle Model of Entrepreneurship proposed by the World Economic Forum (WEF 2014b), as it offers a top-level representation of the idea stage to the internationalisation phase that allows further refinement in sub-phases:

- Stand-up: entrepreneurship is an option. In this phase potential entrepreneurs can choose to start a business or choose another option (work as an employee, continue studying, etc).
- Start-up: the decision to start a business is taken. It is necessary to set up the start-up, get funds and launch the product.
- Scale-up: once the startup has proven viable, the next step is to grow up and proceed to internationalization.

Regardless of the stages or the reference models considered, the dynamic dimension of entrepreneurship is a central element for entrepreneurship education, as the needs and competences can vary depending on the particular circumstances of each individual, which in turn suggests the need to properly adapt programs, methodologies and contents, among other issues

that will be presented in subsequent sections of the thesis, as part of a lifelong learning experience as envisaged by the European Commission. Although previous research has addressed the study of the traits, characteristics and cognitive parameters related to entrepreneurship success, competences supporting business creation and the progressive entrepreneurship lifecycle remains as a gap (Morris, Webb, Fu, & Singhal, 2013).

1.2.4 The role of entrepreneurship education as a driver to foster entrepreneurship activity

Given the relevance of human capital in entrepreneurship, as it represents both the individuals and their skills and the organizations involved in nurturing intellectual talent, entrepreneurship education is considered essential for developing human capital competences (World Economic Forum, 2009).

A first analysis of the agents involved in this area suggests the relevance of primary and secondary schools, universities, technical colleges and schools, research centres and laboratories, technical parks and clusters, tech-transfer centres, business schools, accelerators, incubators and companies that generate skilled workers. It is framed as lifelong learning, through formal and informal education and from youth stages, towards higher education and further continuing education (Council of the European Union, 2018; European Council, 2006; World Economic Forum, 2009).

The European Commission has developed a wide policy framework for the promotion of entrepreneurship education. In its 2012 Communication *Rethinking education: Investing in skills for better socio-economic outcomes* (European Commission, 2012), it emphasizes transversal skills and, in particular, entrepreneurial skills and recommends that: '*Member States should foster entrepreneurial skills through new and creative ways of teaching and learning from primary schools onwards, alongside a focus from secondary to higher education on the opportunity of business creation as a career destination. Real world experience, through problem-based learning and enterprise links, should be embedded across all disciplines and tailored to all levels of education. All young people should benefit from at least one practical entrepreneurial experience before leaving compulsory education*'.

The Entrepreneurship 2020 Action Plan³, published in 2013, identified entrepreneurship education as one of the three areas for immediate intervention according to the results of public consultation (European Commission & EUC, 2012). In 2016, the report *Entrepreneurship*

³ https://ec.europa.eu/growth/smes/promoting-entrepreneurship/action-plan_en

Education at School in Europe, aims governments to review the educational framework to improve the entrepreneurial capabilities of citizens, highlighting that it is still an emerging area for entrepreneurship education strategy in Europe (European Commission/EACEA/Eurydice, 2016).

According to the European Commission⁴ "Entrepreneurship in Education is about inspiring entrepreneurial potential". The Horizon 2020 Strategy includes several initiatives which consider entrepreneurship education to be about enabling young people to develop the skills they need for life and work and assumes that crucial skills are teachable and must be integrated at all levels. In this sense, the initiative "Rethinking Education"⁵ includes, as one of the big four axis, the promotion of entrepreneurial skills.

Although the focus on economic activities is clear, the trend has been to open the entrepreneurship concept to more than financial projects. The European Commission in Recommendation 2006/962/EC on key competences for lifelong learning already included the sense of entrepreneurship as the ability to turn ideas into action through creativity, innovation and risk taking as well as the ability to plan and manage projects. As mentioned before, a further step is taken in 2016 when the Entrepreneurship Competences Framework (Bacigalupo et al., 2016) inside the European Commission is published and proposes the concept of Entrepreneurship as a competence, defined as *"the capacity to act upon opportunities and ideas to create value for others. The value created can be social, cultural, or financial"*. Further works have been developed with some practical cases and guidelines (McCallum E. et al., 2018) and as continuation of the Recommendation of 2006, the Recommendation of the Council of the European Union of 2018 highlights that *"investing in basic skills has become more relevant than ever"* (Council of the European Union, 2018). A non-exhaustive selection of the milestones p described in this section is included in Figure 2.

⁴ http://ec.europa.eu/education/policy/strategic-framework/entrepreneurship_en

⁵ http://ec.europa.eu/education/policy/multilingualism/rethinking-education_en

Figure 2. Entrepreneurship education and competences presence in Policy Agenda

Already in 2009, the World Economic Forum in its specific report about *Education for entrepreneurs* identified as main challenges the integration of local context in the tailoring of programs and initiatives, the promotion of exchanges of experience between educators, not only between schools and universities but also between academia and the business world, the acceptance of entrepreneurship more broadly within academia, the measurement of medium- and longer-term results and the scalability and penetration of education entrepreneurship programs mainly through technology (World Economic Forum, 2009).

The progressive approach to the promotion of competences for a new era, open the challenges related to the role entrepreneurship education must play. The relevance policies are granting to entrepreneurship education is clear, but complex questions arise: What entrepreneurial skills should be taught? What is the best methodology to teach them? Is success related to these skills? Are the same competences of equal relevance in the different stages of an entrepreneur? Should they be part of educational programs at all ages and levels?

Given the number of challenges around entrepreneurship education and skills, the aim of this thesis is to contribute to this complex and relevant debate by particularizing the exploration of how entrepreneurship education programs could increase entrepreneurship intention in the early stages of the entrepreneurship process through the development of specific competences.

1.3 Overview of the study

1.3.1 Research objectives

The aim of this research is to explore how entrepreneurship education programs could increase entrepreneurship intention in the early stages of the entrepreneurship process through the development of specific competences. Results can contribute to the design of entrepreneurship education programs, tailoring contents and methods to actual students' needs, and orienting best practices that really affect in their entrepreneurship intention and future behaviour.

This research aim is addressed through three research questions:

- Can self-perceived entrepreneurship competences contribute to explain entrepreneurship intention?
- What competences are more related to entrepreneurship intention?
- What is the impact of an entrepreneurship education program on competences and entrepreneurship intention?

This general aim of the thesis is addressed through the following specific objectives:

- To explore the entrepreneurship education concept, evolution, models and outcomes pursued.
- To understand what the entrepreneurship activity lifecycle is and to explore the needs of individuals in each stage.
- Focused on potential entrepreneurs, to explore how entrepreneurship intention can be explained through theoretical models that allow the implementation of quantitative research and previous research results about antecedents of entrepreneurship intention.
- To explore entrepreneurship competences models in previous research and their presence in entrepreneurship educational frameworks.
- To explore how entrepreneurship competences can be measured and their potential relation to entrepreneurship intention.
- To propose an instrument in order to test how specific entrepreneurship education programs affect entrepreneurship intention and competences.

1.3.2 Research method

The process of research is described following the onion model research stages proposed by Saunders, Lewis, & Thornhill (2009), which is highly adopted as an instrument that sets a

structured research path by layers. Beginning with the outer layer, the process covers the different steps towards the data collection methods and techniques. The research methodology is summarised in Figure 3.

Figure 3. Research methodology following the model proposed by Saunders et al. (2009)

- Research philosophy:** the research objectives are aimed at the exploration of the reality of entrepreneurs' perceptions and intentions, and the impact of education, as well as the use of theory to contribute proposals on a given issue to testing hypotheses. In this sense, from the epistemological perspective the research philosophy is pragmatic and from the ontological side, it is positivist. From this point, the first stage has been to conduct a literature review process aimed to consider the state of the art of research in the field and the identification of research questions that are transformed into hypotheses that can be tested. In a waterfall path, the literature review performed has been focused on the identification of previous conclusions about factors influencing entrepreneurship behaviour, the definition of entrepreneurship stages to narrow the samples under study, the exploration of models to study entrepreneurship intention, the research on entrepreneurship competences and the results previously obtained in experiments.
- Research Approach:** The research methodology has been developed following a deductive method, this is, from general to particular. Previous research is considered to

identify specific knowledge of entrepreneurship education, intentions and competences and questionnaires are created to test, through empirical observation, the hypothesis derived from the research questions.

- **Research strategies:** a survey strategy is used to collect data. A structured questionnaire is built with questions that allow the obtainment of quantitative parameters for the different constructs under analysis. The definition and operationalization of variables is described in Chapter 4, Methodology. The observation of the impact on self-perceived entrepreneurship attitudes, intentions and competences through entrepreneurship education programs is performed selecting a case study: the ActuaUPM entrepreneurship program. The case study approach provides a useful framework for the research to compare results among different entrepreneurship education programs.
- **Research Choice:** the research is performed with a mixed-method approach, combining quantitative and qualitative methodology.
- **Research time horizon:** a cross-sectional approach is needed to explore the results of the entrepreneurship education program under study. This is performed by designing a pretest–posttest experiment. Competences and entrepreneurship intention were measured both in the pretest (time 1—t1—before the start of the program) and the posttest (time 2—t2—when the program was over). The individuals who took the program formed the experimental or program group, and the individuals who did not take it formed the control group.
- **Analysis data and collection:** the final layer of the model addresses the process in which data are collected and analyzed. Primary data collection is chosen and the procedure follows the Bethlehem (2009) survey process. The selection of the sample is suitable for the focus on potential entrepreneur research. The individuals in the sample have joined an entrepreneurship education program because they already have a business idea to explore and potentially launch, but setup of the venture has not yet started (Kelley, Singer, & Herrington, 2016). The research design follows a pre-test – pos-test approach; consequently, answers are obtained at the beginning of the entrepreneurship program and at the end. Longitudinal studies could provide further research on the transformation of intention into behaviour, but this is a limitation linked to the period of thesis research. The procedure uses an online survey provider, which allows to avoid missing values and an accountability measure on time completion to discard non qualifying answers. The analysis is performed by using statistical methods: reliability tests, factor analysis,

multiple regression, correlation analysis and t-Students tests, deeply described in Chapter 4. SPSS software is used.

1.4 Thesis Outline

With the above goals, this thesis is structured in five main sections:

- Chapter 1 provides an introductory overview of the concept of entrepreneurship and some of the core constituents to understand its conception from an economic activity to a personal skill that can be thought and learned.
- Chapter 2 provides the theoretical framework for reviewing the evolution of entrepreneurship education and the complexity of cover, under the same concept, different purposes for different audiences. Focused on early entrepreneurship stages, entrepreneurship intention predictors are explored. The section is completed with a discussion about the influence of entrepreneurship competences and the different frameworks that previous studies have proposed.
- Chapter 3 includes the operationalisation of the research questions addressed in the thesis and the hypotheses that lead the experiments that are conducted.
- Chapter 4 details the methodology followed, describing the selected theoretical frameworks for the research, the sample selection, the operationalisation of the variables for the elaboration of the questionnaire, the procedure for gathering the primary data and the method of analysis that is used.
- Chapter 5 gathers the results and discusses the role of entrepreneurship competences as predictors of entrepreneurship intention, the particular competences that results show are the most relevant, and their evolution in the selected entrepreneurship education programs in the experiments.
- Finally, Chapter 6 compiles the main conclusions and implications of the thesis, as well as the identified limitations and further avenues for research.

2 Theoretical Framework

This chapter includes the main conclusions of the literature review performed. Considering entrepreneurship education as a driver, firstly the scope of this tool as a mean to foster entrepreneurship is described, followed by the main aspects that constitute research gaps on the field. From this, the process of review has followed a waterfall strategy, studying the different approaches of the entrepreneurship education concept, evolution and challenges regarding the need to define audience and purpose of each programs in order to be able to measure the effectiveness of contents and methods, and improve them to the expected outcomes.

From this general approach, the different entrepreneurship stages are described, and the focus is put on potential entrepreneurs, defined as those individuals with the intention of launching a business venture and therefore, specific models to explore entrepreneurship intention and previous research of the factors affecting are included. Among these, the role that entrepreneurship competences play on entrepreneurship intention results underexplored, being at the same time the main purpose of entrepreneurship education the development of competences.

In order to select a framework for the quantitative part of the research, the chapter ends with a revision of the entrepreneurship competences concept and different frameworks identified.

Figure 4. Theoretical Framework Diagram

2.1 Entrepreneurship Education: evolution and challenges

The lack of philosophical and didactical dimensions of entrepreneurship education has been addressed by many scholars (Brockhaus, 2001; Bechard & Gregoire, 2005; Schulte, 2007; Lackéus, 2015) and policy works (Valerio, Parton, & Robb, 2014), and continues being a field of research because of the multiple dimensions involved (Aadland & Aaboen, 2020).

As a generic model that offers a high scheme translating the commonly used teaching model in social sciences to the Entrepreneurship Education field, this research addresses the education entrepreneurship sections taking as reference the didactical model proposed by Fayolle & Gailly (2008) included in Figure 5.

Figure 5. Generic teaching model in entrepreneurship education (Fayolle & Gailly, 2008)

Regarding the philosophical layer, the concept and definition of entrepreneurship education continues being heterogeneous. The following section offers a deeper detail in both, the different approach to the concept of entrepreneurship education and the evolution on the design of programs since the eighties.

2.1.1 Concept

As far the entrepreneurship concept has been historically linked to the enterprise practices, without clearly boundaries between disciplines and having a relatively recent own space, the result of joining the words “education” and “entrepreneurship” has not even now a clearly and assumed definition. Although researchers have addressed the entrepreneurship

education field along last years, the specific definition or conceptualization of what entrepreneurship education is not usually included (Fayolle, 2013).

The literature review conducted offered different approaches and the trials to establish a common policy strategy from the European Commission include the debate about the difficulty for stakeholders in reaching a common understanding.

The wider approach is proposed by the European Commission. Following the identification of the “sense of initiative and entrepreneurship” as one of the Key Competences for Lifelong Learning in the 2006 Recommendation of the European Parliament and the Council, the concept of Entrepreneurship Education adopted is *“about learners developing the skills and mind-set to be able to turn creative ideas into entrepreneurial action. This is a key competence for all learners, supporting personal development, active citizenship, social inclusion and employability. It is relevant across the lifelong learning process, in all disciplines of learning and to all forms of education and training (formal, non-formal and informal) which contribute to an entrepreneurial spirit or behaviour, with or without a commercial objective”* (European Commission/EACEA/Eurydice, 2016).

This definition includes under the umbrella of entrepreneurship education the whole vision of three axes:

- Purpose pursued: entrepreneurial spirit or behaviour, with or without a commercial objective.
- Type of audience: for all learners (with application to supporting personal development, active citizenship, social inclusion and employability).
- Type of format: all forms of education and training (formal, non-formal and informal).

In the same sense but more ambiguous, the European Commission in its Strategic Framework for Entrepreneurship includes that *“Entrepreneurship in Education is about inspiring entrepreneurial potential”*⁶.

Nevertheless, differentiation on these three axes offer alternatives definition for this type of education, and different meanings of the concept of entrepreneurship education.

⁶ http://ec.europa.eu/education/policy/strategic-framework/entrepreneurship_en

This way, Entrepreneurship Education programs can be classified under *education* and *training* programs (Valerio et al., 2014). In this sense, while Entrepreneurship Education Programs *tend to focus on building knowledge and skills about entrepreneurship and target secondary or higher education students*, Entrepreneurship Training Programs *tend to focus on building knowledge and skills to start or operate an enterprise. These target potential entrepreneurs (e.g. vulnerable or unemployed individuals) and those who are already practicing (e.g. owners of small or high-growth potential enterprises).*

A further step is the proposal of the Quality Assurance Agency for Higher Education (2018) which tries to difference the business activity for which the development of competences is pursued and emerges the split into *Enterprise* and *Entrepreneurship Education* (Quality Assurance Agency for Higher Education, 2018b). In this sense, enterprise education is oriented “*to provide students enhanced impact through placements and activities that build links between academic institutions and external organisations. Enterprise competencies will be useful to those in employment, or those who become self-employed and work on a freelance or consultancy basis. It can help develop a ‘can-do’ confidence, a creative questioning approach, and a willingness to take risks, enabling individuals to manage workplace uncertainty and flexible working patterns and careers. Enterprising competencies, such as teamwork and the ability to demonstrate initiative and original thought, alongside self-discipline in starting tasks and completing them to deadline, are essential attributes that have been identified by employers as priorities*” while “entrepreneurship education” and “the development of entrepreneurial capacity” is “*not simply linked to employment. It provides competencies to lead a rewarding, self-determined professional life. Students will be well placed to add significant social, cultural and economic value to society through entrepreneurial activity throughout their careers. Entrepreneurship Education takes the next leap, and builds on these, introducing and developing business competencies that enable the journey towards start-up and new business development*”.

To include both purposes, sometimes it is used *Enterprise and entrepreneurship education*, which would cover the development of skills in the whole professional scope (See for example (Hannon, 2005).

Other approaches include under the term *Entrepreneurial Education*, the previous Enterprise and Entrepreneurship Education, omitting the mention to business dimension and would also include the personal development or entrepreneurial mindset in general (Erkkilä, 2000). However, the use of *entrepreneurial* is usually applied to refer the process of teaching and learning, in the sense that not entrepreneurship education could also be taught by through an entrepreneurial methodology.

Sometimes the concept is split into *education through entrepreneurship*, *for entrepreneurship* and *about entrepreneurship* but they are not really exclusive, in the sense that refers to the method, the purpose and the contents respectively (Lackéus, 2015).

It is not easy to clearly define a concept that involve different applications, targets and formats, but for this research thesis, we use the term Entrepreneurship Education adopting the wider concept proposed by the European Commission and particularizing the specific purpose, audience, and format in each case. In this sense, all initiatives will be under the concept of Entrepreneurship Education Programs, adding for which results and for whom it is promoted.

2.1.2 Historical Perspective: from business to competences

Entrepreneurship education programs started around 1980's and their popularity have been growing due to a wide range of initiatives progressively developed worldwide (Fayolle, 2013; Donald F. Kuratko, 2005).

Initially, entrepreneurship education was not considered a specific discipline that required a different methodology from standardized business and management programs (Jones & English, 2001). Given the evolving nature of business management, with more small and dynamic firms compared to large established corporations, and the conception of entrepreneurship as a competence potentially applicable to all spheres of life, a number of new approaches has addressed an alternative path for education through innovative methods of teaching, contents and scope.

The definition, design and purpose of these programs have been explored by many scholars since the eighties (Bechard & Gregoire, 2005). Two decades later, their research and development potential were considered at its infancy (Brockhaus, 2001; Schulte, 2007) and ten years later, the conception of the capabilities that should be taught continues under debate (Bacigalupo et al., 2016).

For the last ten years, the importance of these competences together with the method of teaching has increased and acquired more relevance in the research field (what should be taught and how).

Already in 2004, Kuratko & Hodgetts (2004) proposed a definition of entrepreneurship that involved much more than management knowledge *Entrepreneurship is a dynamic process of vision, change, and creation. It requires an application of energy and passion towards the creation and implementation of new ideas and creative solutions. Essential ingredients include the willingness to take calculated risks – in terms of time, equity or career; the ability to formulate*

an effective venture team; the creative skill to marshal needed resources; and fundamental skill of building solid business plan; and finally, the vision to recognise opportunity where other see chaos, contradiction, and confusion”.

In this sense, different authors have proposed models for entrepreneurship education that offer a combination of soft-capabilities and business knowledge. For instance Vesper & Gartner (1997) suggest the combination of personal developments and applied knowledge for business creation as the two main axis to build entrepreneurial oriented programs. It includes personal skills such as creativity and innovation, ethical self-assessment, networking, negotiating and deal-making, and enterprise basis like identifying and evaluating opportunities, developing entry strategies, constructing a business plan or finding capital. In the same sense, the model proposed by Rae (2005) includes three major common themes related to the entrepreneurial learning process balancing the method between contextual learning, personal and social emergence and the negotiated enterprise framework, which pretends to offer a blended learning experience with similar relevance on business knowledge and personal and social skills.

In 2009, the World Economic Forum in the report "Educating the Next Wave of Entrepreneurs" addresses the competence debate by suggesting a three components structure about what should be taught: personal development (confidence, motivate progress, strengthen the entrepreneurial mindset, foster a desire to achieve and inspire action), business knowledge (technical, financial literacy and skills to engage in self-employment, employment and in entrepreneurship that can lead to self-improvement) and entrepreneurial skills development (training in social skills, networking, creative problem solving, opportunity seeking, selling, interviewing, presentations, group leadership, community co-operation, dealing with bureaucracy, local cultural norms and how they affect business) (World Economic Forum, 2009)

Haase and Lautenschläger (2011) propose an integrative conceptual model of entrepreneurship education based on three pillars: the Know-what (hard skills related to business management), the Know-how (soft-skills related to communication and creativity skills) and the Know-why (related to personal attitude and motivations), concluding that it is not the knowledge to run a business what really lead in an entrepreneurial behaviour and therefore they do not see clear reason to include the Know-what in entrepreneurship education. The key should be the integration of a "learning by doing" methodology, with effect on the Know-how and with a role for the entrepreneurship educator as a conductor or facilitator, more than a classic teacher-lecturer approach. This will also impact on the motivation (the Know-why), which can be transmitted through role models and testimonies (Haase & Lautenschläger, 2011).

The review of Boyles & College (2012) about the 21st knowledge, skills and abilities regarding their application on undergraduate entrepreneurship education gathers a set of competences oriented to address current work challenges and opportunities, linked to entrepreneurs success objective and to be considered by educators when defining these programs. They propose a three categories approach: cognitive (knowledge structures to take decisions: opportunity recognition, alertness, evaluation of ideas, information processing), social (social processes and social behavior: relationships, networking, adaptation, ability to persuade, solving problem), and action-oriented (definition of goals, planning, monitor, adaptation) competences.

As a concluding remark, the evolution of the competences debate shows that personal skills have acquired a higher prominence in entrepreneurship education objectives but, as aforementioned, despite the vibrant interest on building an entrepreneurial capability among citizens, there is not a common and clear definition about what entrepreneurial competences are (Bacigalupo et al., 2016).

Furthermore, the revision of academic and institutional literature conducted offers different models combining cognitive and non-cognitive capabilities, with an increasing interest on the relevant role of those non-cognitive that require learning-by-doing methodologies (Lackéus, 2015) such as opportunity recognition, self-efficacy, perseverance, proactiveness, identity or ambiguity management potentially applied to all spheres of life, while business and management knowledge seem to lose relevance.

The debate is still open and, gathering previous research about entrepreneurship competences, including a comprehensive review of the academic and grey literature, an in-depth analysis of case studies, desk research and a set of iterative multi-stakeholder consultations, the *EntreComp* model within the European Commission's strategy for entrepreneurship (Bacigalupo et al., 2016) proposes a set of 15 competences that all together address the capacity to turn ideas into action. The framework focus on entrepreneurship competences as capabilities or abilities that can be trained to create learning outcomes.

The following figure offers a comprehensive picture of how entrepreneurial competences within educational programs have evolved along the last three decades, highlighting the drivers of change of the educational practice (contents, methods and focus) and its stages of development: (i) the genesis of the entrepreneurship education as an independent discipline from traditional and management that shares contents and methods; (ii) a second stage in which personal skills began to be considered as interesting entrepreneurship attributes that must be included in every program but maintaining the focus on the venture creation objective, (iii) and a third one in which competences linked to personal abilities gain space to the core business management tradition,

and there is an increasing interest in learning-by-doing methodologies, with a wider focus on general citizens due to their potential application in all spheres of life.

Figure 6. Entrepreneurship education evolution representation (own elaboration)

Based on the model proposed by (Fayolle & Gailly, 2008) to define entrepreneurship education programs, the dimensions under analysis considered in the research can be summarized as follows:

- Why? Objectives and Goals
- For whom? Audiences, Targets
- What? Contents, knowledge
- How? Methods, pedagogies
- For which results? Evaluations, Assessments

Traditionally, objectives of entrepreneurship education have been linked to the business management and creation but as seen in the policy initiatives, the development of an entrepreneurial mindset, towards the creation of value not only related to economic activity, has been progressively getting relevance.

Regarding the methodological approach, the traditional lecturer-centred passive learning style seems to be less effective than action-oriented methods, more experimental and process-based (Gibb, 2002; Lackeus, 2015; Rasmussen & Sørheim, 2006).

The evolution of contents has pivoted according to the purpose of these programs. While traditionally focused on the management orientation and the process of nurturing a new venture (Fayolle, 2013), many authors consider that the development of skills and capabilities needed to

become an entrepreneur should occupy a wider space when defining the programs (Boyles & College, 2012; Haase & Lautenschläger, 2011; Thrane et al., 2016).

Simultaneously, the conception of entrepreneurship as a competence applicable to a wider range of activities than launching a new business, including general professional and personal development, has promoted that not only specific business training takes place, but also the aspiration to integrate these capabilities as part of horizontal students curricula along the entire education cycle (Bacigalupo et al., 2016; European Commission, 2012, 2016; Lackéus, 2015; World Economic Forum, 2009).

Accordingly, also measurement of the success of these programs has evolved. Usually the indicators were linked to the number of ventures that students launch but even when the purpose of them is focused on economic entrepreneurship activity, the developmental level of students on each learning outcome (e.g. problem solving, creative thinking, teamwork, information literacy and integrative and applied learning, etc) has been considered a meaningful assessment to evaluate the impact of programs and more instruments are needed (Schneider, 2015)

2.1.3 Current challenges of entrepreneurship education

Already introduced in the first Chapter, entrepreneurship has acquired a great relevance in the policy agenda. A lot of initiatives have been created in order to foster entrepreneurial activity and the entrepreneurship education has emerged as a very relevant driver, with heterogeneous objectives pursued and a wide range of potential stages of application from primary schools to higher education.

Although the proliferation of entrepreneurship education programs in all levels, higher education, primary, secondary schools and non-formal trainings, is a fact, and public policies are increasingly supporting the promotion of entrepreneurship education as a driver, there is a need to reflect deeply on what we are talking about when fostering entrepreneurship education.

As Fayolle (2013) identified, two evolutions are needed to really define and perform entrepreneurship education programs adequate to the objectives pursued. Firstly, a more theoretical and conceptual research of the fields of entrepreneurship and education, that support the design of these courses and programs. Secondly, to reflect on the practices developed, being critical with the historical methods assumed.

After the previous revision, the analysis suggests that the promotion of any type of entrepreneurship education initiative, and particularly the policies aimed to promote

entrepreneurship education as a mean to make a better skilled society, must cover two strategic questions:

- Which is the result expected from entrepreneurship education?
- Who should be the audience of these trainings?

Objectives and audience should be a premise to define the programs because contents, methods and assessment should be adapted to them. There are a lot of challenges related to all these areas.

For the last decades, entrepreneurship education presence in academic research has also increased, and it is considered a source of entrepreneurial knowledge and experiences that contribute to reinforce students' capabilities (Boyles & College, 2012; Haase & Lautenschläger, 2011; Thrane et al., 2016).

Therefore, as part of the initiatives that can promote entrepreneurship in a whole, it should be considered as a tool to provide specific outcomes and to enhance citizens with better skills towards a disruptive and innovative professional framework but the economic dynamization linked to the entrepreneurship movement cannot be only pretended with entrepreneurship education programs.

The role of education should be narrowed to competences acquisition, to improve the human capital of the ecosystem, but when talking about entrepreneurship activity, the economic, social and political context must be in line (Valerio et al., 2014). Implementing competence-oriented education, training and learning is a must (Council of the European Union, 2018) and this is relevant because the heterogeneous goals of policy initiatives regarding entrepreneurship education should be transformed in specific outcomes depending on the audience of the entrepreneurship programs and their needs and should be measurables in order to adequate methods and contents.

Following the Fayolle (2013) model for entrepreneurship education, the theoretical review shows that there are gaps and challenges in all areas:

Objectives: the goals addressed under the concept of entrepreneurship education are heterogeneous and have evolved. The revision of the policy initiatives considering entrepreneurship education a key driver reflects different objectives regarding the promotion of self-employment or new businesses and the improvement of professional skills (Quality Assurance Agency for Higher Education, 2018a), the provision of general capabilities, to strengthen human capital, employability and competitiveness, the re-entrance to professional

market (Comisión de las Comunidades Europeas, 2006; Quality Assurance Agency for Higher Education, 2018a; Rodríguez & Vega, 2016; K. Wilson, 2008). There is a need to split the socio-economics objectives from the pedagogical ones, and the link between the contents and methods suitable according to the different objectives, defined in a clear and realistic way, has been pointed at in the past (Fayolle, 2013; Valerio et al., 2014) and continues under research.

Audiences: in the same sense, the target to whom the entrepreneurship education is aimed involves a huge range of groups including students of primary, secondary, higher education, vocational professionals, potential entrepreneurs, disadvantage sectors, senior professionals, citizens in general. There is a gap on the identification of the different needs of each of these targets and their transformation into objectives that work accordingly towards them.

Contents: the knowledge supposed to be taught has evolved. We could say that entrepreneurship education tries to provide the knowledge associated with the concept of entrepreneurs, and as far as this has not been static, neither the contents have been. Entrepreneurs are perceived as value creators in the form of new businesses ventures and as generators of new jobs by mobilizing economic resources, which in combination has a positive impact in terms of increasing productivity and economic growth (IEG World Bank, 2013). This economical-oriented approach has initially focused a lot the business management in the core of contents (Fayolle, 2013). The policy approach continues considering that, even when people do not chose to open and enterprise, the marketable skills are always useful (Valerio et al., 2014). However, progressively and in a wider approach, entrepreneurs skills have not been considered only linked to the business knowledge needed for the creation of new business, but to a set of capabilities oriented to the process of creating value for others, which have inspired educational contents further the management issues, covering techniques towards the opportunity identification, evaluation and exploitation of ideas, communication, leadership, among others that will be explained in following sections, and the debate about which these skills are continues open as well as their linked to different audience's needs and programs purposes.

Methods: referring the way to teach. Entrepreneurship education programs and research show a lot of different methodologies and as far as objectives and contents have evolved, also the methods used for the entrepreneurial learning. This way, literature research includes from classical lecture-oriented classes, to the use of case studies, business plan elaboration, action-oriented practices, experiential learning in both, theoretical environments and real-work world, internships and mentorships, etc.

More research is needed to compare the effectiveness among the different teaching methods (Fayolle, 2013) and which are the most adequate for the different results and audiences.

Assessment: evaluation of the impact of entrepreneurship education is a must. In social terms, policies have tried to explore if people who participate in entrepreneurship education programs are better prepared in professional general terms, obtaining positive results regarding the likelihood to start their own business, the innovation and successful of their companies, the steadiness of being employed and the better professional position (European Commission, 2015). Nevertheless, being very relevant the macro indicators, the particular assessment of each type of entrepreneurship education program is needed to really know if results pursued are obtained as learning outcomes. As summarized in the World Bank Report Entrepreneurship Education and Training Programs around the World: Dimensions for Success “*Rigorous impact evaluations are needed to determine- with greater precision- what works, how it works, and why it works*” (Valerio et al., 2014).

Considering the dimensions of this model of reference, research, policies and practitioners offer a huge amount of insights, non in a systematic way and mostly partially addressed. The question is...are these entrepreneurship education programs effective?

And any type of answer should consider a flow that link all the pieces to really perform a system in which the results obtained can be measurable and confronted with the objectives pursued. In this sense, an iteration of the model proposed by Fayolle & Gailly (2008) is shown in Figure 7, and used in the case study of the research of the thesis.

Figure 7. Model proposed to design and measure entrepreneurship education programs

Acknowledging the importance of education as driver for entrepreneurship take up, the notion of entrepreneurial competences and the way people learn and acquire new skills have gained momentum. In this context, from social or economic objectives, the debate turns into competences development need for the different audiences, as the capabilities or abilities that can

be trained to create learning outcomes through entrepreneurship education. Figure 8 represents the mapping of competences that should guide the objectives of the different entrepreneurship education programs, according to the purpose and the audience.

Figure 8. Representation of the mapping of competences that should guide Entrepreneurship Education programs according to the purpose and the audience.

As a contribution from this thesis, the research focus is on the identification of those competences that are related towards entrepreneurship intention in an entrepreneurship education program for potential entrepreneurs with the purpose of launching a business. Following sections describe more deeply the different stages of the audience and the behaviours pursued following the entrepreneurship lifecycle, previous research on entrepreneurship intention and the competences frameworks of reference.

2.2 Entrepreneurship lifecycle: entrepreneurs' stages

The WEF (World Economic Forum, 2014a) describes how the life cycle of an innovation driven entrepreneurial venture can be divided into three phases – stand up, start up and scale up, with different needs in each one. In the stand-up phase, the focus is to promote the attitudes and skills required to mobilize the desire and the ability to create scalable entrepreneurial ventures. In the start-up phase, the objective is to gather the resources to start a business, with a particular focus on access to capital for entrepreneurs and in the scale up, need are linked to enable ventures to scale, with a particular focus on collaborations that simultaneously improve the innovation capacity of all partners to create growth and jobs.

In this sense, since the late eighties, the study of the entrepreneurship activity phases has evolved from effectively “launching a business” as the landmark that defines the first stage to the current notion of the "idea to launch". From the high level phases approach of the WEF, the Global Entrepreneurship Institute proposes a more detailed roadmap called the Entrepreneurial Life Cycle that includes seven stages: Opportunity Recognition, Opportunity Focusing, Commitment of Resources, Market Entry, Full Launch and Growth, Maturity and Expansion and Liquidity Event (Price, 2004).

According to the entrepreneurship education concept previously described, programs can potentially benefit all audiences. Nevertheless, as far the stages require different needs, the purposes of the programs should consider which are the needs of the particular target, and consequently, define the learning outcomes and results that would apply.

As far as nascent entrepreneurs are considered those "actively involved in setting up a business they will own or co-own" (Kelley et al., 2016), it includes the moment in which the commitment of resources has started. It is separated a previous stage of "potential entrepreneurs" in which opportunities, knowledge and skills play a determinant role to the "conception" of a business, which can lead or not to the stage of nascent entrepreneurs when starting to creating the firm (Kelley et al., 2016).

Considering the commitment of resources (venture creation) the beginning of the start-up phase and aligned with the Global Entrepreneurship Monitor approach (Kelley et al., 2016) it involves market entry, persistence and growth intention. The scale-up stage will lead the maturity and expansion of the venture. Figure 9 summarize the stages and characteristics of individuals in each one.

Figure 9. Conceptualization of the entrepreneurship stages

Following this reasoning, early stages are mainly characterized by potential entrepreneurs, defined as those individuals with the intention of launching a business venture. In the earliest phase, known as “stand-up”, opportunities, knowledge and skills play a determinant role to the conception of a business, which can lead or not to the “start-up” phase when the firm is effectively launched (Kelley et al., 2016).

For the last three decades, some authors have defended the relevance of these potential entrepreneurs (Shapero, 1981) as the key for long-term resilience in communities and organizations, more than the success of the real jobs already created. Their preparation to recognize opportunities is relevant as antecedent of the entrepreneurial activity and entrepreneurial actions, specifically, the action of starting a business or becoming entrepreneur, are widely considered in the scientific literature on planned actions, this is, implying intentionality behind (Autio, Keeley, Klofsten, Parker, & Hay, 2001). This early stage is the focus of this research.

Given the interest of promoting an entrepreneurial culture and empowering society through new skills, our research efforts pay special attention to the early stages of entrepreneurship when the accumulation of potential can be transformed into entrepreneurship behavior.

2.3 Entrepreneurship Intention: the preliminary step to start up and predictors

As aforementioned, entrepreneurship has become important in the current economic context, being one of the key priorities for policy plans and initiatives as a means to foster economic and social progress (Arenal et al, 2017), especially in sectors related to the STEM disciplines because of their impact on innovation and economic growth (O’Shea, 2007). However, these efforts contrast with a relatively low entrepreneurship intention rate in some geographies (GEM⁷)⁸. As an example from a regional perspective, only 12% of 16-64 years old population has intention to start a business in the European Union, being even lower (9%) in European countries out of the UE; the same rate in North-America, 20.5% in Asia and Oceania and quite

⁷ <http://ec.europa.eu/social/main.jsp?catId=1223>

⁸ In the European Union only 10.8% of 16-64 years old population intend to start a business compared to 14.3% in North-America, 26.2% in Asia and Oceania, 32.3% in Latin-America and 33.4% in Africa (GEM, 2018).

higher in Latin-America (28.8%) and Africa (45.1%) (Xavier, Guelich, Kew, Nawangpalupi, & Velasco, 2014).

Particularizing the analysis for the case of Spain, global indexes show that, although with a positive trend, entrepreneurship intention is among the lowest ranking positions. In 2016 the entrepreneurship intention got the second lowest rate (5%) together with Malaysia (Global Entrepreneurship Research Association, 2017) from a list of 64 countries, in 2017 (Global Entrepreneurship Research Association, 2018) the third lowest position (5,6%) and in 2018, 6,2%, the fourth one (Global Entrepreneurship Research Association, 2019). The Total Early-stage entrepreneurship activity (TEA), referring to the 16-64 years old actively involved in setting a business or already business owner, show similar patterns (5,2% in 2016, 6,2% in 2017 and 6,4% in 2018).

As the intention to do something is considered the best single predictor of effectively doing it (Krueger & Brazeal, 1994), and recent meta-analysis confirm the relation between intentions and subsequent behaviours in the entrepreneurship field (Schlaegel & Koenig, 2014), the impact that education can have on entrepreneurship intention will sum into the policy aspiration to increase effective entrepreneurs (Schlaegel & Koenig, 2014).

2.3.1 Models

The exploration of the entrepreneurship intention has focused scholars' attention, particularly with the objective of understanding which are the main parameters of influence and obtaining better recipes to focus initiatives pursuing the creation of business.

While the first studies addressing the choice of an entrepreneurial career were focused on the influence of personality variables and history, social context and demographics, since the nineties the research consolidate as the most relevance determinants on the election of being an entrepreneur the social psychological variables, which evolved the models of research involving more proximal variables (Gelderen et al., 2008). As the intention to do something is considered the best single predictor of effectively doing it, including entrepreneurship (Krueger & Brazeal, 1994), intention models offer a better understanding in predicting behaviour than individual or situational variables, such as a personality or employment situation (Krueger, Reilly, & Carsrud, 2000).

Among the different intention models used to explain entrepreneurial actions, two theories have been widely used:

- the Shapero's model of the entrepreneurial event (SEE) (Shapero & Sokol, 1982) in which entrepreneurial intentions are derived from perceptions of desirability and feasibility, and propensity to act towards opportunities;
- and the Theory of Planned Behaviour (TPB) (Icek Ajzen, 1991), in which the attitude towards the behaviour (one's perception about the behaviour as positive or negative), the Subjective norm (one's perception about what people around are going to think about the behaviour) and Perceived behavioural control (one's perception about his/her own capabilities to the actual behaviour) are considered the main predictors of intentions.

Although with differences, both models share the explanation of intentions by willingness (in the case of TPB “attitudes” and in the Shapero's model, “desirability”) and capabilities (in the case of TPB “Perceived behavioural control” and in Shapero's “perceived feasibility”). The main differential aspect is that SEE assumes that only when something interrupts the inertia of lives, the human behaviour changes respectively to a previous situation to identify an opportunity available. On the contrary, TPB consider that exogenous characteristics (such as models of reference, or previous entrepreneurial experience) are indirect influencers on intentions and behaviours, in the sense that they affect by influencing the attitudes or self-perceived capability to perform the behaviour.

Additionally, the TPB includes the perception of the environment about the behaviour. Related with the increase interest on generate entrepreneurship ecosystems, this issue is relevant from the decision makers' perspective (policy, universities...), as far as the configuration of environmental conditions can be a factor of influence towards the entrepreneurship intention and TPB allows to consider the individuals perception about it. Particularly, the university as an institution is joining these trends with a view on contributing to the human capital for the entrepreneurial ecosystem (Graham, 2014) as a fundamental driver for entrepreneurship take up (Al Mamun, Binti Che Nawi, Dewiendren, & Fazira Binti Shamsudin, 2016).

Both models have been validated with strong statistical support (Krueger et al., 2000) but TPB has been widely used in studies related to entrepreneurship for the last twenty years and is considered highly consistent (Lortie & Castogiovanni, 2015; Tiago, Costa Dias Faria, de Almeida Couto, & Pinheiro Melo Borges Tiago, 2014). Following section goes deeper into the main results of previous research.

2.3.2 Factors affecting Entrepreneurship Intention

Most of the entrepreneurial intention research has been done over the premises of the Theory of Planned Behaviour (Icek Ajzen, 1991) that addresses the prediction of Intention (motivations to do something) and Behaviour (the fact of doing something) from the analysis of three personal variables: the Attitude towards the behaviour (one's perception about the behaviour as positive or negative), the Subjective norm (one's perception about what people around are going to think about the behaviour) and Perceived behavioural control (PBC) (one's perception about his/her own capabilities to the actual behaviour). The assumption behind is that having sufficient confident about the fact that the behaviour is possible and that the outcomes are positive are needed to really perform the behaviour (Autio et al., 2001).

It has been widely used in literature, mostly in a partial way, linking parts of the model: attitudes to intentions, PBC to intentions and intentions to behavior are supported in more than 90% of the cases, while subjective norms to intentions are supported in 86%, and the less explored relationship is PBC to behavior, with limited publications and empirically supported in the 50% of the cases (Lortie & Castogiovanni, 2015).

Results focused on the gender perspective do not offer a consensus about particular differences on these cognitive antecedents: while some of entrepreneurship intention studies identify context, subjective norms and culture as significant factors influencing by gender (Shinnar, Giacomini, & Janssen, 2012) other conclude without validation of the social context as determinant for intention (F. J. Santos, Roomi, & Linan, 2016). Regarding the attitude, although some studies conclude it is lower in women than in men but do not observe a different influence over intention by gender (F. J. Santos et al., 2016), others point to a general less entrepreneurial attitude in women as a factor of influence (Fuentes, Saco de Larriva, & Rodríguez, 2013). Research exploring the three antecedents together show similar influence of them for both gender and in different contexts (Minniti, 2014; Minniti & Nardone, 2007).

The TPB has also been tested by exploring some other personal attributes as mediators or influencers of the three personal variables of the model and towards intention. For instance autonomy, authority, self-realization, and economic opportunity as positive antecedents to attitudes (Kolvereid & Isaksen, 2006) or openness, conscientiousness, extraversion, agreeableness, and neuroticism as antecedents to PBC (Obschonka et al. 2010).

The role of self-efficacy in entrepreneurship has been extensively explored and it is explained as the perceived capability to perform a certain behaviour. Particularly the use of models of behaviour includes the self-efficacy (called perceived control behaviour in the TPB) as one of the antecedents of intention and behaviour, as far as actions seem to be linked more with

what people believe they can do than with objective facts (Markman, Baron, & Balkin, 2005). Conclusions notice that it is a good predictor of business creation and business growth (Oyeku et al., 2014). Particularly, recent literature compilation about the research of the entrepreneurial intention through TPB notices that more empirical research of PBC to Entrepreneurial Intentions relationship should be carried out (Lortie & Castogiovanni, 2015).

In this sense, most studies exploring factors that influence entrepreneurship intentions have mainly emphasised norms, attitudes and traits (Lortie & Castogiovanni, 2015; Tiago et al., 2014). While these have presented relevant insights into how differences in intentions arise between individuals and how education can affect these intentions (Entrialgo & Iglesias, 2016; Liñán, Rodríguez-Cohard, & Rueda-Cantuche, 2011), the main output of education is competence development and, although research notes that initiating a business is affected by the fostering of skills and knowledge (Kelley et al., 2016; Sánchez, 2013; G. Santos, Marques, & Ferreira, 2018), the relationship between competences and entrepreneurship intention has gained much less attention.

2.3.3 Entrepreneurship Competences and Entrepreneurship Intention

Research notices that initiating a business is affected also by fostering entrepreneurs traits, skills and knowledge (Kelley et al., 2016; Sánchez, 2013). In this sense, the TPB has been tested by exploring some personal attributes as mediators or influencers towards intention. For instance autonomy, authority, self-realization, and economic opportunity as positive antecedents to attitudes (Kolvereid & Isaksen, 2006) or openness, conscientiousness, extraversion, agreeableness, and neuroticism have been analysed (Obschonka et al. 2010). However, most of the existing analysis focuses on personal traits, rather than in knowledge or skills that can be acquired on a learning process.

Beyond traits, competences, as the combination of knowledge and skills, have a long tradition of being considered an intrinsic attribute of an individual that can be used to predict the behaviour (Spencer Jr. & Spencer, 1993). In particular, the competences that are considered relevant to foster entrepreneurship has been the subject of considerable research for the last decade, however without a common and clear definition about what entrepreneurial competences are yet as mentioned before (Bacigalupo et al., 2016).

Previous studies working on the detection of the competences that are relevant for effective entrepreneurship offer a wide range of insights, usually exploring them in an isolated or partial way. For instance, starting from a list of 20 competences commonly considered key in literature, Robles & Zárraga-Rodríguez (2015) identify strong influence of these nine: risk

assumption, initiative, responsibility, dynamism, troubleshooting, search and analysis of information, results orientation, change management and quality of work, while others frequently considered do not obtained consensus: social networks development, self-control and social mobility (Robles & Zárraga-Rodríguez, 2015). Morris et al., (2013), from a conceptual framework composed by 13 competences, find influence towards the entrepreneurship behaviour on *opportunity recognition*, *opportunity assessment*, *resource leveraging*, and *developing business models*, as well as attitudinal competencies, including *resilience*, *self-efficacy*, and *tenacity*.

Splitting the competences between soft and hard, some studies find significant effect on intention of initiative, self-confidence and assertiveness (considered soft) and human resources capability competency and production capability competency (considered hard) (Riyanti, Sandroto, & D.W, 2016). Other analysis concludes that the ability to recognize income-generating opportunities, entrepreneurial training and skills, innovativeness, and information-seeking competencies have a significant effect on entrepreneurial intention (Al Mamun et al., 2016).. Self-efficacy is also widely considered to effect the intention to become an entrepreneur (Liñán & Fayolle, 2015; Lortie & Castogiovanni, 2015). Action-oriented competences have been considered as key necessary abilities in previous models reported in the literature (Boyles & College, 2012).

The opportunity recognition capacity is considered one of the most important attributes for successful entrepreneurs (Dimov, 2007) and, despite of the creativeness or motivation of the potential entrepreneur, some scholars notice that without identifying opportunities to target, entrepreneurial activity does not take place (Short, Ketchen, Shook, & Ireland, 2010). As an antecedent of entrepreneurial intention, attitude and behaviour, it has been used to expand models of intention such as the TPB, obtaining positive relation enabling action (Dimov, 2007). However, recent studies consider that more research should be done in order to explore the relationships between one's intentions to launch a new business and the same person's ability to recognize an entrepreneurial opportunity (Lortie & Castogiovanni, 2015).

If the relationship between competences and entrepreneurship intention has not been deeply treated in research, the understanding of competences perceived by female entrepreneurs and the relationship of their acquisition to the different venture stages are understudied topics, despite its importance when designing education and training initiatives (Mitchelmore & Rowley, 2013).

The research literature notes that, in the case of women, a more unfavourable perception of the environment affect more towards a lower entrepreneurship intention (Díaz-García &

Jiménez-Moreno, 2010; Langowitz & Minniti, 2007) and more pessimistic perception of business opportunities (Camelo-Ordaz, Diáñez-González, & Ruiz-Navarro, 2016; Díaz-Casero, Sanchez, & Postigo, 2002; Jack & Anderson, 2002).

Regarding self-efficacy, its effect on entrepreneurship intention seems to be stronger for women (F. Wilson, Kickul, & Marlino, 2007), in the sense that the perception of having the abilities considered necessary to run a business is more determinant to orient an entrepreneurial career. Other empirical analysis, however, conclude that entrepreneurial intentions and self-efficacy are not moderated by gender (Campo, 2011). The perception of self-efficiency, linked to the management of resources, is considered a factor of influence (Camelo-Ordaz et al., 2016; Díaz-García & Jiménez-Moreno, 2010) and the fear of failure, related to perseverance, is noted as one of the main factors explaining lower intentions in women than in men (Camelo-Ordaz et al., 2016).

There are few studies of entrepreneurship intentions that include samples of women in STEM (Morton, Huang-Saad, & Libarkin, 2016). Sánchez Cañizares and Fuentes García (2010) found that the gap in entrepreneurship intention is higher in the STEM fields than in social sciences, law or business majors. In this study, female students give a greater relevance as obstacles to set up a business their lack of business know how, the fear of failure and ridicule, as well as doubts regarding their own entrepreneurial capacity. Personal characteristics positively related to entrepreneurship intentions were moderated by gender, being independence at work, perseverance, creativity and tackling difficulties very relevant to women, whereas addressing new challenges and take moderating risks are more relevant to men, and having initiative is relevant to both.

With a gender perspective, the differences between the influence of the competences perceived by gender has neither reached a consensus but some recent studies about women entrepreneur candidates conclude that the PBC is the most important predictor of their entrepreneurial intention (Sen, Yilmaz, & Ari, 2018). When exploring the relation between the perception of barriers and entrepreneurship intention previous research also finds the lack of competence to be more important for women than men, in the sense of having the necessary knowledge, skills, and experience to be an entrepreneur (Shinnar et al., 2012).

In this sense, although many scholars have explored the definition, design and purpose of entrepreneurship education programs (EEP) since the 1980s (Bechard & Gregoire, 2005), including attempts to identify the key entrepreneurship competences for higher education organisations in order to help develop them (Robles & Zárraga-Rodríguez, 2015), there is still debate about the conception of the abilities that should be taught (Bacigalupo et al., 2016).

2.3.4 Entrepreneurship Education and Entrepreneurship Intention

Traditionally, entrepreneurship education has been focused on providing business knowledge that encourage and improve the performance of ventures creation (Jones & English, 2001). This way, the exploration of the entrepreneurship intention has attracted scholars' attention, particularly with the objective of understanding which are the main parameters of influence and obtaining better recipes to focus initiatives pursuing the creation of a new venture.

Although the influence of entrepreneurship education and entrepreneurship intention has not received comparable attention from the academia in comparison to the amount of studies about personal traits or family background, previous research considered entrepreneurship education as one of the most influential tools to improve entrepreneurial attitudes (Liñán et al., 2011).

Most empirical studies in which authors make pre- and post-treatment note that entrepreneurship education programs have a positive impact on the entrepreneurship intentions of students (Mueller, 2011; Sánchez, 2013; Souitaris, Zerbini, & Al-Laham, 2007), but some others see a negative effect (Oosterbeek, van Praag, & Ijsselstein, 2010; Patricia & Silangen, 2016), particularly on female university students (Westhead & Solesvik, 2004). Derived from this gap, to know more about the competences that people who hold entrepreneurship intention perceive, the potential differences by gender and the relationship with a higher or lower intention emerge as a field of interest.

Studies exploring the impact of particular entrepreneurship education programs over specific promoted capabilities notice that self-efficacy, proactiveness and risk “tolerance” seem to be increased through the programs and are positively affecting the entrepreneurship intention (Sánchez, 2013). Other studies evidenced that particular competencies remained stable while others can be enhanced based on exposure to an entrepreneurship program and intense experiential learning such as opportunity recognition (the capacity to perceive changed conditions or overlooked possibilities in the environment that represent potential sources of profit or return to a venture), risk management (reduce the probability of a risk occurring or reduce the potential impact), resource leverage / bootstrapping (skills at accessing resources one does not necessarily own or control to accomplish personal ends), guerrilla skills (the capacity to take advantage of one's surroundings, employ unconventional, low-cost tactics not recognized by others, and do more with less), value creation (capabilities of developing new products, services, and/or business models that generate revenues exceeding their costs and produce sufficient user benefits to bring about a fair return), resilience (ability to cope with stresses and disturbances such that one remains well, recovers, or even thrives in the face of adversity), building and using networks (social

interaction skills that enable an individual to establish, develop, and maintain sets of relationships with others who assist them in advancing their work or career) (Morris et al., 2013). The process to identify opportunities can be understood with two different perspectives: the fact that opportunities surround potential entrepreneurs and they can be identified (active search, passive search and fortuitous discovery) or the approach that they can be created (creation of opportunities) (DeTienne & Chandler, 2004). Although with different level of creativity, from our view both involves the capacity to recognize innovative challenges and take advantage of them. Literature review shows that education can play a role improving this ability (DeTienne & Chandler, 2004; Liñán et al., 2011). Particularly DeTienne & Chandler (2016) focused on the passive search, as far as it involves creativity as a learnable characteristic and test the impact over two indicators, the number of ideas and their innovativeness, obtaining positive results after a training based on the proposed SEEC methodology (securing, expanding, exposing and challenging inspired on Epstein (1996)). This approach implies that not only the pure recognition of opportunities is key, but the way in which they can be addressed.

Additional references reinforces the positive impact of entrepreneurship education programs over the entrepreneurship intention (Liñán & Fayolle, 2015), however, it is highlighted the need for more precise analysis (Lorz et al., 2013; Rideout & Gray, 2013) and specially the link between education, lecturing methodologies and contents (Liñán & Fayolle, 2015).

2.4 Entrepreneurship Competences: selecting a framework of reference

2.4.1 Concept

Competences are understood as the set of skills and knowledge that a person achieves through education or experience (Bacigalupo et al., 2016; Burgoyne, 1993; Cheng, Dainty, & Moore, 2003; Man et al., 2002; Parry, 1998). They are considered personal attributes that affect the decisions we take and the way we put them into action and, consequently, they can foster or decrease our intentions to do something (Spencer Jr. and Spencer, 1993). Among the mechanism of personal agency, the Social Cognitive Theory point the relevance of people's beliefs about their capabilities -*self-efficacy perception*- to exercise control over events that affect their lives is considered determinant (Bandura, 1989), being the actions more affected by what people believe they can do than with objective facts (Markman et al., 2005).

The concept of entrepreneurship competences has acquired a great relevance in recent decades because of the importance that entrepreneurship has gained as an economic driver in society, and due to the conception of entrepreneurs as individuals with the capacity to create value, usually linked to the creation and development of businesses but desirable for society in general (Council of the European Union, 2018; IEG World Bank, 2013). In this sense, as aforementioned,

entrepreneurship intentions, their configuration and what influences them, have been extensively explored in research, although basically linked to three precedents: a positive or negative attitude towards a career as an entrepreneur, the perceived capability to start a business and the perception of the social acceptance (Lortie and Castogiovanni, 2015; Micaela et al., 2014).

Nevertheless, competences also play a role in entrepreneurship intentions and education is considered an enabler (Kelley et al., 2016; Sánchez, 2013). Their presence on policy agendas, and specifically via entrepreneurship education, has been increased as a facilitator of these entrepreneurship competences, that can be trained and developed (Burgoyne, 1993; Parry, 1998). There is still, however, debate about what these entrepreneurship competences are, and which are more related to the intention to start a business (Bacigalupo et al., 2016).

2.4.2 Overview of relevant frameworks of competences

Although entrepreneurship competences have been usually linked to management skills it is commonly accepted that entrepreneurship activities involve a wider range of competences beyond the management of businesses (Bird, 1995; Lerner & Almor, 2003; Man et al., 2002).

One of the main challenges in research has been to group these entrepreneurship competences into comprehensive categories in order to provide further understanding and insights (Gianesini, Cubico, Favretto, & Leitão, 2018).

Bird (1995) defined entrepreneurial competencies as *“underlying characteristics such as generic and specific knowledge, motives, traits, self-images, social roles, and skills which result in venture birth, survival, and/or growth”*.

Man, et al. (2002) suggested that *“entrepreneurial competencies are considered a higher-level characteristic encompassing personality traits, skills and knowledge, and therefore can be seen as the total ability of the entrepreneur to perform a job role successfully”* and reviewed research into partial competences in order to propose a framework including six categories: *opportunity competences*, including those related to the recognition opportunities in the market, *relationship competences*, referring to interaction with people, *conceptual competences*, such as risk taking or being proactive, *organising competences*, such as team building or leadership, *strategic competences*, including project management, and *commitment competences*, including the ability to work hard.

The model proposed by Bartram (2005) establishes eight broad competences clusters that integrates abilities, personality, and motivation performance: *leading and deciding, Supporting and cooperating, interacting and presenting, analysing and interpreting, creating and*

conceptualizing, organizing and executing, adapting and coping, enterprising and performing. Mitchelmore and Rowley (2010; 2013) also proposed a conceptual framework, using a literature review to create four categories: *entrepreneurial competencies, business and management competencies, human relations competencies* and *conceptual and relationship competencies*, reporting the difficulties to narrow the definitions of competences, competencies, skills or abilities, the separation between personal traits and knowledge acquired and the needs to deep into specific research involving women.

The model proposed by Morris et al., (2013) includes a core of 13 entrepreneurial competences into three categories: signification (individuals search for environmental change), legitimation (interpretation and evaluation of this change) and domination (respond to this change). It includes *opportunity recognition, opportunity assessment, risk management/mitigation, conveying a compelling vision, tenacity/perseverance, creative problem solving/imaginativeness, resource leveraging, guerrilla skills, value creation, maintain focus yet adapt, resilience, self-efficacy and building and using networks.*

Five dimensions are included in the competences framework proposed by (Lee, Lee, & Shim, 2016) *Opportunity competencies, Administrative competencies, Relationships Competencies, Personal Competencies* and *Commitment competencies*. The self-perception of entrepreneurship competences and their relationship towards intention has been also addressed under the concept of *self-efficacy*, understood as people's beliefs about their capabilities to produce effects which operate action through motivational, cognitive, and affective intervening processes (Bandura, 1989, 1994). In this sense the *Entrepreneurial self-efficacy construct (ESE)* proposed by (Chen, Gene Greene, & Crick, 1998) include the self-perception of 22 competences grouped into five categories: *marketing, innovation, management, risk-taking, and financial control*. Based on Mueller (2001), Fernández-Pérez et al., (2019) defines self-efficacy with five self-perceived capabilities related to *idea definition, business plan, negotiation, opportunity recognition* and *financial relationship* and, considering *emotional competences* as antecedents of entrepreneurship attitudes and self-efficacy, include a framework of five additional dimensions: *self-awareness, self-regulation, motivation, empathy* and *social skills*.

In general, previous studies working on the identification of competences that are relevant for effective entrepreneurship offer a wide range of insights, but usually explore them in an isolated or partial way.

The debate is still open and, focused on entrepreneurship competences as capabilities or abilities that can be trained to create learning outcomes, the *EntreComp* model within the European Commission's strategy for entrepreneurship (Bacigalupo et al., 2016) proposes a set of

15 competences that all together address the capacity to turn ideas into action. The framework gathers previous research about entrepreneurship competences, including a comprehensive review of the academic and grey literature, an in-depth analysis of case studies, desk research and a set of iterative multi-stakeholder consultations.

The interest on this framework emerges because it has been developed as a potential common reference with which to shape all types of education and training programs in order to provide citizens with the competences that are considered potentially applicable to all spheres of life, highlighting three core aspects connected to personal and professional development, including the creation of new businesses. The categorisation proposed is innovative because abilities are included according to the phases that have been identified in the process of taking ideas to reality: *identification of ideas*, *resources management* and *into action*. The conceptualisation is based on a theoretical approach which the authors suggest that over time will be further elaborated and refined to address the particular needs of specific target groups.

We contribute to adding a quantitative dimension by proposing a set of variables that allow the perceptions of the set of competences in a particular group of potential STEM entrepreneurs to be measured, exploring whether the theoretical grouping is statistically supported and selecting those competences that result more linked to entrepreneurship intention. Characterized as self-perceived competences related to orient entrepreneurship intention, the instrument can be considered a proposal for *self-efficacy* scale.

Figure 10. Entrepreneurship competences frameworks (non-exhaustive selection)

2.4.3 EntreComp: definition, purpose and use in Academia

The promotion of entrepreneurial mindsets as part of the core set of skills for future professionals profiles seems to be a must, however, despite the vibrant interest on building an entrepreneurial capability among citizens, there is not a common and clear definition about what entrepreneurial competences are (Bacigalupo et al., 2016) and the role that entrepreneurship education plays (Lorz et al., 2013; Rideout & Gray, 2013). In this sense, the *EntreComp* model within the European Commission's strategy for entrepreneurship (Bacigalupo et al., 2016) emerges to build consensus around a common understanding of entrepreneurship competence by defining 3 competence areas, a list of 15 competences, learning out-comes and proficiency levels, and as a framework that can commonly guide entrepreneurship education. Its aim is to propose a common conceptual approach to support the development of entrepreneurship competence at European level and guide any initiative that aims to foster entrepreneurship understanding the acquisition of entrepreneurship competence as a bridge between education and work.

Therefore, the EntreComp pursues:

- To propose a definition for entrepreneurship as a competence
- To develop the reference framework describing its components in terms of knowledge, skills and attitudes
- To provide European citizens with the appropriate tools to assess and effectively develop this key competence

The framework gathers previous research about entrepreneurship competences, including a comprehensive review of the academic and grey literature, an in-depth analysis of case studies, desk research and a set of iterative multi-stakeholder consultations and proposes the following definition "Entrepreneurship as a competence is defined as the capacity to act upon opportunities and ideas to create value for others. The value created can be social, cultural, or financial."

Entrepreneurship competence in this sense, would apply to all spheres of life, being an enabler for personal and social development, professional profiles to enter the job market, and to start-up or scale-up ventures.

It is conceived as inspiration to reform method and contents in formal education and training, to design practical entrepreneurial experiences in non-formal learning context and the development of tools for citizens to evaluate their own entrepreneurial proficiency.

Although detailed in the methodology section to operationalize the variables, the competences proposed are summarized in Table 3.

Table 3. Areas and competences proposed by the EntrComp

Area	Competences	Hint	Descriptors
Ideas as opportunities	1.1 Spotting opportunities	Use your imagination and abilities to identify opportunities for creating value	<ul style="list-style-type: none"> Identify and seize opportunities to create value by exploring the social, cultural and economic landscape Identify needs and challenges that need to be met Establish new connections and bring together scattered elements of the landscape to create opportunities to create value
	1.2 Creativity	Develop creative and purposeful ideas	<ul style="list-style-type: none"> Develop several ideas and opportunities to create value, including better solutions to existing and new challenges Explore and experiment with innovative approaches Combine knowledge and resources to achieve valuable effects
	1.3. Vision	Work towards your vision of the future	<ul style="list-style-type: none"> Imagine the future Develop a vision to turn ideas into action Visualise future scenarios to help guide effort and action
	1.4 Valuing ideas	Make the most of ideas and opportunities	<ul style="list-style-type: none"> Judge what value is in social, cultural and economic terms Recognise the potential an idea has for creating value and identify suitable ways of making the most out of it
	1.5 Ethical and sustainable thinking	Assess the consequences and impact of ideas, opportunities and actions	<ul style="list-style-type: none"> Assess the consequences of ideas that bring value and the effect of entrepreneurial action on the target community, the market, society and the environment Reflect on how sustainable long-term social, cultural and economic goals are, and the course of action chosen Act responsibly
Resources	2.1 Self-awareness and self-efficacy	Believe in your-self and keep developing	<ul style="list-style-type: none"> Reflect on your needs, aspirations and wants in the short, medium and long term Identify and assess your individual and group strengths and weaknesses Believe in your ability to influence the course of events, despite uncertainty, setbacks and temporary failures
	2.2 Motivation and perseverance	Stay focused and don't give up	<ul style="list-style-type: none"> Be determined to turn ideas into action and satisfy your need to achieve Be prepared to be patient and keep trying to achieve your long-term individual or group aims Be resilient under pressure, adversity, and temporary failure
	2.3 Mobilizing resources	Gather and manage the resources you need	<ul style="list-style-type: none"> Get and manage the material, non-material and digital resources needed to turn ideas into action Make the most of limited resources

<i>Area</i>	<i>Competences</i>	<i>Hint</i>	<i>Descriptors</i>
			<ul style="list-style-type: none"> Get and manage the competences needed at any stage, including technical, legal, tax and digital competences
	2.4 Financial and economic literacy	Develop financial and economic know how	<ul style="list-style-type: none"> Estimate the cost of turning an idea into a value-creating activity Plan, put in place and evaluate financial decisions over time Manage financing to make sure my value-creating activity can last over the long term
	2.5 Mobilizing resources	Inspire, enthuse and get others on board	<ul style="list-style-type: none"> Inspire and enthuse relevant stakeholders Get the support needed to achieve valuable outcomes Demonstrate effective communication, persuasion, negotiation and leadership
<i>Into action</i>			<ul style="list-style-type: none"> Initiate processes that create value
	3.1 Taking the initiative	Go for it	<ul style="list-style-type: none"> Take up challenges Act and work independently to achieve goals, stick to intentions and carry out planned tasks
	3.2 Planning and management	Prioritize, organize and follow-up	<ul style="list-style-type: none"> Set long-, medium- and short-term goals Define priorities and action plans Adapt to unforeseen changes
	3.3 Coping with uncertainty, ambiguity and risk	Make decisions dealing with uncertainty, ambiguity and risk	<ul style="list-style-type: none"> Make decisions when the result of that decision is uncertain, when the information available is partial or ambiguous, or when there is a risk of unintended outcomes Within the value-creating process, include structured ways of testing ideas and prototypes from the early stages, to reduce risks of failing Handle fast-moving situations promptly and flexibly
	3.4 Working with others	Team up, collaborate and network	<ul style="list-style-type: none"> Work together and co-operate with others to develop ideas and turn them into action Network Solve conflicts and face up to competition positively when necessary
	3.5. Learning through experience	Learn by doing	<ul style="list-style-type: none"> Use any initiative for value creation as a learning opportunity Learn with others, including peers and mentors Reflect and learn from both success and failure (your own and other people's)

The EntreComp framework provides a practical and flexible reference and it is designed to be adapted and applied to promote and enable individuals and organisations to be entrepreneurial. The policy approach has followed developing practical tools and cases to illustrate the potential application (McCallum E. et al., 2018):

- Create shared understanding: Use EntreComp as a basis for creating a shared understanding of what it means to be entrepreneurial. Use its language for a clear and consistent approach to developing strategies and actions.
- Use the visuals: Use the EntreComp visuals to engage learners, colleagues and other stakeholders. For example, the wheel provides an easy-to-understand visual that different stakeholder groups can relate to and remember.
- Find the right level: Think about who you are working with and decide which level of EntreComp works for your audience – do you need to explain the whole model, or do you simply need to share what it means to be entrepreneurial?
- Find the right competences: Prioritise the entrepreneurial competences needed for your project or organisation and include them in recruitment and/or training and development activities. An activity may address only 1 competence or could develop all 15 competences.
- Understand your starting point: Appraise your existing activities or resources against the EntreComp competences to identify how you are supporting others to develop their own entrepreneurship competences.
- Adapt if you need to: EntreComp is not a fixed tool and can be adapted in any way. For example, the learning outcomes are generic, and it is likely that you will need to adapt them to work for your needs.
- Understand the starting point of your learners: Whoever they are, employees or school children, they will have different starting points for their skills development. A learner is not expected to develop all the competences to a specific level and very few learners are expected to acquire the highest level of proficiency in all the competences.
- Refine or evaluate learning strategies: Think about your approach to teaching and learning – whatever your subject area. Consider how you could adapt your approach or introduce opportunities for practical entrepreneurial experiences to also develop 1 or more entrepreneurship competences.
- Identify the learning outcomes that suit your activity: Learning outcomes may be relevant from different levels of the progression model for the same learning activity e.g. level 4 in creativity but level 1 in financial literacy.
- Self-assessment: Introduce EntreComp to your learners as a framework for reflection or self-assessment so that they can assess the level of their own competences and chart their progress.
- Demonstrate value: Show the value of your activities and resources by highlighting those that successfully address EntreComp competences.

- Map against your existing activity: Identify opportunities to extend your activities to support entrepreneurial learning by mapping them against EntreComp to identify any gaps.
- Provide an evidence base: Use EntreComp as the evidence base for making changes in your approach to learning. Research shows that these are the competences that learners need to effectively create social, cultural or financial value at work or in the community.

This way, from the practitioners' side it is a tool that offers a lot of possibilities to work together in the building of teaching methods and assessment around a common framework for entrepreneurship competences development. Nevertheless, as stated in the own framework, the conceptualisation is based on a theoretical approach which the authors suggest that over time will be further elaborated and refined to address the needs of specific target groups.

We have performed an analysis to validate the use of this framework in the Academia. For this, we have done a systematic review of literature to identify the use of the EntreComp since its publication (2016). We built a comprehensive database by selecting relevant articles in various steps:

1. We employed the following databases to identify articles referring the EntreComp:
 - Index Journals: Web of Sciences, Scopus, which provide articles published in indexed journals
 - Scientific research: Google Scholar, which provide articles published in general journals
 - Scientific communities: Researchgate, Academia.edu, which provide working papers, reports, other conferences or initiatives
2. Search include the strings "EntreComp" and "Entrepreneurship Competence framework" in the fields theme, title and abstract (when possible). No language restrictions.

Results provides 921 references and by using the EndNote research tool, we worked on the identification of duplicated references between databases. Results provide 453 references.

We refined the set of papers, hereby excluding articles that did not assess the EntreComp proposal of the European Commission. Results provide 374 references.

Figure 11. Academic references citing the EntreComp by year

Additionally, several projects are found⁹. Not included as academic papers in the database under analysis, also support the transversal application of the framework and the consideration as a reference guide tool.

Analysis of journals, years of publications, type of publication, authors result in:

⁹ EmindS: the project, which is funded by the Erasmus+ Program, aims to develop entrepreneurial mindset of Higher Education and VET students based on the EntreComp competence (a framework that has been published by the JRC), through the application of a systematic methodology using student centered innovative approaches. <https://www.researchgate.net/project/EmindS-Development-of-an-Entrepreneurial-Mindset-in-Higher-Education/> / <https://e-minds.eu/>

EntreComp Edu: policy reform project to develop a teachers professional framework for entrepreneurship competences and aligned training/development <https://www.researchgate.net/project/EntreCompEdu-EntreComp-for-teachers-Erasmus-KA3/> / <http://entrecompedu.eu/>

SEED: Smart Entrepreneurial Education and Training: The SEED project aims to develop skills and competences in the agricultural sector by introducing the concept of digital transformation. The project will support the development of a Joint VET Qualification (EQF 5) on digital farming. Skills and competences developed will be mapped against the EntreCOMP and DigCOMP frameworks and a strong work-based learning component will be the main feature of the project. <https://www.researchgate.net/project/SEED-Smart-Entrepreneurial-Education-and-training-in-Digital-farming/> / <http://www.digitalseed.eu/>

REACT Erasmus+: The main priority of the REACT project (www.reactproject.online) addresses Social Inclusion and Enhancing access to training and qualifications for all, giving in this way the opportunity to low skilled adults to reinforce the entrepreneurship entrepreneurial skill that is useful to increase their quality of life, including the research of a job and their re-inclusion in society. <https://zenodo.org/record/2652228#.XbOR-hKh3h> / www.reactproject.online

- Total Authors involved in the Database References: 855¹⁰
- Total Countries of affiliation: 63¹¹. The geographical distribution shows, as expected, a higher concentration in Europe, with the 87% of publications.
- However, also the framework is being used by authors in other continents (5% America, 5% Asia, 1% Africa, 1% Oceania).

Figure 12. Authors in the EntreComp database references per country of affiliation (accumulation of 85% of authors)

- Total Journals: 192. Although mostly identified in Education, the references seem not to be concentrated in particular journals. EntreComp is being used in a diversified way.
- Total Conferences: 51
- Total EC Reports: 38
- Total books: 30
- Total: thesis: 17
- Total Reports/Communication/Publication N/A

For a qualitative analysis, textual revision is developed. Although a wide range of themes are included, the most common research areas identified in the documents are:

- Entrepreneurship education

¹⁰ In the case of Reports of Institutions, it is considered as an author

¹¹ Available Country of Affiliation in 829 references

- Development of competences in educative curriculum
- Development of competences in professional environments (including general approaches and some particular sectors such as tourism, biomedicine or audiovisual).

Most of papers analysed include the EntreComp as a reference to:

- Support the concept of entrepreneurship beyond and economic activity
- Support the entrepreneurship competence as a transversal competence.
- Support the debate about entrepreneurship competences and what is to be an entrepreneur.
- Support the relevance of particular competences linked to the purpose of the research (ethical and sustainable thinking, creativity, problem solving...)
- Refer as a potential guide for entrepreneurship education
- List policy initiatives related to entrepreneurship, entrepreneurship education or skills

Narrowing the EntreComp corpus selecting those articles that not only includes the EntreComp as a reference, but develop research over its basis, the result are 52 articles under analysis (the complete list and the use of the framework in each reference is included in Annex I). Textual revision exploring the use of EntreComp in this corpus reveals that researchers go deeper in the following lines:

- Including descriptions of the areas and the progressive learning process
- Mapping the competences with other frameworks
- Analysing the learning outcomes of educational curriculum or programs with the EntreComp
- Developing a questionnaire to assess the competences
- Designing programs following the EntreComp as a guide.

In summary, EntreComp is being scrutinized by researchers in the field of entrepreneurship education and it is increasingly cited in academic publications. We therefore consider it as an adequate framework to explore entrepreneurship competences in this thesis.

3 Operationalization of the Research Questions

Following the conclusions from the theoretical framework of the thesis, entrepreneurship competences represent a broad research field to explore, being of particular interest for the present research work the role that entrepreneurship education programs can play in the acquisition and development of entrepreneurship competences.

The aim of the quantitative part of the thesis is precisely contributing to this research field with the analysis of a specific entrepreneurship education program: ActuaUPM. Following the model proposed in Figure 5, the objectives pursued in this program are oriented to the start-up of new business and the audience are potential entrepreneurs. Over this sample, the analysis aims to respond the following questions:

- Can self-perceived entrepreneurship competences contribute to explain entrepreneurship intention?
- Which are the competences more related towards entrepreneurship intention?
- Which is the impact of this program on the competences and entrepreneurship intention?

Results are expected to contribute on these aspects:

- The influence that self-perceived competences can have as predictor of entrepreneurship intentions.
- The identification of those competences whose development should be pursued in entrepreneurship education programs oriented the setting up of new businesses.
- The current results of the methods used in this program on them.

With these objectives, the analysis tests:

- The relationships of the self-perceived entrepreneurship competences and the entrepreneurship intention of this group, by proposing a modification of the TPB and comparing the results with the original approach.
- The exploration of which of the particular set of abilities of the EntreComp as framework of reference are more related towards entrepreneurship intentions, with sub-results by gender.
- The self-perceived competences and intentions before the program and after, with a control group in the experiment.

- The potential moderating effect of gender on these relationships.

As an additional result, the EntreComp is used as instrument of measure, and results contribute to its development from the theoretical perspective. The conceptualisation of this framework is based on a theoretical approach which the authors suggest that over time will be further elaborated and refined to address the particular needs of specific target groups. We contribute to adding a quantitative dimension by proposing a set of variables that allow the perceptions of the set of competences in a particular group of potential entrepreneurs to be measured, exploring whether the theoretical grouping is statistically supported and selecting those competences that result more linked to entrepreneurship intention.

Supported on the previous literature review, the following hypotheses are formulated:

H1: The sense of the entrepreneurship competence contributes to explain better the entrepreneurship intention than the perceived control behaviour to start-up.

H2: There is a positive relationship between competences and entrepreneurship intention.

H3: At the end of an entrepreneurship program, students will perceive higher entrepreneurship competences and intention than at the beginning of the program.

Sub analysis by gender considers:

H4: Female entrepreneurship competences perception is lower than men.

H5: Gender moderates the positive relationship between competences and entrepreneurial intentions so that the relationship is stronger for female STEM students compared to male STEM students.

4 Methodology

The quantitative part of the research is based on primary data collected through a questionnaire specifically design for the purpose of the thesis. Data has been processed following the Bethlehem (2009) surveys' process proposal, which is included in Figure 13.

Figure 13. Survey process (Bethlehem, 2009)

This chapter summarises the details of this process, starting with the design of the survey, by describing the theoretical models selected and the previous questionnaires used in the entrepreneurship research that have been reviewed and considered as reference for the operationalization of variables. The description of the sample and the procedure performed for the data collection and data editing is included in the next part. Finally, the method of analysis accomplished is explained.

4.1 Theoretical models of reference

4.1.1 The Theory of Planned Behaviour

The selected framework of reference to explore entrepreneurship intention is the TPB (Icek Ajzen, 1991).

As aforementioned, the TPB has been widely used in the entrepreneurship field (Lortie & Castogiovanni, 2015), specially on entrepreneurship intentions research. The application of the Theory of Planned Behavior to study entrepreneurship actions (start a business, growing it, become an entrepreneur, etc) implies the consideration of them as planned actions, it is, assuming an intentionality behind (Schlaegel & Koenig, 2014) and the intention to do something is considered the best single predictor of effectively doing it (Krueger & Brazeal, 1994).

The TPB is based on the Theory of Reasoned Action (I. Ajzen & Fishbein, 1980) and addresses the prediction of Intention (motivations to do something) and Behavior (the fact of doing something) from the analysis of three personal variables: the attitude towards the behavior (one's perception about the behavior as positive or negative), the Subjective norm (one's perception about what people around are going to think about the behavior) and Perceived behavioral control (one's perception about his/her own capabilities to the actual behavior). Figure 14 includes the model proposed by Ajzen (1991).

Figure 14. Theory of Planned Behaviour (Icek Ajzen, 1991)

As far as the attitudes, the subjective norms, the perceived control, and the intention are not directly measurable, the treatment needs to be as constructs, variables indirectly characterized by means of other variables. In this sense, in order to explore the links, the instrument usually used is a structured questionnaire with questions that allow to obtain quantitative parameters for the different constructs (Autio et al., 2001; Fernández-Pérez et al., 2019; Kolvereid & Isaksen,

2006; Liñán, 2008; Liñán & Chen, 2009; Lortie & Castogiovanni, 2015; Mueller, 2011; Sommer & Haug, 2011).

4.1.2 EntreComp

As explained in the theoretical framework section, the selected framework of reference to explore the entrepreneurship competences is the EntreComp.

The EntreComp model within the European Commission's strategy for entrepreneurship (Bacigalupo et al., 2016) proposes a set of 15 competences that all together address the capacity to turn ideas into action.

The interest on this framework emerges because it has been developed as a potential common reference with which to shape all types of education and training programs in order to provide citizens with the competences that are considered potentially applicable to all spheres of life, highlighting three core aspects connected to personal and professional development, including the creation of new businesses. The categorisation proposed is innovative because abilities are included according to the phases that have been identified in the process of taking ideas to reality: *identification of ideas*, *resources management* and *into action*. The conceptualisation is based on a theoretical approach which the authors suggest that over time will be further elaborated and refined to address the particular needs of specific target groups. We contribute to adding a quantitative dimension by proposing a set of variables that allow the perceptions of the set of competences in a particular group of potential STEM entrepreneurs to be measured, exploring whether the theoretical grouping is statistically supported and selecting those competences that result more linked to entrepreneurship intention. Characterized as self-perceived competences related to orient entrepreneurship intention, the instrument can be considered a proposal for *self-efficacy* scale.

Figure 15. The EntreComp wheel: 3 competence areas and 15 competences (McCallum E. et al., 2018)

The first area of the EntreComp model is "Ideas and Opportunities", which reflects the capacity to recognise opportunity and the valuation of ideas to meet the challenges. This block of competences includes: (1) *spotting opportunities*, defined as the ability to find opportunities to generate value for others, recognising opportunities that need to be met and responding to challenges; (2) *creativity*, understood as the ability to develop multiple ideas that create value for others and transform these ideas into solutions; (3) *vision*, referring to the capacity to imagine a desirable future and an inspiring vision to guide strategic decision-making; (4) *valuing ideas*, representing the ability to understand and appreciate the value of ideas and their possible different types of use, developing strategies to make the most of the value generated by ideas; and (5) *ethical and sustainable thinking*, as the ability to recognise the impact of choices and behaviours, within both the community and the environment, driven by ethics and sustainability, when making decisions.

The second block in the *EntreComp* model is called "Resources" and involves the abilities to follow-up an opportunity that has been identified. It includes material and non-material attributes such as: (6) *self-awareness* and *self-efficacy*, defined as the capacity to trust our own ability to generate value for others, making the most of their strengths and weaknesses and compensating for the latter by teaming up with others; (7) *motivation and perseverance*, which refers the capacity to guide efforts through passion and perseverance to achieve goals; (8)

mobilising resources, defined as the ability to find and use resources and knowledge responsibly, and to manage them; (9) *financial and economic literacy*, which refers to the capacity to draw up a budget as a first step, with progression towards the exploration of financial options and economic sustainability; and (10) *mobilising others*, defined as the capacity to communicate ideas clearly and with enthusiasm (communication skills) and to persuade, inspire and 'get others on board' (leadership skills).

The third block of the framework is the "Into Action" competences, reflecting features regarding the ability to transform ideas into reality and including: (11) *taking the initiative*, defined as the ability to initiate value-creating activities; (12) *planning and management*, referring to the ability to define a goal, create action plans and identify priorities; (13) *coping with uncertainty, ambiguity and risk*, including the perspective of not being afraid of mistakes and making choices despite uncertainty; (14) *working with others*, which involves the capacity to work together in a team based on the needs of a value-creating activity and the ability to solve conflicts and face competition positively when necessary; and (15) *learning through experience*, defined as the ability to recognise lessons learnt when taking part in value-creating activities, judging achievements and failures and learning from them.

4.2 Self-assessment tool: design of the questionnaire

Data gathering is based on a structured questionnaire, consisting of a set of standardized questions adequate for survey research and quantitative analysis (Bethlehem, 2009).

Previous entrepreneurial intention questionnaires applied on research on entrepreneurial intentions were used for designing the TPB items (Autio et al., 2001; Liñán & Chen, 2009; Liñán et al., 2011) and the additional predictors included (Rohrmann, 1997). All items in the questionnaire were measured using a Likert scale, ranging from 1 (totally disagree) to 7 (totally agree). The description of the blocks of the questionnaires and the corresponding variables is included below.

Dependent variable:

Entrepreneurship intention measures the intention of becoming an entrepreneur in the sense of setting up a new business sometime in the future. Entrepreneurship intention is the crucial variable in our analysis and it is very difficult to measure directly. Liñán and Chen, (2009) and Liñán, Rodríguez-Cohard and Rueda-Cantuche (2011) proposed and validated a system based on six items.

Table 4. Operationalization of the Entrepreneurship Intention construct

	Variable	Range
I1	I am ready to do anything to be an entrepreneur	1-7
I2	My professional goal is to be an entrepreneur	1-7
I3	I will make every effort to start and run my own business	1-7
I4	I am determined to create a business venture in the future	1-7
I5	I have very seriously thought in starting a firm	1-7
I6	I've got the firm intention to start a firm some day	1-7

Attitude

Entrepreneurial attitude construct reflects the personal beliefs about the entrepreneurship career (Liñán & Chen, 2009). Items are both, affective and instrumental in character (Rhodes, Blanchard, & Matheson, 2006). To analyse this construct, participants answered six items on 7-point Likert scales, ranging from 1 = totally disagree to 7 = totally agree. The six-item measure has been previously used and validated in entrepreneurship intention research (Liñán & Chen, 2009; Liñán et al., 2011).

Table 5. Operationalization of the Attitude construct

	Variable	Range
A1	If I had the opportunity and resources, I would love to start a business	1-7
A2	Being an entrepreneur would entail great satisfactions for me	1-7
A3	Being an entrepreneur implies more advantages than disadvantages to me	1-7
A4	A career as entrepreneur is attractive for me	1-7
A5	Among various options, I would rather be an entrepreneur	1-7
A6	I personally consider entrepreneurship to be a highly desirable career alternative for people with my professional and educational background	1-7

Perceived Behavioural Control

Perceived Behavioral Control captures the perception about oneself capacity to set up a new venture (Liñán, 2008; Liñán & Chen, 2009). To analyse this construct, participants answered six items on 7-point Likert scales, ranging from 1 = totally disagree to 7 = totally agree. The six-item measure (detailed in Table 5) has been previously used and validated in entrepreneurship intention research (Liñán & Chen, 2009; Liñán et al., 2011).

Table 6. Operationalization of the Perceived Behavioural Control construct

	Variables	Range
C1	Starting a firm and keeping it viable would be easy for me	1-7
C2	I am able to control the creation process of a new business	1-7

C3	<i>I know the necessary practical details to start a firm</i>	1-7
C4	<i>If I tried to start a business, I would have a high chance of being successful</i>	1-7
C5	<i>It would be very difficult for me to develop a business idea</i>	1-7
C6	<i>I have all the required skills and capabilities to succeed as an entrepreneur</i>	1-7
C7	<i>I'm prepared to start a viable firm</i>	1-7
C8	<i>I know how to develop an entrepreneurial project</i>	1-7

Subjective norms

Subjective norm measures the perceived social acceptance (or not) of carrying on the behavior. Three approaches are included the University environment (Autio et al., 2001), conceived as a descriptive construct (Rhodes et al., 2006), the Region, built also as a descriptive construct (Rhodes et al., 2006) and the closed family support (Liñán & Chen, 2009), built as an injunctive construct (Rhodes et al., 2006). As the context in which the program is developed, the correspondent to the perception of the University environment (Autio et al., 2001), conceived as a descriptive construct (Rhodes et al., 2006) is included in analysis, but all are included in the questionnaire. Variables are also defined on 7-point Likert scales, ranging from 1 = totally disagree to 7 = totally agree.

Table 7. Operationalization of the Subjective Norms construct (City and Region environment)

<i>Variable</i>	<i>Range</i>
E1 <i>The culture in my city/region is highly favourable towards entrepreneurial activity</i>	1-7
E2 <i>The entrepreneur's role in the economy is generally undervalued in my city/region</i>	1-7
E3 <i>Most people in my city/region consider it unacceptable to be an entrepreneur</i>	1-7
E4 <i>In my city/region, entrepreneurial activity is considered to be worthwhile, despite the risks</i>	1-7
E5 <i>It is commonly thought in my city/region that entrepreneurs take advantage of others</i>	1-7

Table 8. Operationalization of the Subjective Norms construct (Close environment)

<i>Variable</i>	<i>Range</i>
E6 <i>My immediate family values entrepreneurial activity above other activities and careers</i>	1-7
E7 <i>My friends value entrepreneurial activity above other activities and careers</i>	1-7
E8 <i>My colleagues value entrepreneurial activity above other activities and careers</i>	1-7

Table 9. Operationalization of the Subjective Norms construct (Close environment approval of the decision)

	<i>Variable</i>	<i>Range</i>
S5	<i>Your close family</i>	1-7
S6	<i>Your friends</i>	1-7
S7	<i>Your colleagues</i>	1-7

Table 10. Operationalization of the Subjective Norms construct (University environment)

	Variable	Range
S1	<i>I know many people in my university who have successfully started up their own business</i>	1-7
S2	<i>In my university, people are actively encouraged to pursue their own ideas</i>	1-7
S3	<i>In my university you get to know many people with good ideas for a new business</i>	1-7
S4	<i>In my environment there is a well-functioning support infrastructure in place to help the startup of a new business</i>	1-7

Considering previous research on entrepreneurship intentions, also is included a block corresponding the risk perception, which describes how people deal with risky situations and what their attitudes towards risk decisions are (Rohrmann, 1997).

Table 11. Operationalization of the Risk Perception construct

	Variable	Range
R1	<i>I follow the motto, 'nothing ventured, nothing gained'</i>	1-7
R2	<i>If a task seems interesting, I'll choose to do it even if I'm not sure whether I'll manage it</i>	1-7
R3	<i>Even when I know that my chances are limited, I try my luck</i>	1-7
R4	<i>I express my opinion even if most people have opposite view</i>	1-7
R5	<i>Success makes me take higher risks</i>	1-7
R6	<i>I'm quite cautious when I make plans and when I act on them</i>	1-7
R7	<i>I've not much sympathy for adventurous decisions</i>	1-7
R8	<i>I don't like to put something at stake, I would rather be on the safe</i>	1-7
R9	<i>In my work I only set small goals so that I can achieve them without difficulty</i>	1-7
R10	<i>My decisions are always made carefully and accurately</i>	1-7
R11	<i>I tend to imagine the unfavourable outcomes of my actions</i>	1-7

Role Models

We also include an additional variable to consider the near entrepreneurial roles: single statement that capture the positive influence or near entrepreneurs.

	Variable	Range
F1	<i>I have friends and acquaintances that have already started a business and that experience positively influences me to become an entrepreneur</i>	1-7

Entrepreneurship competences

The entrepreneurship competences variables were generated following the *EntrComp* model of reference explained above. As far as there are no specific questionnaires exploring this particular framework in previous research, we have defined this block following the questionnaires of previous authors about particular entrepreneurship competences research (DeTienne & Chandler, 2004; Liñán et al., 2011), creating new variables when needed. A first set

of 15 variables, aligned with the definitions of the competences proposed, was added to the entrepreneurship intention variables. A small pre-test among PhD researchers and professors was undertaken. Although there were limitations, this pre-test allowed us to measure the average time of response and get feedback about doubts and confusion when answering. Consequently, we modified some variables that included aptitudes that could have different perceptions: (1) communication and leadership skills were separated into two variables, (2) digital skills and legal skills were separated into two variables, (3) networking, team working and problem solving skills were separated into two variables, and (4) “learn by doing” and “learn from mistakes” were also separated. An additional variable referring to "multidisciplinary skills" was added. In this way, the 15 competences described in the framework were captured through 22 variables in the final version of the questionnaire. Before its final launch, the questionnaire was validated in a second pre-test, and there were no problems in understanding the questions and validity of the scales used in this second round. In summary, the theoretical *EntreComp* groups were formed as follows: *Ideas and Opportunities* participants answered five items on 7-point Likert scales, ranging from 1 (no aptitude at all) to 7 (very high aptitude). Six items were built on 7-point Likert scales, ranging from 1 (no aptitude at all) to 7 (very high aptitude) for the *Personal Resources* competences construct. *Specific knowledge* was anchored in three variables built on 7-point Likert scales, ranging from 1 (no aptitude at all) to 7 (very high aptitude). Finally, participants answered five items on 7-point Likert scales, ranging from 1 (no aptitude at all) to 7 (very high aptitude) for the *Into Action* competences.

Table 12. Operationalization of Entrepreneurship Competences variables

Variables	Range
<i>Ideas and Opportunities (ID)</i>	
O1- Identify opportunities to create value and challenges that need to be met	1-7
O2- Development of creative and purposeful ideas	1-7
O3- Visualisation of future scenarios to guide effort and action	1-7
O4- Recognise the potential that an idea has for creating value	1-7
O5- Assess the consequences and impact of ideas, opportunities and actions	1-7
<i>Personal Resources (PR)</i>	
O6- Identify and assess my individual and group strengths and weaknesses	1-7
O7- Determination to turn into action my ideas, being resilient under pressure, adversity and temporary failure	1-7
O8- Making the most of limited resources	1-7
O9- Leadership skills	1-7
O10- Communication skills	1-7
O11- Multidisciplinary skills	1-7
<i>Specific Knowledge (SK)</i>	
O12- Digital know how	1-7
O13- Legal know how	1-7
O14- Financial and economic know how	1-7
<i>Into Action (IA)</i>	

<i>Variables</i>	<i>Range</i>
<i>O15- Development of new products and services</i>	<i>1-7</i>
<i>O16- Defining priorities and action plans</i>	<i>1-7</i>
<i>O17- Making decisions dealing with uncertainty, ambiguity and risk</i>	<i>1-7</i>
<i>O17- Networking skills and making professional contacts</i>	<i>1-7</i>
<i>O19- Team working</i>	<i>1-7</i>
<i>O20- Problem solving skills</i>	<i>1-7</i>
<i>O21- Learn by doing</i>	<i>1-7</i>
<i>O22- Learn from mistakes</i>	<i>1-7</i>

Control Variables

Our analysis also included three control variables: age, having previous entrepreneurship education and self-employed parents. Previous research has shown that age negatively affects entrepreneurial intention (Camelo-Ordaz et al., 2016). In our research, age was measured as a continuous variable (between 18 and 64). Also the family background has been considered a factor affecting entrepreneurship intention (Carr & Sequeira, 2007). We coded this as a binary variable: 1 if the respondent's parents had been self-employed or were entrepreneurs; 0 if not. Finally, studies about the effect of entrepreneurship education argue that it has a positive impact on intention (Liñán et al., 2011), Souitaris, Zerbinati and Al-Laham, 2007; Sánchez, 2013). The variable values were 1 if the respondent had participated in previous entrepreneurship education programs; 0 otherwise.

4.3 Data collection

4.3.1 Selection of samples

The sample under analysis is composed by individuals who have joint the most consolidated entrepreneurship program at the Universidad Politécnica de Madrid (UPM) in its 13th edition: ActuAUPM.

This sample of students is of particular interest as it can be seen as a paradigmatic group of potential STEM entrepreneurs. They have joined an entrepreneurship education program because they already have a business idea to explore and potentially launch, but the setting up of the venture has not started yet (Kelley et al., 2016) and they also have technical backgrounds. The main objective of the program is to help students to identify market opportunities, provide tools to develop their ideas and help them to establish a business plan. At the end of the program, the best business ideas are rewarded, and further support is provided to start the business.

Taking into consideration the entrepreneurship programs previous review, the EEP under study (ActuaUPM) can be described by the following elements in the different areas:

- Objectives and Goals: to promote the business creation among STEM profiles.
- Audiences: individuals who study or have studied at the UPM.
- Contents: (1) specific knowledge: teachings of accounting, finance, marketing, management, legal framework, technological security; (2) teaching and practice in competencies such as self-efficacy, team management, communication, proactiveness and risk taking; (3) business plan; and (4) an “interaction with practice” component, which includes talks from practitioners, mentorship and networking events.
- Methods: The teaching methodology consisted of 12 on-site classes with theoretical presentations and practical work on the business ideas with distance mentoring support in order to build a One Pager document including: motivation and antecedents, business opportunity, market validation, business model, competitive advantage, goals achieved and next steps, team, metrics and financial ratios + presentation. The reception of ideas to participate in the program was in April and the entrepreneurship program was offered over six months (April to September).
- Results: long term studies evaluate the results in terms on ventures effectively launched.

The pre-post test analysis offers an assessment of the impact of this program over the self-perceived entrepreneurship competences and intention, ante their relationship, as it is considered a good predictor of a further real venture creation.

4.3.2 Procedure

In order to analyse the impact of the program on entrepreneurial competencies and intentions, we set up a pre-test and post-test design. Competences and entrepreneurship intention of were measured both in the pretest (time 1—t1—before starting the program) and the post-test (time 2—t2—when the program was over). The individuals who took the program formed the experimental or program group, and the individuals who did not take it formed the control group. A questionnaire-based survey was conducted in order to collect data and it was explained to both groups that the questionnaires they were to fill in were for research purposes.

Firstly, the questionnaire was launched in June 2017 among the applicants of the ActuaUPM entrepreneurship program, which includes a contest for entrepreneurial ideas followed by a training program for selected teams. The questionnaire was structured as a

voluntary online survey distributed by email and administered through the survey provider Typeform. The whole set of variables is included in Annex II.

The survey was distributed by email to the 1400 applicants, 80% men and 20% women, and the response rate was 10%, making a total final sample of 140 participants. Strict criteria were applied to identify low-quality responses (substantially incomplete; time of completion shorter than 1/3 of the mean; first click too fast on any of the sections), resulting in a total of 138 valid answers. Questions considered in the analysis was fully completed, with no missing values treatment needed.

Geographically, 122 participants were born in Europe (119 in Spain), 14 in America and 3 are from other continents. The major distribution of the participants by areas of knowledge was: Scientific or Technical Degree (94.2%), Social Sciences Degree other than Economics (3.6%) and Other (2.2%). As far as it is a program promoted by a technical university, and since at least one of the team components must have studied there, the strong presence of technical profiles is understandable, which allows the exploration of a STEM sample. At the same time, none of the participants had studied Economics or Business Administration as their main degree, and 5% have a mixed profile with further education in these areas. Some 23.9% had participated in other entrepreneurship education programs before ActuaUPM. Although the program is linked to the university at large, the sample is formed not only of general students but also by post-doctoral students and more mature professional profiles: 72.5% are already graduates (among them 24 are PhD or PhD researchers and 57 hold or were currently studying for, a master's degree) and only 27.5% undergraduates (3 in second course, 7 in third course and 28 in fourth course). 65.9% have work experience. See Table 13 for a summary.

Table 13. Demographics characteristics of the sample of potential entrepreneurs

	<i>No</i>	<i>Percentage</i>
<i>Sex</i>	<i>138</i>	<i>100%</i>
<i>Men</i>	<i>114</i>	<i>82.6%</i>
<i>Women</i>	<i>24</i>	<i>17.4%</i>
<i>Age (mean)</i>	<i>28,21</i>	
<i>Family main occupations</i>	<i>138</i>	<i>100%</i>
<i>Self-employed</i>	<i>42</i>	<i>30.4%</i>
<i>Private sector</i>	<i>61</i>	<i>44.2%</i>
<i>Public sector</i>	<i>67</i>	<i>48.6%</i>
<i>Other</i>	<i>6</i>	<i>0.04%</i>
<i>Participants major</i>	<i>138</i>	<i>100%</i>
<i>Technical or scientific</i>	<i>130</i>	<i>94.2%</i>
<i>Social sciences</i>	<i>5</i>	<i>3.6%</i>
<i>Other</i>	<i>3</i>	<i>2.2%</i>
<i>Studies</i>	<i>138</i>	<i>100%</i>
<i>Graduate/Master/PhD</i>	<i>100</i>	<i>72.5%</i>
<i>Undergraduate</i>	<i>38</i>	<i>27.5%</i>
<i>Work experience</i>	<i>138</i>	<i>100%</i>
<i>Previous work experience</i>	<i>91</i>	<i>65.9%</i>

	<i>No</i>	<i>Percentage</i>
<i>Not previous work experience</i>	47	34.1%
<i>Entrepreneurship education</i>	138	100%
<i>Previous EEP</i>	33	23.9%
<i>Not previous EEP</i>	105	76.1%

After finishing the program, questionnaires were received by these 138 individuals, obtaining a response rate of 52% by email, using the same survey provider Typeform. A total of 82 students participated in the study; 50 belonged to the experimental group and 32 to the control group. The respondents comprised 83% men and 17% women, which is representative of the applicant proportions, and the average age was 28. The major distribution of the participants by areas of knowledge was: Scientific or Technical Degree (94%), Social Sciences Degree other than Economics (2%) and Other (4%). As far as it is a program promoted by a technical university, and since at least one of the team components must have studied there, the strong presence of technical profiles is understandable, which allows the exploration of a STEM sample. At the same time, none of the participants had studied Economics or Business Administration as their main degree, and 5% have a mixed profile with further education in these areas. Some 27% had participated in other entrepreneurship education programs before ActuaUPM. Although the program is linked to the university at large, the sample is formed not only of general students but also by post-doctoral students and more mature professional profiles: 77% are already graduates (among them 13 are PhD or PhD researchers) and only 23% undergraduates. 88% have work experience. Summary on Table 14.

Table 14. Demographics characteristics of the samples in the experiment and control groups

	<i>Total t1</i> (N=138)		<i>Total t2</i> (N=82)		<i>Experiment</i> (N=50)		<i>Control</i> (N=32)	
	<i>Nº</i>	<i>Percent</i>	<i>Nº</i>	<i>Percent</i>	<i>Nº</i>	<i>Percent</i>	<i>Nº</i>	<i>Percent</i>
<i>Sex</i>	138	100%	82	100%	50	100%	32	100%
<i>Men</i>	114	82.6%	68	83%	40	80%	28	88%
<i>Women</i>	24	17.4%	14	17%	10	20%	4	13%
<i>Age (mean)</i>	28.21		28.14		30.3		24.71	
<i>Family main occupations</i>	138	100%	82	100%	50	100%	32	100%
<i>Self-employed</i>	42	30.4%	27	33%	11	22%	16	50%
<i>Private sector</i>	61	44.2%	34	41%	24	48%	10	31%
<i>Public sector</i>	67	48.6%	38	46%	26	52%	12	38%
<i>Other</i>	6	0.04%	5	6%	3	6%	2	6%
<i>Participants major</i>	138	100%	82	100%	50	100%	32	100%
<i>Technical or Scientific</i>	130	94.2%	77	94%	45	90%	32	100%
<i>Social Sciences</i>	5	3.6%	2	2%	2	4%	0	0%
<i>Other</i>	3	2.2%	3	4%	3	6%	0	0%
<i>Studies</i>	138%	100%	82	100%	50	100%	32	100%
<i>Graduate/Master/PhD</i>	100	72.5%	63	77%	43	86%	20	63%

	<i>Total t1</i> (N=138)		<i>Total t2</i> (N=82)		<i>Experiment</i> (N=50)		<i>Control</i> (N=32)	
<i>Undergraduate</i>	38	27.5%	19	23%	7	14%	12	38%
<i>Work experience</i>	138	100%	82	100%	50	100%	32	100%
<i>Previous work experience</i>	91	65.9%	72	88%	47	94%	25	78%
<i>Not previous work experience</i>	47	34.1%	10	12%	3	6%	7	12%
<i>Entrepreneurship education</i>	138	100%	82	100%	50	100%	32	100%
<i>Previous EEP</i>	33	76.1%	22	27%	17	34%	5	16%
<i>Not previous EEP</i>	105	23.9%	60	73%	33	66%	27	84%

SPSS software was used for the analysis.

4.4 Method of analysis

The quantitative results can be grouped in the following areas, and the detailed method of analysis for each part is offered bellow:

- Relationship between the TPB predictors and entrepreneurship intention and the role of the scale of entrepreneurship competences as a modification of the model.
 - Reliability of scales is validated using the Cronbach's test, obtaining that all selected constructs have satisfactory internal consistency.
 - Multiple regression and correlation analysis were applied on testing the hypotheses. Significant levels are considered where p-value
- Descriptive analysis of the entrepreneurship competences self-perception and intention of the group of potential entrepreneurs applying the entrepreneurship program. Comparison by gender.
 - 22 self-reported perception of competences means analysis.
 - For gender analysis, although when difference in means is desired for interpretation of the data, Students t-tests analysis are preferred, limitations of the data under analysis suggest to use Wilcoxon-Mann-Whitney test for independent sample as a non-parametric method asymptotically more powerful (Fay & Proschan, 2010). In this sense the analysis of differences by gender for these 22 items has been performed using both methods, obtaining similar results.
- Identification of the entrepreneurship competences that result higher related towards a higher entrepreneurship intention

- First analysis is aimed to test whether the EntreComp competences theoretical constructs was statistically valid used Principal components analysis (PCA) for dimension reduction, Cronbach's test to test the reliability and validity of the latent variables (constructs) and confirmatory analysis, which did not finally support the theoretical four constructs grouping proposed by the EntreComp -Estimator ML, Model Fit Statistic 393.538, Degrees of freedom 203, P-value Chi-square 0.000- (Hooper, Coughlan, & Mullen, 2008; Kline, 2011).
 - Taking this into account, from the theoretical approach based on the EntreComp Framework, factor analysis was used to determine the smallest number of factors to best represent the inter-relationships among the set of 22 self-reported competencies, and to identify the competencies that loaded onto the key factors. The suitability of the data for the PCA was established by various means. The Cronbach's alpha coefficient was calculated; with a value of 0.88 this confirmed the reliability of the scale within the sample. The alpha coefficient is not improved by removing any of the items, so the factor analysis included the whole set of 22 variables.
 - Both Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were conducted to measure sampling adequacy.
 - Factor analysis was executed by extracting the number of factors with eigenvalues >1;
 - Next, the factors were rotated using Varimax with Kaiser normalisation to avoid multicollinearity effects among the variables.
 - Once the factors were identified, we used a multiple regression model to study the relationship between the competence and skill factors in *Entrepreneurship Intention (EI)*.
- Differences on the entrepreneurship competences self-perception and entrepreneurship intention after the EEP, between the treatment and control groups.

In order to examine differences between treatment and control groups we use:

- Correlation to observe the relationship between the entrepreneurship competences and the intention, at t1 and t2.
- Pre-post treatment differences between control and treatment group are observed by using Students t-test.

- To test the effect of the program on the changes in competences and intentions, we use one-way ANOVA on the difference scores (total sample) with group membership (experimental versus control) as the independent variable.

5 Results and Discussion

The combination of entrepreneurial competences, the early stage of the entrepreneurial process and the intention to real launch a business are the main attributes of the experiment conducted among the participants in the ActuaUPM¹² program of the Technical University of Madrid (UPM), which offers a genuine example of potential entrepreneurs. Taking into account that business development is linked to innovation, technology and scalability (Blank, 2010; Graham, 2012), Sciences, Technical, Engineering and Mathematical (STEM) profiles are specially relevant in the context of potential business creation, being the sample of particular interest as the UPM is one of the most important technical universities in Spain, and ActuaUPM is the leading entrepreneurship education program among technical universities in the country.

5.1 Factors affecting entrepreneurship intention of early stages entrepreneurs and the role of entrepreneurship competences

As far as intention models have been traditionally used to explore the main factors of influences towards the intention of starting-up, we base our study on the Theory of Planned Behavior (Icek Ajzen, 1991) and contribute to the understanding of potential entrepreneurs decisions by testing the role that the Entrepreneurship Competence Framework can play.

The TPB has been tested by exploring some other personal attributes as mediators or influencers of the three personal variables of the model and towards intention. For instance autonomy, authority, self-realization, and economic opportunity as positive antecedents to attitudes (Kolvereid & Isaksen, 2006) or openness, conscientiousness, extraversion, agreeableness, and neuroticism have been analysed (Obschonka et al. 2010). Most of them are focus on personal traits, more than in knowledge or skills that can be acquired on a learning process.

Nevertheless, research also notices that launching a business is affected by the reinforcement of entrepreneurs traits, skills and knowledge as well (Kelley et al., 2016; Sánchez, 2013) and particularly, recent literature compilation about the research of the entrepreneurial intention through TPB notices that more empirical research of the Perceived Behavioural Control (PBC) to Entrepreneurial Intentions (EI) relationship should be carried out (Lortie &

¹² The entrepreneurship education initiative ActuaUPM is aimed to students (31.7% of woman at UPM in 2015), teachers and researchers (24.7% of woman at UPM in 2015) of the Technical University of Madrid (UPM) and is structured in three phases along which participants evolve from idea stage to the business plan development and, in some cases, the formal consolidation of a new venture. Over the period 1998 - 2013, a total of 146 firms have started from this University, most of them linked to this program, which is a consolidated initiative with fourteen editions.

Castogiovanni, 2015), which is related to the personal perception of the capability to perform the behaviour.

Considering this line of research and reflecting on the Entrepreneurship Competences Framework proposed by the European Commission as a theoretical reference conceived to contribute to reform education, this part of the research attempts to present new insights about how the entrepreneurship competences can influence entrepreneurship intention with the study of a model based on the TPB, and including this set of competences as a scale for the PBC, which is usually oriented to the perceived capability to launch a business, but as seen in the theoretical framework, the entrepreneurs' value creation is characterized by a whole set of abilities that transform ideas into action. The objective is to value if this construct regarding a sense of being an entrepreneur could explain better the intention than the perceived behavioural control only focused on the capacity to start a business and the relationship between the self-perceived competences towards EI.

Model 1: The Theory of Planned Behaviour.

Model 2: The consideration of the scale of competences proposed by the Entrepreneurship Competences Framework as the "Entrepreneurship Competence" as implementation of the PBC. (fig 16).

Figure 16. Model considering the EntreComp as a predictor of intention

Hypothesis considered:

H1: The sense of the entrepreneurship competence contributes to explain better the entrepreneurship intention than the perceived control behaviour to start-up.

H2: The higher perception of the entrepreneurship competence, the stronger the participants' intention to become entrepreneurs.

The results of the Cronbach's test and descriptive statistics are shown in Table 15 for independent and dependent variables and display that all selected constructs have satisfactory internal consistency.

Table 15. Properties of dependent and independent variables considered in the models

Dependent variable	α	Mean	Std. Dev.	Potential Range		Actual Range	
				Min	Max	Min	Max
Intention	0.92	5.34					
I1 - Ready to do anything to be an entrepreneur		4,91	1,63	1	7	1	7
I2 - My professional goal is to be an entrepreneur		4,81	1,81	1	7	1	7
I3 - I will make every effort to start and run my own business		5,23	1,65	1	7	1	7
I4 - I am determined to create a business venture in the future		5,63	1,47	1	7	1	7
I5 - I have very seriously thought in starting a firm		5,72	1,50	1	7	1	7
I6 - I've got the firm intention to start a firm some day		5,75	1,46	1	7	1	7
Independent variables							
Entrepreneurship Competence	0.88	5.51					
Ideas as opportunities							
O1 - Identify opportunities to create value and challenges that need to be met		5,43	1,16	1	7	1	7
O2 - Development of creative and purposeful idea		5,84	1,07	1	7	2	7
O3 - Visualization of future scenarios to guide effort and action		5,64	1,06	1	7	2	7
O4 - Recognize the potential that an idea has for creating value		5,33	1,16	1	7	2	7
O5 - Assess the consequences and impact of ideas, opportunities and actions		5,41	1,06	1	7	1	7
Personal Resources	0.70	5.78					
O6 - Identify and assess my individual and group strengths and weaknesses		5,68	1,05	1	7	3	7
O7 - Determination to turn into action my ideas, being resilient under pressure, adversity and temporary failure		5,72	1,27	1	7	2	7
O8 - Making the most of limited resources		5,83	1,16	1	7	3	7
O9 - Leadership skills		5,67	1,13	1	7	2	7
O10 - Communication skills		5,63	1,24	1	7	1	7
O11 - Multidisciplinary skills		6,15	.911	1	7	4	7
Specific knowledge	0.70	4.27					
O12 - Digital know how		5,67	1,27	1	7	2	7
O13 - Legal know how		3,15	1,53	1	7	1	7
O14 - Financial and economic know how		4,00	1,50	1	7	1	7
Into action	0.74	5.77					
O15 - Development of new products and services		5,43	1,15	1	7	2	7
O16 - Defining priorities and action plans		5,67	.998	1	7	3	7
O17 - Making decisions dealing with uncertainty, ambiguity and risk		5,49	1,22	1	7	1	7

<i>O18 - Networking skills and making professional contacts</i>	4,90	1,54	1	7	1	7
<i>O19 - Team working</i>	5,99	1,06	1	7	1	7
<i>O20 - Problem solving skills</i>	5,99	,940	1	7	2	7
<i>O21 - Learn by doing</i>	6,38	,804	1	7	4	7
<i>O22 - Learn from mistakes</i>	6,32	,879	1	7	2	7
Attitude	0.87	5.89				
<i>A1 - If I had the opportunity and resources, I would love to start a business</i>	6.44	0.90	1	7	4	7
<i>A2 - Being an entrepreneur would entail great satisfactions for me</i>	6.25	1.04	1	7	3	7
<i>A3 - Being an entrepreneur implies more advantages than disadvantages to me</i>	5.41	1.34	1	7	2	7
<i>A4 - A career as entrepreneur is attractive for me</i>	6.07	1.11	1	7	2	7
<i>A5 - Among various options, I would rather be an entrepreneur</i>	5,51	1,32	1	7	2	7
<i>A6 - I personally consider entrepreneurship to be a highly desirable career alternative for people with my professional and educational background</i>	5.66	1.32	1	7	1	7
Subjective Norms: University	0.79	3.77				
<i>S1 - I know many people in my university who have successfully started up their own business</i>	3,15	1,62	1	7	1	7
<i>S2 - In my university, people are actively encouraged to pursue their own business ideas</i>	3,73	1,77	1	7	1	7
<i>S3 - In my university you get to know many people with good ideas for a new business</i>	4,15	1,52	1	7	1	7
<i>S4 - In my environment there is a well-functioning support infrastructure in place to help the startup of a new business</i>	4,03	1,64	1	7	1	7
Perceived Behavioural Control	0.87	4.56				
<i>C1 - Starting a firm and keeping it viable would be easy for me</i>	3,83	1,45	1	7	1	7
<i>C2 - I am able to control the creation process of a new business</i>	4,49	1,43	1	7	1	7
<i>C3 - I know the necessary practical details to start a firm</i>	4,33	1,62	1	7	1	7
<i>C4 - If I tried to start a business, I would have a high chance of being successful</i>	4,42	1,44	1	7	1	7
<i>C5 - I'm prepared to start a viable firm</i>	4,88	1,47	1	7	1	7
<i>C6 - I know how to develop an entrepreneurial project</i>	4,75	1,34	1	7	1	7

Multiple regression and correlation analysis were applied on testing the hypotheses. Table 16 shows correlations between dependent and independent variables in the Model. As expected, attitude towards entrepreneurship, subjective norms and perceived behavioral control are strongly positively correlated. A similar pattern is followed by subjective norms towards attitude. The perception of the entrepreneurship competences is strongly related towards intention, attitude and towards PBC. A particularly strong correlation is observed between attitude towards entrepreneurship intention.

Table 16. Pearson Correlations Variables Model 1

	1	2	3	4	5
1. <i>EntreComp</i>	1	,509**	,146	,524**	,501**
2. <i>Attitude</i>	,509**	1	,242**	,514**	,817**
3. <i>S. Norms</i>	,146	,242**	1	,404**	,209*
4. <i>PBC</i>	,524**	,514**	,404**	1	,524**
5. <i>Intention</i>	,501**	,817**	,209*	,524**	1

** . Correlation is significant at the 0.01 level (2-tailed), * . Correlation is significant at the 0.05 level (2-tailed).

Results of the regression analysis in the two models are shown in Table 17.

Table 17. Regression Models - Standardized beta coefficients

	TPB	Model2
Predictor variables	Intention	Intention
Attitude	.746**	.756**
S. norms	-	-
PBC	.154*	
EntrComp		.115*
F (p.<.000)	96.40	93.92
R2	.683**	.678**
Adjusted R2	.676**	.670**

In Model 2, the regression analysis support hypotheses 2: the entrepreneurship competences construct as influencer of intention and similar to the perceived control behavior designed as usual, focused only to the perceived capability to start a business.

Although similar, R² adjusted is a quite lower in the entrepreneurship competences model proposed than the Theory of Planned Behavior approach, so hypotheses 1 is not validated.

Results obtained show that the entrepreneurship competence framework proposed by the European Commission as a set of "knowledge, skills and attitudes" is positively related to entrepreneurship intention, in a similar way that the perceived control of the practical details of starting-up is. This result open a path of research to evaluate if the oneself perception as an entrepreneur can be defined by the perception of this particular set of competences and particular application of theory of planned behaviour model to entrepreneurship could be enriched by taking into account this kind of entrepreneurship competence. These first results notice that the Entrepreneurship Competences Framework, from a quantitative perspective, is a good starting point as reference for the competences that should be pursued in entrepreneurship education as a tool to promote new business creation.

5.2 Exploring the most relevant entrepreneurship competences towards entrepreneurship intention

Assuming that the whole set of competences is positively related towards entrepreneurship intention, the higher or lower influence of particular entrepreneurship competences is explored through regressions models.

The first analysis performed aimed to test whether the *EntreComp* competences theoretical constructs was statistically valid¹³ and the confirmatory analysis did not finally support the theoretical four constructs grouping proposed by the *EntreComp*.

Taking this into account, from the theoretical approach based on the *EntreComp* Framework, factor analysis was used to determine the smallest number of factors to best represent the inter-relationships among the set of 22 self-reported competencies, and to identify the competencies that loaded onto the key factors. The suitability of the data for the PCA was established by various means. The Cronbach's alpha coefficient was calculated; with a value of 0.88 this confirmed the reliability of the scale within the sample. The alpha coefficient is not improved by removing any of the items, so the factor analysis included the whole set of 22 variables.

Both Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were conducted to measure sampling adequacy. The KMO value was 0.83, which is greater than the recommended value of 0.6 (Kaiser, 1974). Bartlett's test was statistically significant at the p 0.00 level (Bartlett, 1954).

¹³ The theoretical grouping was maintained and a principal component analysis (PCA) was carried out in each block of items. The scores obtained for the first components in each analysis were chosen as an indirect measure of the unobservable construct. Principal components analysis is used for dimension reduction and the loading factors of variables are showed in Table 4. SPSS software was used for the analysis. The analysis obtains an index (construct) for each block that is a linear combination of the items that define it. This indicator extracts the maximum information from the group of associated items.

We used a Cronbach's test to test the reliability and validity of the latent variables (constructs), obtaining satisfactory internal consistency for all the constructs proposed (EI 0.92; ID 0.78; PR 0.70; SK 0.70; IA 0.74). The **Kaiser-Meyer-Olkin measure of sampling adequacy (KMO)**, which indicates the proportion of variance that might be caused by underlying factors, was above 0.55 and around 0.80 for most factor analysis (EI KMO=0.88; ID KMO=0.80; PR KMO=0.64; SK KMO =0.57; IA KMO=0.67). **Bartlett's tests of sphericity** are highly significant in all cases, which indicated that a factor analysis may be useful. The confirmatory analysis did not finally support the theoretical four constructs grouping proposed by the *EntreComp* -Estimator ML, Model Fit Statistic 393.538, Degrees of freedom 203, P-value Chi-square 0.000- (Hooper et al., 2008; Kline, 2011).

Factor analysis was executed by extracting the number of factors with eigenvalues >1; this resulted in the identification of six factors for a satisfactory model fit (chi square statistic is 126.4 on 114 degrees of freedom; p-value is 0.201).

Next, the factors were rotated using Varimax with Kaiser normalisation to avoid multicollinearity effects among the variables. Item 22, learn from mistakes, load onto two components, which is not surprising because the own *EntreComp* framework stands they are interconnected and previous studies looking for competence clustering obtained similar results regarding the permeability of boundaries (Mitchelmore & Rowley, 2013). Component 2 gathers those competences related to commitment and component 6 includes item 22 isolated. We used a Cronbach's test to evaluate the reliability and validity of the components and the Cronbach's alpha of factor 2 with item 22 is not worse than without it, then we consider this variable loads in Factor 2, and discard the component 6. Satisfactory internal consistency is obtained for all the components.

Table 18 lists the eigenvalues associated with these five factors, and the variance in self-reported competencies explained. The selected five components explain a total of 57.372 per cent of the variance.; it shows meaningful strong loadings for each of the five components. Four competences do not load significantly on any of the components: *Development of creative and purposeful ideas (O2)*, *development of new products and services (O15)*, *networking skills and making professional contacts (O18)* and *problem-solving skills (O20)*.

Table 18. Result of factor analysis for entrepreneurship competences

Factor	Eigen value	%variance	α	Variable name	Factor loading	Operational definition
1	6.683	30.378	0.71	O4- Recognise the potential that an idea has for creating value	0.751	Opportunity and ideas (ID)
				O3- Visualisation of future scenarios to guide effort and action	0.711	
				O1- Identify opportunities to create value and challenges that need to be met	0.668	
				O5- Assess the consequences and impact of ideas, opportunities and actions	0.603	
2	1.9	8.638	0.71	O21- Learn by doing	0.686	Commitment competences (CC)
				O8- Making the most of limited resources	0.658	
				O12- Digital know how	0.579	
				O7- Determination to turn into action my ideas, being resilient under pressure, adversity and temporary failure	0.564	
				O22- Learn from mistakes	0.533	

Factor	Eigen value	%variance	α	Variable name	Factor loading	Operational definition
				O11- Multidisciplinary skills	0.507	
3	1.571	7.142	0.65	O16- Defining priorities and action plans	0.787	Decision making (DM)
				O17- Making decisions dealing with uncertainty, ambiguity and risk	0.669	
				O6- Identify and assess my individual and group strengths and weaknesses	0.613	
4	1.268	5.765	0.67	O10- Communication skills	0.836	Organising
				O19- Team working	0.625	competences (OC)
				O9- Leadership skills	0.542	
5	1.199	5.449	0.83	O14- Financial and economic know how	0.867	Specific knowledge (SK)
				O13- Legal know how	0.849	

The model results in five factors, which offer a different categorisation from the *EntreComp* theory and suggest an aggrupation aligned with Man et al. (2002), with exception of the relationship competences related to the context such as networking and professional contacts, which does not significantly load in any of the factors resulting in our model.

Factor 1 – *Opportunity and ideas (ID)*. Four items cluster to form the first factor. This factor includes most of the competences linked to the first group of *EntreComp*, referring to the ability to recognise opportunities, value ideas, forecast future scenarios and evaluate consequences. From the *EntreComp* theory framework, the one that does not load into this factor is the perception of the ability to *develop creative and purposeful idea*, which does not significantly load in any of the components.

Factor 2 – *Commitment competences (CC)*. Six items cluster to form the second factor. This includes competences related to moving ahead with the business: determination to turn ideas into action, being resilient under pressure and temporary failure, making the most of limited resources, learning by doing and learning from mistakes. The perception of having multidisciplinary skills and digital know how also contributes to his factor.

Factor 3 – *Decision making (DM)*. Three items cluster to form the third factor: defining priorities and action plans, making decisions with uncertainty and risk and the identification and assessment of the own individual and group strengths and weaknesses.

Factor 4 – *Organising competences (OC)*. Three items cluster to form the fourth factor, related to team management: communication skills, leadership and team working.

Factor 5 – *Specific knowledge (SK)*. Two items cluster to form the fifth factor: and they correspond to the legal and financial and economic knowledge.

Regression analysis

Once the factors were identified, we used a multiple regression model to study the relationship between the competence and skill factors in *Entrepreneurship Intention (EI)*.

The model of competences proposed has a R-square=.284. Hypothesis 2 is validated for ID, CC, DM and OC competences, which significantly affect the intention. The relationships between SK and EI is not validated in this sample.

When considering gender in the model, results reveal that the relation between competences and intentions in this sample is not moderated by gender and therefore hypothesis 5 is not validated. None of the other control variables reached the level of significance. Table 19 summarises the parameters obtained.

Table 19. Regression components of the sample towards intention

Predictor variables	Model 1										Model 2		Model 3	
	EI	Sig	EI	Sig	EI	Sig	EI	Sig	EI	Sig	EI	Sig	EI	Sig
ID (Component 1)									0,372**	.000	0,339**	.000		
CC (Component 2)									0,309**	.000	0,325**	.000		
DM (Component 3)									0,158*	0,04	0,162*	0,06		
OC (Component 4)									0,191*	0,02	0,180*	0,04		
SK (Component 5)									0,049	0,53	0,043	0,64		
ID*GENDER													0,103	0,25
CC*GENDER													-0,057	0,54
DM*GENDER													-0,049	0,62
OC*GENDER													0,098	0,37
SK*GENDER													0,025	0,8
Gender	.005	.954							-.006	.946	-0.003	.970	- 0.13	.876
Previous EEP			0.72	.402					.077	.378	-0.035	0.656	-0,034	0,67
Age					.023	.790			.21	.808	-0.065	0.397	-0,064	0,45
Family entrepreneur					.042	.622	.594	.553	0.063	0.419	0.058	0,47		
R2	.005		0.72		.023		.042		.091		.533		.544	
Adjusted R2	.000		0.05		.001		.002		.008		.284		.296	

**. Significant at the 0.01 level (2-tailed). *. Significant at the 0.05 level (2-tailed).

Model 1: Control variables; Model 2: Control variables and main effects; Model 3: Control variables, main effects and moderating effects. First column includes the beta coefficients; second column significance levels (p-values).

Competences loading in *Opportunity an Ideas (ID)*, regarding the *ability to identify opportunities and value of the potential of ideas* results the most influential competence towards the entrepreneurship intention ($\beta=0.339$; $t=3.983$; $p\text{-value}=0.000$). Opportunity recognition capacity in the framework of entrepreneurship education has been explored in recent years, included in previous entrepreneurship competences frameworks (Man et al., 2002; Mitchelmore & Rowley, 2010, 2013) and found to significantly entrepreneurship intention (Dimov, 2007; G. Santos et al., 2018). This ability is considered one of the most important attributes for successful entrepreneurs (Dimov, 2007) and, despite the creativeness or motivation of the potential entrepreneur, some scholars note that without identifying opportunities to target, entrepreneurial activity does not take place (Short et al., 2010). Our results show that this ability significantly affects the entrepreneurship intentions of this group of STEM students.

The second group of competences that results more related to a higher entrepreneurship intention is related to *Commitment Competences (CM)* ($\beta=0.325$; $t=3.803$; $p\text{-value}=0.000$). A positive relation is also found between a higher perception of abilities related to DM, related to *making decision* ($\beta=0.162$; $t=1.895$; $p\text{-value}=0.060$) and OC, regarding the *organization of teams* ($\beta=0.180$; $t=2.050$; $p\text{-value}=0.042$). Action-oriented competences have been considered key abilities in previous models (Boyles & College, 2012).

On the other side, the effect of higher levels of specific knowledge, such as economic, financial or legal skills, towards intention has not been validated in this sample. This scenario is aligned with trends in entrepreneurship education models, in which the development of soft skills plays a higher role than business or management contents (Haase & Lautenschläger, 2011) and suggests a need to reinforce methods that contribute to developing personal skills and entrepreneurial mindsets rather than specific management knowledge (Costa, Santos, Wach, & Caetano, 2018).

5.3 Understanding the evolution of the entrepreneurship competences self-perception and the entrepreneurship intention through an EEP

5.3.1 Entrepreneurship intention and entrepreneurship competences self-perceived: characterization of potential entrepreneurs joining ActuaUPM

The first part of the analysis aims to explore deeply the entrepreneurship intention of the sample. As far as these individuals are considered representative of potential entrepreneurs, the

premises considered EI to be high and confirming our expectations considering the origin of the sample, participants rate the six items than define *Entrepreneurship Intention* (EI) highly. On a 1-7 scale, measure values are between 4.8 (“I2-My professional goal is to be an entrepreneur”) and 5.75 (“I6-I’ve got the firm intention to start a firm someday”). In general, higher values were obtained for individuals whose parents were entrepreneurs and also for those who had joint previous EEP, although without significant differences.

The ratios of business ventures created to previous editions of this program show that few participants finally become entrepreneurs (Agudo et al., 2014). Agudo et al. (2014) showed that less than 20% of students have historically finished the EEP and less than 10% have finally started up a business. Reasons for this involve the motivation for joining the program, real commitment and the capabilities of the team, so the exploration of the dependent variable can offer interesting insights into the “higher” or “lower” intentions of individuals.

Firstly, we analysed the linear dependency of the six items of the Entrepreneurship Intention construct. The correlation matrix shows high correlations, both positive and significant, between all of them, with values between 0.477 and 0.804. The analysis was completed obtaining Kaiser-Meyer-Olkin –KMO—as a measure of sampling adequacy (0.883) and Bartlett’s Test of Sphericity, highly significant (p value < 0.001), both indicating the dependency between the six variables.

We performed factor analysis (maximum likelihood method) to objectively establish the number of factors needed to explain the variability of the six original variables. A chi-square test indicated that one factor was insufficient (p -value <0.00001), and a two factors model was adequate (p -value = 0.225). The results were similar when using principal component analysis (PCA). PCA was chosen to provide consistency with the rest of the analysis.

Table 2 displays the matrix of loading factors with two components. The first explains a high percentage of the variance (74%) and has a high positive correlation with the six variables. We refer to them as *Entrepreneurship Intentions* (EI) and they will be used in the rest of the analysis as dependant variables. This is considered a suitable measure of the intention to become an entrepreneur, obtained as a combination of the six proposed variables: the higher it is, the greater the intention of individuals to be an entrepreneur. Although all items contribute with similar loadings, I4 and I3 are slightly more important (*determination to create a business in the future and disposition to do any effort to start and run an own business*). Confirming our hypothesis, the intention to become entrepreneurs in this sample was high, with a mean value of 5.34 on a scale of 1 to 7.

The second component is much less relevant, but in the light of its results in the factor analysis its importance is not depreciable to explain the correlation structure of the original variables. It explains 11% of the variance and is a component that contrasts (Table 16) the first three variables (positive correlations) and the last three (negative correlations). Most loading variables in this component are I1 (to be ready to do anything to be an entrepreneur) with positive load and I5 (I have seriously thought in starting a firm) and I6 (I've got the firm intention to start a firm someday), both with a negative load. As far as the variables I1, I2 and I3 capture the immediate disposition to start a business, and I4, I5 and I6 reflect this intention in the future, this factor can be considered a measure of the temporal horizon (Immediacy) in which the individual desires to start up a business.

Figure 1 shows the projection of the 138 individuals included in the sample in the plane defined by the two principal components. According to the previous description, the first dimension offers a measure of the intensity of the EI, individuals on the right side have values over the mean. Interpretation of the second component is more difficult and related to the immediacy of that intention. Individuals above the horizontal axis are thinking about starting a business in the short term, while those below are considering it in a longer term. Women are represented by pentagons and men by circles, no different patterns are observed by gender, neither intention nor immediacy.

Table 20. EI Component Matrix. Extraction Method: Principal Component

<i>Entrepreneurship Intention (EI)</i>	<i>Factor 1</i>	<i>Factor</i>
<i>I1- Ready to do anything to be an entrepreneur</i>	,805	,497
<i>I2- My professional goal is to be an entrepreneur</i>	,861	,248
<i>I3- I will make every effort to start and run my own business</i>	,900	,184
<i>I4- I am determined to create a business venture in the future</i>	,910	-,117
<i>I5- I have very seriously thought in starting a firm</i>	,816	-,445
<i>I6- I've got the firm intention to start a firm some day</i>	,866	-,357

Figure 17. Principal Component plot. First Component 1 (Axis X) and Second Component (Axis Y).

Gender do not significantly affect entrepreneurial intention in this group. A direct mean comparison of EI shows similar values for men (5.35) and women (5.33). A Student's t-test analysis of the six variables that define the *Entrepreneurship Intention* construct do not show significant differences in any of them¹⁴. There is a widespread idea in the literature according to which the entrepreneurial intention of men is greater than that of women (Guerrero et al., 2016; Kelley et al., 2016; Santos, Roomi and Linan, 2016). In this case, although the sample size (24 women and 114 men) is not large, the means obtained in intention for the two groups are quite similar. Consequently, the results obtained do not confirm the hypothesis of differences between men and women (Hypothesis 4). It is important to note that our sample is not a random sample of the general population but comprises STEM students with an initial predisposition toward entrepreneurship.

A detailed analysis of this group of potential STEM entrepreneurs shows that the general perception of entrepreneurship competences is quite high, with most values over 4 (the central value). The respondents in general perceive their weakest competences on the *legal and economic know-how*, which was perhaps predictable due to their technical background. The higher rates are obtained in capabilities included in the "*Into Action*" competences area, perceiving themselves as enjoying multidisciplinary profiles that can learn by doing, work in teams, solve problems and

¹⁴ Additionally, a discriminant analysis using the six variables and the Wilks' Lambda test indicates no significant differences between the two groups (p-value is 0.820).

take advantage of mistakes. Figure 1 represents graphically the mean value obtained in the 22 variables by gender.

Figure 18. Perception of competences in the sample of potential entrepreneurs (mean value)

Although when difference in means is desired for interpretation of the data, Students t-tests analysis are preferred¹⁵, limitations of the data under analysis suggest to use Wilcoxon-Mann-Whitney test for independent sample as a non-parametric method asymptotically more powerful (Fay & Proschan, 2010). In this sense the analysis of differences by gender for these 22 items has been performed using both methods, obtaining similar results (Table 3). In this sample, there are significant differences in four particular capabilities (p -value < 0.05), as explained in the following.

The results suggest that women have a significant lower perception of their ability to *recognise the potential that an idea has for creating value*. This could be aligned with previous research noting that women have a more pessimistic perception of business opportunities (Camelo-Ordaz et al., 2016; Díaz-Casero et al., 2002; Jack & Anderson, 2002). The difference in the perception of *digital skills*, in which women rate themselves as less capable than men, is also significant. This is especially remarkable in a STEM sample, where all the women participants have a technical background, but previous studies are aligned with this result noting that, although there is no great difference between men and women, regarding digital abilities, women's self-assessed competence is significantly lower (Hargittai, 2006). In the same sense this sample of women perceive themselves to have less *economic and financial know-how* than men, although

¹⁵ Equal variances can be assumed in all items excepting O2 (*Development of creative and purposeful idea*), O9 (*Leadership skills*) and O16 (*Defining priorities and action plans*).

in both cases it is relatively low. Financial skills are also usually self-rated as lower by women (Brush, 1992; Chaganti, 1986).

By contrast, women's perceptions of their *team working* abilities are higher than men. Team working skills have not been extensively explored in previous research in entrepreneurship competence models but team management is especially valued by women as a pragmatic method of leading teams (A.T. Kearney, 2015).

Consequently, only regarding the *recognition of the potential value of an idea*, the *digital know-how* and the *financial know-how* the capability perceived is higher in men than in women. No significant differences are obtained for the rest of the competences, and in the case of *team working skills*, perceived the capability is higher in women.

Table 21. Self-perceived competences of the sample of potential entrepreneurs

	Mean			t-test for Equality of Means		Wilcoxon - Mann - Whitney	
	Male	Fem	Dif	t	p-value	Z	p-value
<i>Ideas and Opportunities (ID)</i>							
<i>O1- Identify opportunities to create value and challenges that need to be met</i>	5.46	5.33	0.123	0.468	0.640	-0,345	0,730
<i>O2- Development of creative and purposeful ideas</i>	5.84	5.83	0.009	0.030	0.976	-0,608	0,543
<i>O3- Visualisation of future scenarios to guide effort and action</i>	5.60	5.83	-0.237	-0.995	0.322	-0,836	0,403
<i>O4- Recognise the potential that an idea has for creating value</i>	5.44	4.79	0.647	2.518	0.013	-2,374	0,018
<i>O5- Assess the consequences and impact of ideas, opportunities and actions</i>	5.43	5.29	0.138	0.580	0.563	-0,998	0,318
<i>Personal Resources (PR)</i>							
<i>O6- Identify and assess my individual and group strengths and weaknesses</i>	5.67	5.75	-0.083	-0.351	0.726	-0,334	0,739
<i>O7- Determination to turn into action my ideas, being resilient under pressure, adversity and temporary failure</i>	5.71	5.79	-0.081	-0.284	0.777	-0,900	0,368
<i>O8- Making the most of limited resources</i>	5.82	5.88	-0.059	-0.227	0.821	-0,270	0,787
<i>O9- Leadership skills</i>	5.70	5.54	0.160	0.515	0.611	-0,106	0,916
<i>O10- Communication skills</i>	5.58	5.88	-0.296	-1.065	0.289	-1,304	0,192
<i>O11- Multidisciplinary skills</i>	6.10	6.42	-0.320	-1.573	0.118	-1,567	0,117
<i>Specific Knowledge (SK)</i>							
<i>O12- Digital know how</i>	5.79	5.08	0.706	2.514	0.013	-2,456	0,014
<i>O13- Legal know how</i>	3.18	3.04	0.134	0.389	0.698	-0,455	0,649
<i>O14- Financial and economic know how</i>	4.11	3.46	0.656	1.974	0.050	-1,929	0,054
<i>Into Action (IA)</i>							
<i>O15- Development of new products and services</i>	5.47	5.25	0.224	0.864	0.389	-0,982	0,326
<i>O16- Defining priorities and action plans</i>	5.62	5.92	-0.294	-1.670	0.102	-1,175	0,240
<i>O17- Making decisions dealing with uncertainty, ambiguity and risk</i>	5.47	5.54	-0.068	-0.248	0.804	-0,428	0,669
<i>O17- Networking skills and making professional contacts</i>	4.92	4.79	0.129	0.373	0.710	-0,441	0,659
<i>O19- Team working</i>	5.90	6.42	-0.513	-2.177	0.031	-2,372	0,018
<i>O20- Problem solving skills</i>	5.93	6.29	-0.362	-1.727	0.086	-1,885	0,059
<i>O21- Learn by doing</i>	6.37	6.46	-0.090	-0.496	0.620	-0,367	0,713
<i>O22- Learn from mistakes</i>	6.32	6.33	-0.018	-0.088	0.930	-0,115	0,909

5.3.2 Changes on entrepreneurship competences self-perceived and entrepreneurship intention after the program.

Pre-post treatment differences between control and treatment group are listed in Table 22. Both groups show similar perceptions of competences and intention at the beginning. Pre-treatment measures only show significant differences on the perception of multidisciplinary skills. Post-treatment measures show a higher perception experiment vs control groups on all the competences.

Although the sample size does not allow to obtain significant difference in many of them, there are 7 competences with significant differences ($p < 0,05$): *making decisions dealing with uncertainty, ambiguity and risk* (O17), *making the most of limited resources* (O8), *communication skills* (O10), *development of new products and services* (O15), *defining priorities and actions plans* (O16), *making decisions with uncertainty, ambiguity and risk* (O17) and *team working* (O19). Entrepreneurship intention is significantly higher on the program group in the post-treatment (Control=4.65; Program=5.47; $p\text{-value}=0.005$). A graphical representation of measures in both groups is included in Figure 19.

Table 22. Pre-post treatment differences between control and treatment group

	Pre-treatment			t-test for Equality of Means		Post-treatment			t-test for Equality of Means	
	Control	Treatment	Dif	t	p-value	Control	Treatment	Dif	t	p-value
<i>Ideas and Opportunities</i>										
<i>O1- Identify opportunities to create value and challenges that need to be met</i>	5,406	5,420	- 0,0137	- 0,0497	0,9605	5,4375	5,6800	- 0,24	- 1,0936	0,2774
<i>O2- Development of creative and purposeful idea</i>	5,625	5,940	- 0,3150	- 1,2070	0,2310	5,7813	6,0800	- 0,30	- 1,5272	0,1307
<i>O3- Visualization of future scenarios to guide effort and action</i>	5,500	5,660	- 0,1600	- 0,6478	0,5190	5,3750	5,6000	- 0,23	- 0,9097	0,3657
<i>O4- Recognize the potential that an idea has for creating value</i>	5,313	5,300	0,0125	0,0464	0,9631	5,5313	5,5800	- 0,05	- 0,2006	0,8415
<i>O5- Assess the consequences and impact of ideas, opportunities and actions</i>	5,344	5,520	- 0,1763	- 0,7194	0,4740	5,3125	5,6600	- 0,35	- 1,4464	0,1520
<i>Personal Resources</i>										
<i>O6- Identify and assess my individual and group strengths and weaknesses</i>	5,719	5,740	- 0,0213	- 0,0916	0,9273	5,5625	5,4200	0,14	0,5900	0,5570
<i>O7- Determination to turn into action my ideas, being resilient under pressure, adversity and temporary failure</i>	5,625	5,800	- 0,1750	- 0,5984	0,5513	5,1875	5,9800	- 0,79	- 2,8842	0,0050
<i>O8- Making the most of limited resources</i>	5,844	5,860	- 0,0163	- 0,0586	0,9535	5,7188	6,1200	- 0,40	- 1,9693	0,0530
<i>O9- Leadership skills</i>	5,563	5,620	- 0,0575	- 0,2150	0,8303	5,2500	5,7000	- 0,45	- 1,5218	0,1320
<i>O-10 Communication skills</i>	5,250	5,600	- 0,3500	- 1,1604	0,2493	5,0313	5,7800	- 0,75	- 2,7056	0,0083
<i>O11- Multidisciplinary skills</i>	5,844	6,360	- 0,5163	- 2,4081	0,0183	6,0625	6,2000	- 0,14	- 0,5441	0,5883
<i>Specific Knowledge</i>										
<i>O12- Digital know how</i>	5,969	5,520	0,4488	1,8149	0,0741	5,5313	5,8600	- 0,33	- 1,2385	0,2192
<i>O13- Legal know how</i>	2,875	3,040	- 0,1650	- 0,5131	0,6093	3,1563	3,5800	- 0,42	- 1,1127	0,2692
<i>O14- Financial and economic know how</i>	4,125	3,980	0,1450	0,4701	0,6395	4,0313	4,3800	- 0,35	- 1,0607	0,2920
<i>Into Action</i>										
<i>O15- Development of new products and services</i>	5,438	5,620	- 0,1825	- 0,6705	0,5045	4,7500	5,7200	- 0,97	- 3,4131	0,0010
<i>O16- Defining priorities and action plans</i>	5,750	5,880	- 0,1300	- 0,5843	0,5607	5,4063	5,8200	- 0,41	- 1,8617	0,0663
<i>O17- Making decisions dealing with uncertainty, ambiguity and risk</i>	5,250	5,560	- 0,3100	- 1,1166	0,2675	4,9375	5,7800	- 0,84	- 3,6657	0,0004
<i>O18- Networking skills and making professional contacts</i>	4,406	4,820	- 0,4138	- 1,1585	0,2501	4,8438	5,0800	- 0,24	- 0,7638	0,4478
<i>O19- Team working</i>	5,750	6,120	- 0,3700	- 1,4526	0,1503	4,8438	5,0800	- 0,24	- 2,9716	0,0039
<i>O20- Problem solving skills</i>	5,844	5,920	- 0,0762	- 0,3250	0,7460	5,8438	6,1600	- 0,32	- 1,5272	0,1307
<i>O21- Learn by doing</i>	6,438	6,340	0,0975	0,5190	0,6052	6,5000	6,3200	0,18	0,8696	0,3871
<i>O22- Learn from mistakes</i>	6,406	6,280	0,1263	0,5970	0,5522	6,3438	6,3600	- 0,02	- 0,0733	0,9418
<i>Intention</i>	5,067	5,513	0,345	1,124	0,264	5,476	4,645	0,830	2,860	0,005

Figure 19. Graphical representation of the pre-post treatment differences between control and treatment group

The correlations between competences and intention and descriptive statistics are listed in Table 21. Both at t1 and t2 the entrepreneurship intention was positively and significantly related to most of the competences, with the higher values on the *ability of developing new products and services* (O15) and the *determination to turn into action ideas, being resilient under pressure, adversity and temporary failure* (O7). On the opposite, no significant relationship with the *financial and economic knowhow* (O14) and the *communication skills perception* (O10). None of the control variables results significantly related to entrepreneurship intention in t1 (age $r=0,135$, p -value $0,226$; previous EEP $r=0,194$, p -value $0,080$; parents self-employed $r=0,137$, p -value $=0,304$) or t2 (age $r=0,091$, p -value $0,414$; previous EEP $r=0,158$, p -value $0,156$; parents self-employed $r=0,97$, p -value $=0,385$).

Table 23. Descriptive Statistics and Pearson Correlations-Competencies and Intentions for Total Sample (N=82)

Variable	MEAN	S.D.	Intention (T2)	p-value	Intention (T1)	p-value
O1 (t2)	5,585	,9807	,354**	,001	,393**	,000
O2 (t2)	5,963	,9743	,340**	,002	,376**	,001
O3 (t2)	5,512	1,0914	,267*	,015	,319**	,004
O4 (t2)	5,561	1,0669	,364**	,001	,393**	,000

<i>Variable</i>	<i>MEAN</i>	<i>S.D.</i>	<i>Intention (T2)</i>	<i>p-value</i>	<i>Intention (T1)</i>	<i>p-value</i>
<i>O5 (t2)</i>	<i>5,524</i>	<i>1,0684</i>	<i>,365**</i>	<i>,001</i>	<i>,339**</i>	<i>,002</i>
<i>O6 (t2)</i>	<i>5,476</i>	<i>1,0912</i>	<i>,323**</i>	<i>,003</i>	<i>,338**</i>	<i>,002</i>
<i>O7 (t2)</i>	<i>5,671</i>	<i>1,2674</i>	<i>,542**</i>	<i>,000</i>	<i>,445**</i>	<i>,000</i>
<i>O8 (t2)</i>	<i>5,963</i>	<i>,9222</i>	<i>,353**</i>	<i>,001</i>	<i>,374**</i>	<i>,001</i>
<i>O9 (t2)</i>	<i>5,524</i>	<i>1,3168</i>	<i>,413**</i>	<i>,000</i>	<i>,433**</i>	<i>,000</i>
<i>O10 (t2)</i>	<i>5,488</i>	<i>1,2692</i>	<i>,202</i>	<i>,069</i>	<i>,204</i>	<i>,066</i>
<i>O11 (t2)</i>	<i>6,146</i>	<i>1,1013</i>	<i>,288**</i>	<i>,009</i>	<i>,306**</i>	<i>,005</i>
<i>O12 (t2)</i>	<i>5,732</i>	<i>1,1764</i>	<i>,361**</i>	<i>,001</i>	<i>,259*</i>	<i>,019</i>
<i>O13 (t2)</i>	<i>3,415</i>	<i>1,6847</i>	<i>,226*</i>	<i>,041</i>	<i>,237*</i>	<i>,032</i>
<i>O14 (t2)</i>	<i>4,244</i>	<i>1,4535</i>	<i>,211</i>	<i>,057</i>	<i>,188</i>	<i>,091</i>
<i>O15 (t2)</i>	<i>5,341</i>	<i>1,3354</i>	<i>,571**</i>	<i>,000</i>	<i>,458**</i>	<i>,000</i>
<i>O16 (t2)</i>	<i>5,659</i>	<i>,9965</i>	<i>,465**</i>	<i>,000</i>	<i>,532**</i>	<i>,000</i>
<i>O18 (t2)</i>	<i>5,451</i>	<i>1,0904</i>	<i>,401**</i>	<i>,000</i>	<i>,409**</i>	<i>,000</i>
<i>O18 (t2)</i>	<i>4,988</i>	<i>1,3471</i>	<i>,221*</i>	<i>,046</i>	<i>,149</i>	<i>,182</i>
<i>O19 (t2)</i>	<i>6,000</i>	<i>1,1967</i>	<i>,411**</i>	<i>,000</i>	<i>,312**</i>	<i>,004</i>
<i>O20 (t2)</i>	<i>6,037</i>	<i>,9222</i>	<i>,372**</i>	<i>,001</i>	<i>,294**</i>	<i>,007</i>
<i>O21 (t2)</i>	<i>6,390</i>	<i>,9130</i>	<i>,287**</i>	<i>,009</i>	<i>,377**</i>	<i>,000</i>
<i>O22 (t2)</i>	<i>6,354</i>	<i>,9734</i>	<i>,296**</i>	<i>,007</i>	<i>,340**</i>	<i>,002</i>
<i>INTENTION (t2)</i>	<i>5,1524</i>	<i>1,33878</i>	<i>1</i>		<i>,828**</i>	<i>,000</i>
<i>O1 (t1)</i>	<i>5,415</i>	<i>1,2467</i>	<i>,433**</i>	<i>,000</i>	<i>,515**</i>	<i>,000</i>
<i>O2 (t1)</i>	<i>5,817</i>	<i>1,1561</i>	<i>,293**</i>	<i>,007</i>	<i>,414**</i>	<i>,000</i>
<i>O3 (t1)</i>	<i>5,598</i>	<i>1,0871</i>	<i>,300**</i>	<i>,006</i>	<i>,331**</i>	<i>,002</i>
<i>O4 (t1)</i>	<i>5,305</i>	<i>1,1831</i>	<i>,360**</i>	<i>,001</i>	<i>,466**</i>	<i>,000</i>
<i>O5 (t1)</i>	<i>5,451</i>	<i>1,0790</i>	<i>,215</i>	<i>,052</i>	<i>,215</i>	<i>,053</i>
<i>O6 (t1)</i>	<i>5,732</i>	<i>1,0189</i>	<i>,195</i>	<i>,080</i>	<i>,182</i>	<i>,101</i>
<i>O7 (t1)</i>	<i>5,732</i>	<i>1,2867</i>	<i>,442**</i>	<i>,000</i>	<i>,462**</i>	<i>,000</i>
<i>O8 (t1)</i>	<i>5,854</i>	<i>1,2184</i>	<i>,227*</i>	<i>,040</i>	<i>,245*</i>	<i>,027</i>
<i>O9 (t1)</i>	<i>5,598</i>	<i>1,1744</i>	<i>,123</i>	<i>,270</i>	<i>,202</i>	<i>,068</i>
<i>O10 (t1)</i>	<i>5,463</i>	<i>1,3351</i>	<i>,114</i>	<i>,307</i>	<i>,177</i>	<i>,111</i>
<i>O11(t1)</i>	<i>6,159</i>	<i>,9746</i>	<i>,252*</i>	<i>,022</i>	<i>,244*</i>	<i>,027</i>
<i>O12 (t1)</i>	<i>5,695</i>	<i>1,1077</i>	<i>,250*</i>	<i>,024</i>	<i>,314**</i>	<i>,004</i>
<i>O13 (t1)</i>	<i>2,976</i>	<i>1,4140</i>	<i>,102</i>	<i>,362</i>	<i>,146</i>	<i>,191</i>
<i>O14 (t1)</i>	<i>4,037</i>	<i>1,3558</i>	<i>,126</i>	<i>,259</i>	<i>,106</i>	<i>,343</i>
<i>O15 (t1)</i>	<i>5,549</i>	<i>1,1983</i>	<i>,385**</i>	<i>,000</i>	<i>,519**</i>	<i>,000</i>
<i>O16 (t1)</i>	<i>5,829</i>	<i>,9788</i>	<i>,161</i>	<i>,147</i>	<i>,246*</i>	<i>,026</i>
<i>O17 (t1)</i>	<i>5,439</i>	<i>1,2282</i>	<i>,136</i>	<i>,221</i>	<i>,196</i>	<i>,078</i>
<i>O18 (t2)</i>	<i>4,659</i>	<i>1,5809</i>	<i>,206</i>	<i>,064</i>	<i>,214</i>	<i>,053</i>
<i>O19 (t1)</i>	<i>5,976</i>	<i>1,1328</i>	<i>,344**</i>	<i>,002</i>	<i>,293**</i>	<i>,008</i>
<i>O20 (t1)</i>	<i>5,890</i>	<i>1,0305</i>	<i>,282*</i>	<i>,010</i>	<i>,261*</i>	<i>,018</i>
<i>O21 (t1)</i>	<i>6,378</i>	<i>,8261</i>	<i>,157</i>	<i>,158</i>	<i>,218*</i>	<i>,049</i>

<i>Variable</i>	<i>MEAN</i>	<i>S.D.</i>	<i>Intention (T2)</i>	<i>p-value</i>	<i>Intention (T1)</i>	<i>p-value</i>
<i>O22 (t1)</i>	<i>6,329</i>	<i>,9304</i>	<i>,232*</i>	<i>,036</i>	<i>,320**</i>	<i>,003</i>
<i>INTENTION (t1)</i>	<i>5,2785</i>	<i>1,36034</i>	<i>,828**</i>	<i>,000</i>	<i>1</i>	

ANOVA for the entire sample (Table 24) showed differences program vs control in the pre–post scores in *determination to turn into action ideas, being resilient under pressure, adversity and temporary failure* (F = 6,669, p =0,012), *digital skills* (F =9,153, p=,03), *making decisions dealing with uncertainty, ambiguity and risk* (F =4,363, P=0,040), *teamwork* (F=4,525, p=0,036 and *intention* (F =7,971, p=0,006). We therefore find support for Hypothesis 2, but not for the whole set of variables.

Table 24. Means difference values between the Program and the Control Group. Anova one factor.

Difference in:	F	Sig.
T2_T1_O1_OPP_RECOGNITION	1,066	,305
T2_T1_O3_CREATIVITY	,006	,938
T2_T1_O3_FUTURE_SCENARIOS	,056	,814
T2_T1_O4_VALUE_POTENTIAL	,058	,811
T2_T1_O5_ETHICS	,277	,600
T2_T1_O6_PERSONAL_LIMITATIONS	,301	,585
T2_T1_O7_DETERMINATION	6,669	,012
T2_T1_O8_RESOURCES_MAX	2,082	,153
T2_T1_O9_LEADERSHIP_SKILLS	2,491	,118
T2_T1_O10_COMM_SKILLS	2,793	,099
T2_T1_O11_MULTIDISCIPLINARITY	2,792	,099
T2_T1_O12_DIGITAL_SKILLS	9,153	,003
T2_T1_O13_LEGAL_SKILLS	,910	,343
T2_T1_O14_FINANCIAL_SKILLS	4,104	,046
T2_T1_O15_NEW_DEVELOPMENT	7,721	,007
T2_T1_O16_PRIORITIES	1,697	,196
T2_T1_O17_UNCERTAINTY_DECISIONS	4,363	,040

Difference in:	F	Sig.
T2_T1_O18_NETWORKING	,433	,512
T2_T1_O19_TEAMWORK	4,525	,036
T2_T1_O20_PROBLEM_SOLVING	1,264	,264
T2_T1_O21_LEARN_BY_DOING	,164	,687
T2_T1_O22_LEARN_FROM_MISTAKES	,469	,495
T2_T1_INTENTION	7,971	,006

Results show that the ActuaUPM entrepreneurship program under study had positive impact on the increasement of entrepreneurship intention of the participants (H3). Regarding the entrepreneurship competences perceptions, the sample of the program rates themselves higher in all of them, and significant differences are found between the program and control groups (H3) Most competences result significant related to entrepreneurship intention (H2), particularly the higher correlations are found with those focused on the ability of developing new products and services (O15) and the determination to turn into action ideas, being resilient under pressure, adversity and temporary failure (O7).

Both competences result significantly different between the program and the control group, so this program, oriented to the development of business ideas and their effective launch, has effect on those competences that seem to be linked to a higher entrepreneurship intention.

6 Conclusions

6.1 Thesis contribution: answering research questions

The relevance of entrepreneurship education in policies requires attention to be paid to define both expectations and initiatives. The theoretical review conducted in the present research shows that there is not a homogeneous concept of what is understood by entrepreneurship education.

Under the various concepts of entrepreneurship education, entrepreneurial education, enterprise education, entrepreneurship in education, education for entrepreneurship, education through entrepreneurship, or the differences between programs and trainings, emerges a paradigm that tries to distinguish the purposes of this type of education and the audience to whom it is aimed. The commonality among the different initiatives is the objective to develop particular skills, which contribute in each case to a specific purpose. In this context, the present research proposes a model to define the initiatives by using entrepreneurship education and the specific purposes pursued, as well as the audience targeted to both define the programs and measure the impact.

This approach allows to follow a traceable flow to adapt and improve the elements of the programs such as contents, methodologies and outcomes pursued, which are not the same depending on the two elements that should accompany any reference to the entrepreneurship education initiative: for whom and for what.

In this scheme, the development of skills is established as the objective of entrepreneurship education, but, on the one hand, economic indicators are usually linked to it in public policies and, on the other hand, the competences that should be pursued based on the different needs continues to be debated.

The theoretical review performed discusses the role intended for entrepreneurship education in public initiatives. Entrepreneurship education hype as a driver to promote entrepreneurship activity is acknowledged, but it is essential to limit the role that entrepreneurship education must have as developer of competences. Highlighting the relevance of individuals strengths in the nurturing of human capital in the ecosystem, entrepreneurship education should be considered as a tool to provide specific outcomes and to enhance citizens skills towards a disruptive and innovative professional framework; however, the economic dynamization linked to the entrepreneurship movement cannot be achieved with only entrepreneurship education programs but considering a holistic view that shape a social and political context in line.

The impact of education programs must be aligned with the audience's intended behaviour, and this is the context in which the different stages in which individuals can stay along the

entrepreneurship path emerge. The lifecycle of entrepreneurship shows that, as a dynamic activity, needs in each stage must be studied and considered to develop entrepreneurship education programs with impact. In this sense, the thesis gathers previous author's reflections to propose that the role of education should be narrowed to competences acquisition and, in the second part of the research, focuses on the definition of which competences are needed for each purpose.

Although entrepreneurship competences have been addressed in previous research, the proposition of a comprehensive framework continues as a challenge. The literature review conducted shows the difficulties of defining a comprehensive framework for what has been called "entrepreneurship competences". The thesis contributes to a review of how different studies have categorised competences and how entrepreneurship education has evolved from an initial focus on management or business contents to wider approaches in which entrepreneurship is considered an activity that requires a large range of skills. After this review, *EntreComp*, the theoretical framework proposed as a common guide to inspire entrepreneurship education by the European Commission, is selected as reference for the analysis.

The following part tests a way to measure the effectiveness of entrepreneurship education programs according to the model proposed in the first part of the research by studying the individuals enrolled in ActuaUPM, a consolidated entrepreneurship education program oriented to the creation of business ventures. The aim is to explore through an analysis of this case how entrepreneurship education programs could increase entrepreneurship intention in the early stages of the entrepreneurship process through the development of specific competences. Results can contribute to the design of entrepreneurial education programs, tailoring contents and methods to actual student needs and orienting best practices that really impact their intention and future behaviour.

With these premises, the quantitative analysis contributes to the research objectives through the operationalisation of three research questions identified as follows:

- Can self-perceived entrepreneurship competences contribute to explain entrepreneurship intention?

Considering as model of reference the Theory of Planned Behaviour to explain entrepreneurship intention, results obtained show that entrepreneurship competences are positively related to entrepreneurship intention, in a similar way as that of the Perceived Behavioural Control construct of the model which is usually operationalised by evaluating the self-perceived capability to initiate an entrepreneurship activity. This result opens a path of research to explore if the application of the theory of the planned behaviour model to entrepreneurship could be enriched by considering this type of entrepreneurship competence. These first results note that the

Entrepreneurship Competences Framework, from a quantitative perspective, is a good starting point as a reference for the competences that should be pursued in entrepreneurship education as a tool to promote new business creation.

- What competences are more related towards entrepreneurship intention?

The analysis of entrepreneurship intention confirms that the sample of potential entrepreneurs under study share the common interest in becoming entrepreneurs and reveal that entrepreneurship intention between both female and male profiles is not significantly different, despite the widespread hypothesis that entrepreneurship intention is lower in women than in men.

The factor analysis that was conducted suggests a clustering of competences that does not follow the theoretical groups proposed by the *EntreComp*. The *EntreComp* proposal offers a grouping conceptualised on the basis of the process that takes ideas into action (Opportunities & Ideas, Resources and Into Action). Nevertheless, a purpose-behaviour classification aligned with previous frameworks, such as Man et al. (2002), fits a better statistical model and the resulting analysis considers five areas: *Opportunity and Ideas competences (ID)*, *Commitment competences (CC)*, *Decision making competences (DM)*, *Organising competences (OC)* and *Specific knowledge (SK)*.

The competences area of *opportunities and ideas (ID)*, which relates to the ability to identify opportunities and value the potential of ideas, results the most influential towards the entrepreneurship intention. The dimensions that include those competences related to the *commitment* to work on the business (CC), the *decision-making* process (DM) and the *organisation* (OC), also result significantly related to a higher entrepreneurship intention.

On the other hand, the effect of higher levels of specific knowledge on intention, such as financial or legal skills, has not been validated in this STEM sample. This result could be related to a perception that this knowledge can be achieved by an early incorporation to their potential firm of a complementary legal or financial specialist. However there is some evidence that supports that at the early stages, the team composition in Science-Based entrepreneurial firms (SBEF) is usually formed by founders who share network ties that compose homogeneous boards in terms of education, industry experience, functional expertise, and skills (Knockaert, Ucbasaran, Wright, & Clarysse, 2011) and hiring patterns appear to be shaped by "mimetic isomorphism" (Ensley & Hmieleski, 2005). This scenario of the relationship competences-intention is aligned with the trends in entrepreneurship education model, in which the development of soft skills plays a higher role than business or management contents (Haase & Lautenschläger, 2011) and suggests the reinforcement

of methods that contribute to the development of personal skills and an entrepreneurial mindset more than specific management knowledge (Costa et al., 2018).

This relation between competences perceived and entrepreneurship intention does not result being moderated by gender in this STEM sample, despite previous research finds the lack of competence to be more important for women than men, in the sense of having the necessary knowledge, skills, and experience to be an entrepreneur.

- What is the impact of an entrepreneurship education program on competences and entrepreneurship intention?

Results from the analysis at the beginning of the program show these STEM potential entrepreneurs perceived themselves as multidisciplinary profiles able to learn by doing, work in teams, solve problems and take advantage of mistakes.

After the program, results show that the ActuaUPM entrepreneurship program under study had positive impact in raising the entrepreneurship intention of participants.

With regard to the entrepreneurship competences perceptions, the sample in the program rates themselves higher in all of them, and significant differences are found between the program and control groups. Most competences result significantly related to entrepreneurship intention, in particular the higher correlations are found with those focused on the ability of *developing new products and services* and the *determination to turn into action ideas, being resilient under pressure, adversity and temporary failure*. Both competences result significantly different between the program group and the control group. Thus, this program, oriented to the development of business ideas and their effective launch, has an effect on those competences that seem to be linked to a higher entrepreneurship intention.

Implications

The theoretical part of the thesis reviews different models that have been used to explain the antecedents of entrepreneurship intention. Previous research has noted that attitude is the main factor influencing the intention to become an entrepreneur. The perception of the positive or negative acceptance of entrepreneurship in the environment has been partially supported in some studies and the perceived capability to perform the behaviour shows a positive relation but is undertaken in less studies. This line of research is followed in this thesis, because although personal traits have been the main focus of previous research, the role that education can play is mainly through the development of competences, and the self-perceived skills also influence on entrepreneurship intention. The analysis performed over the sample of potential entrepreneurs under study confirms

the Attitude as the main factor of influence but also validate the relevance of self-perceived competences, contributing to explain entrepreneurship intention in a similar way to that of the perceived capability to be able to set up a business.

The thesis contributes to the support of previous studies that have noted a positive relationship between self-perceived competences and entrepreneurship intention. In particular, among this sample of potential entrepreneurs, the competences area of *opportunities and ideas* (ID), which is in regard to the ability to identify opportunities and value the potential of ideas, results the most influential towards the entrepreneurship intention. The dimensions that include those competences related to the *commitment* to work on the business (CC), the *decision-making* process (DM) and the *organisation* (OC), also result in a significant relationship to higher entrepreneurship intention. On the other hand, the effect of higher levels of specific knowledge on intention, such as financial or legal skills, has not been validated in this STEM sample. This scenario of the relationship competences-intention is aligned with trends in entrepreneurship education, in which the development of soft skills plays a higher role than business or management contents (Haase & Lautenschläger, 2011) and suggests the reinforcement of methods that contribute to the development of personal skills and an entrepreneurial mindset more than specific management knowledge (Costa et al., 2018).

As one of the outcomes pursued for most of the entrepreneurship education programs, the final part of the research contributes to an understanding of the entrepreneurship competences held by a group of potential STEM entrepreneurs by identifying differences by gender and exploring which competences are more closely related to higher entrepreneurship intention, thereby contributing to the orientation of educational initiatives.

Overall, as a contribution from the analysis, the inclusion of methods that promote competences oriented to the *identification of opportunities*, *commitment*, *decision-making* and *organisation* can contribute to entrepreneurship education programs as a tool that fosters entrepreneurship intention. Our results do not, however, identify specific orientations that affect female more than male participants. Incorporating methods that teach the use of prototypes and experimentation to identify opportunities could positively affect entrepreneurship intention. Experiential learning, proposing solutions to problems, learning by doing and engaging in real-life situations can be promoted by the incorporation of entrepreneurship experiences in classes and real environment observations to identify opportunities (Costa et al., 2018).

The process to identify opportunities can be understood from two different perspectives: the fact that opportunities surround potential entrepreneurs and that they can be identified (active search, passive search and fortuitous discovery); or the approach that they can be created (creation of

opportunities; DeTienne & Chandler, 2004). From our understanding, both involve the capacity to recognize innovative challenges and take advantage of them, although with different levels of creativity. The literature review shows that education can play a role in improving this ability (DeTienne & Chandler, 2004; Liñán et al., 2011). DeTienne & Chandler (2016) focused on the passive search, as it involves creativity as a learnable characteristic and tested the impact of two indicators, the number of ideas and their innovativeness, and obtained positive results after a training based on the proposed SEEC methodology (securing, expanding, exposing and challenging inspired on Epstein [1996]). This approach implies that not only the pure recognition of opportunities is key, but also the way in which they can be addressed. *Ideas and Opportunities* competence involves not only the identification of opportunities but the development of ideas to meet the challenges they offer, choosing the best options by analysing the value they bring and the long-term consequences.

About this key aspect, as a first conclusion, the incorporation into entrepreneurship education programs of methods that train the use of prototypes and experimentation to identify an opportunity could positively influence entrepreneurship intention. Experiential learning, proposing solutions to problems, learn by doing and engaging in real-life situations can be promoted along with the incorporation of entrepreneurship experiences to practice observation through the identification of opportunities in class and in real environments (Costa et al., 2018). According to Kolb (1984; Kolb and Boyatzis, 2000), four principles guide this training: experience (feeling), reflective observation (watching), abstract conceptualisation (thinking), and active experimentation (doing). The inclusion of practical tools such as design thinking methodology, can favour the evaluation of the potential of ideas. The design thinking methodology sets an approach to test ideas, reflect and identify problems, increase the deep understanding of potential users and evaluate the potential value for others (Rotman, 2006). The impact of the design thinking methodology in entrepreneurship education is currently understudied in spite of its potential to impart entrepreneurship competences (Von Kortzfleisch, Zerwas, & Mokanis, 2013).

6.2 Limitations and avenues for further research

The current debate lays down over the competences that entrepreneurship education should pursue. From the authors' perspective, an understanding of which abilities are better related to the entrepreneurship intention of potential entrepreneurs is the first step, and should only be considered as a departing point from which to define and test methods and practices that could configure comprehensive entrepreneurship education programs that are adapted to promote specific competences that may have an impact on entrepreneurial intention and subsequent behaviour.

The influence of competences on entrepreneurship intention opens a path of intention prediction based on measurable observation, different from traits or attitudes. Although this research

explores the influence of competences based on the self-perception of the different capabilities, as far as the perception of what we can do is an even higher factor to effectively do something than the objective capability, a field of research is open to go deeper into instruments that evaluate the objective acquisition of knowledge and competence development as learning outcomes of entrepreneurship education and behaviour drivers.

The same process should be done in the rest of the entrepreneurship stages, evaluating the impact on entrepreneurship education programs targeted to pre-start up samples towards the development of general capabilities or the increase of entrepreneurship intention, the impact of those aimed to entrepreneurs towards the growth of their business or the scale-up of the ventures. As needs are different, the objectives pursued in each program should be defined accordingly and the development of the most related competences to each particular behaviour assessed.

Finally, observation of the evolution of these competences through any entrepreneurship program and the intention to start a business could help to evaluate the effectiveness of the methodologies and contents taught and contribute to further research into the impact of entrepreneurship education.

Annex I - Scientific impact & dissemination resulting from this thesis

▪ Journal papers

- Armuña, C., Ramos, S., Juan, J., Feijóo, C. and Arenal, A. (2020), From stand-up to start-up: exploring entrepreneurship competences and STEM women's intention, *International Entrepreneurship and Management Journal*, 16, 69–92.
- Arenal, A., Armuña, C., Feijóo, C., Ramos, S., Xu, Z., Moreno, A. (2020), Innovation ecosystems theory revisited: The case of artificial intelligence in China, *Telecommunications Policy*, 2020, 101960,
- Arenal, A., Feijoo, C., Moreno, A., Armuña, C. and Ramos, S. (2019), An academic perspective on the entrepreneurship policy agenda: themes, geographies and evolution, *Journal of Entrepreneurship and Public Policy*, 9 (1), 65-93.
- Feijóo, C., Ramos, S., Armuña, C., Arenal, A., José-Luis Gómez-Barroso (2018), A study on the deployment of high-speed broadband networks in NUTS3 regions within the framework of digital agenda for Europe, *Telecommunications Policy*, 42 (9), 682-699.
- Arenal, A., Armuña, C., Ramos, S., Feijóo, C. (2018). Ecosistemas emprendedores y startups, el nuevo protagonismo de las pequeñas organizaciones. *Economía industrial*, (407), 85-94.

▪ Conference papers

- Armuña, C., Arenal, A., Ramos, S., Gómez-Barroso, JL., Analysis of Entrepreneurial Ecosystem Frameworks: The Need to Quantify Entrepreneurial Activity, 9th International Scientific Conference Riga University, Riga (Estonia), 18-20th May 2017
- Ramos, S., Arenal, A., Armuña, C., From App Economy to Web Entrepreneurship: analyzing the socio-economic impact of mobile applications and web-based entrepreneurs in Europe under the entrepreneurial ecosystem framework, 28th European Regional Conference of the International Telecommunications Society (ITS) -, Passau (Germany), 30 July – 2 August 2017
- Armuña, C., Feijoo, C., Ramos, S., Arenal, A., Feijóo, C, From stand-up to start-up: the influence of the perceived entrepreneurial competences and the potential role of entrepreneurial education, - XXXI Conference Research and Entrepreneurship and Small

Business (RENT) - "Relevance in Entrepreneurship Research", , Lund (Sweden), 16-17th November 2017

- Arenal, A., Feijóo, C., Moreno, A., Armuña, C., Ramos, S., An Investigation of the Evolution of the Entrepreneurship Policy Agenda in the EU – Relevant milestones, key areas and the way forward, 40^a Conference Institute for Small Business and Entrepreneurship (ISBE) – “‘Borders’, prosperity and entrepreneurial responses”, Belfast – UK, 8-9th November 2017
 - Article awarded as best paper within the Business Support, Policy and Practice track
- Arenal, A., Feijóo, C., Moreno, A., Ramos, S., Armuña, C., An Investigation of the Evolution of the Entrepreneurship Policy Agenda in the EU – Relevant milestones, key areas and the way forward, - XXXI Conference RENT - "Relevance in Entrepreneurship Research", Research and Entrepreneurship and Small Business (RENT), Lund (Sweden), 16-17th November 2017 –
 - Article selected for inclusion in the RENT Anthology book 2017, but finally refused by the author in order not to avoid further options of publication
- Feijóo, C., Jie, S., Ramos, S., Arenal, A., Armuña, C., de Prato, G., The Industrial Innovation Ecosystem of Artificial Intelligence in China: Status and prospects, - 22nd ITS Biennial Conference -, (Seoul, South Korea) (24-27th June 2018)
- Armuña, C., Ruíz, JJ, Ramos, S., Arenal, A., Feijóo, C., Entrepreneurial competences and the intention to startup: a cross-regional analysis of Chinese university students (poster), - XXXII Conference Research and Entrepreneurship and Small Business (RENT) Toledo (Spain), 15-16th November 2018
- Arenal, A., Feijóo, C., Moreno, A., Ramos, S., Armuña, C., Leading or Lagging? an Analysis about the business Media Views on the Configuration of the Entrepreneurship Policy Agenda (poster)- XXXII Conference Research and Entrepreneurship and Small Business (RENT) -, Toledo (Spain), 15-16th November 2018
- Armuña, C., Ramos, S., Ruíz, JJ, Arenal, A., Feijóo, C., “Entrepreneurship competences: new skills for a knowledge-based society”. European Regional Conference of the International Telecommunications Society (ITS), in Helsinki (Finland), June 2019
 - Participation in the PhD Seminar.

- Armuña, C., Ruíz, JJ, Ramos, S., Arenal, A., Feijóo, C., “Entrepreneurship education programs: the effect on self-perceived entrepreneurship competences and intention”. RENT XXXIII Conference, in Berlin (Germany). (November 2019)
- Book chapters
 - Ramos, S., Armuña, C., Arenal, A., Ferrandis, J (2015), Mobile Communications and the Entrepreneurial Revolution in: Emerging Perspectives on the Mobile Content Evolution, IGI Glonal, pp.32-43
- Other contributions
 - Contributor at TELOS nº 105 - “Smart Cities” (November 2016 – January 2017)
 - Co-author of a dossier about entrepreneurial ecosystems under the title “Entrepreneurial ecosystems: the relevance of the Urban Environment”
 - VI Workshop de la Sección de Función Empresarial y Creación de Empresas de ACEDE y XI Workshop de Investigación basada en GEM. (September 2017).
 - Accepted contribution and participation at the workshop with the presentation of the paper “Entrepreneurship competences: potential entrepreneurs’ perceptions and the role of entrepreneurial education”.
 - XII Workshop organized by GEM España. Logroño. (September 2018)
 - Accepted contribution and participation at the workshop with the presentation of the paper “The impact of an entrepreneurship education program on the acquisition of entrepreneurship competences: the case of ACTUAUPM”

Annex II - Publications identified with research using the EntreComp

Year	Title	Use of EntreComp	Authors	Total
2016	<i>EntreComp : The Entrepreneurship Competence Framework</i>	<i>Development of EntreComp</i>	Bacigalupo, Margherita;Kampylis, Panagiotis;Punie, Yves;Van den Brande, Godelieve	1
	<i>Interventions: Les dimensions linguistiques de toutes les matières scolaires</i>	<i>Described and linke to DigComp</i>	Conseil de l'Europe	1
	<i>No Limits to Entrepreneurship and Disability - Guide to work systems and accompaniment activities The Ecosystem To Foster Entrepreneurship In People With Disability</i>	<i>Erasmus+ - As a reference of competences -self-employment of persons with disabilities</i>	Fundación Prevent	1
	<i>PROMOTING THE ENTREPRENEURSHIP COMPETENCE OF YOUNG ADULTS IN EUROPE: TOWARDS A SELF-ASSESSMENT TOOL</i>	<i>Development of a self-assessment tool</i>	Bacigalupo, M.;Kampylis, P.;McCallum, E.;Punie, Y.	1
	Total			4
2017	<i>Active job search open course for renewable energy in rural areas: Online module of job seeking and occupational competences. Online module of entrepreneurship</i>	<i>Erasmus+ - Guide for entrepreneurship training</i>	Beas Collado, M ^a ; Martínez, Laura	1
	<i>Bilancio di competenze e competenza imprenditiva</i>	<i>Described</i>	Serreri, Paolino	1
	<i>Building a Conceptual Framework of Entrepreneurial Competencies: The Ontological, Epistemological, and Methodological View</i>	<i>"The consequences of the entrepreneurial process in this framework are adapted from the EntreComp Framework"</i>	Gustomo, Aurik; Herliana, Sri;Dhewanto, Wawan;Ghina, Astri	1
	<i>CREATING INSIGHT AMONG STUDENTS ON WORKING LIFE COMPETENCES THROUGH PROBLEM BASED LEARNING</i>	<i>As base for interviews</i>	Sievers, A.;Ranta, L.;Guilland, A.	1
	<i>Creating sustainable entrepreneurship: Cross-sectional qualitative in-depth interviews to describe Durban SME entrepreneurs' perception of motivation for entrepreneurship using key success factors</i>	<i>"This study had the ability to test this theory and the EntreComp Framework from a South African perspective, and could potentially contribute to the achievement motivation theory for further study in SA (Khan, 2014)"</i>	Kriel, Shannah	1
	<i>Educação para o empreendedorismo: o projeto "Empower students with entrepreneurial skills"</i>	<i>Questionnaire based on EntreComp</i>	Lopes, Sandra Ferrão	1
	<i>EUROPEAN TRAINING FOUNDATION 2017-20. ANNUAL WORK PROGRAMME 2018</i>	<i>Used for the SBA (Small Business Act for Europe) analysis and follow-up recommendations</i>	EUROPEAN TRAINING FOUNDATION	1
	<i>Exploring Students' Entrepreneurial Ideas, Resources, and Actions: The EntreComp Framework</i>	<i>"This study, using a cross-sectional design and a quantitative approach, aims at verifying and empirically validating the framework on a convenience sample of 462 college students"</i>	Serena Cubico	1
	<i>Greenpreneurs: A guide to curriculum design</i>	<i>Erasmus+ LBD-DECR3E project (Adaptation of the LEARNING-BY-DOING Methodology for the Development of Entrepreneurial Competencies in the sectors of</i>	Jarvis, Carol; Aben, Inge;Ainhua, Esnaola;Brooks, Ian;MacInnes,	1

	Renewable Energy and Energy Efficiency – R3E. Design framework linked to the areas of the EntreComp.	Janice;Rajala, Markku;Diaz Rivas, Alberto	
L33N: Liminality and Educational Entrepreneurship - A a discovery journey. Entrepreneurship Cookbook for, in and through Education	Erasmus+ the L33N Cookbook framed in 26 letters linking features of entrepreneurial learning and teaching to the EntreComp framework and conversations in education	Radulescu, Zoe; Araujo, Paula; Marques, Albertina; Ribeiro, Abilio; Kulali I.;Kertesz, Judit;Orav, Kati; Belme, Dora;Turku, Jani;Gilfillan, Colin ;Duda, Ondrej ;Juvova, Alena ; Cajot, Guido;Huion, Patricia	1
Shared Responsibility of Higher Education Institutes (Hei) and Their Partners in Assuring Nursing Students' Employability Skills	As base for interviews	Ranta, Liisa;Sievers, Anna;Guilland, Auli	1
SOCES Handbook-Assessment of Transversal Competences: Focus on Entrepreneurship, Sense of Initiative and Social Skills	Erasmus+ As a reference of framework of competences	Guilland, Auli	1
Taking the future into their own hands. Youth work and entrepreneurial learning	Reference for the development of skills	Andersen, Tine;Hill-Dixon, Amanda;Nindl, Sigrid;Nindl, Sigrid;Fröhlich Hougaard, Karsten	1
Teaching the European key competence of the sense of initiative and entrepreneurship	As a framework for learning outcomes together with the sense of initiative and entrepreneurship (Author & , 2016)	Morselli, Daniele	1
The relationship between entrepreneurial orientation, entrepreneurial competencies, entrepreneurial leadership, and firm performance: A proposed model.	As a framework of competences	Nwachukwu, Chijioke E;Chaladkova, Helena;Zufan, Pavel	1
Why so Reluctant? Something's Preventing Engineers from Embracing Entrepreneurial Education	Described/Conceptual framework for learning outcomes	Gibbons, Chris	1
Total 2017			16
2018	Business Environment Versus Entrepreneurial Reaction: Are Compe-tencies Needed?	To develop competency questionnaire	Šebestová, Jarmila;Lejková, Monika
Competências empreendedoras no Ensino Superior Politécnico	As framework for entrepreneurship competences	Parreira, Pedro;Alves, Leopoldina;Mónico, Lisete;Humberto, Jorge;Teresa, Sampaio	1
CONSIDERATIONS FOR SOLVING THE SKILLS MISMATCH OF YOUNG GRADUATES AND REQUIREMENTS OF BUSINESS WORLD	"This paper presents the results of a study on the skills' requirement set by employers and the means of assessing them among the candidates in the recruitment. The results were analyzed using the qualitative content analysis with the "Entrepreneurship Competence Framework" as a theoretical background. According to the results, much emphasis is set on entrepreneurship although only occasionally any measures are	Guilland, A.	1

taken to confirm their presence or absence among candidates through the recruitment process"

<i>Developing entrepreneurship through Design Thinking: a new frontier for adult education</i>	<i>Described/Framework for entrepreneurship education</i>	<i>Terzaroli, Carlo</i>	<i>1</i>
<i>Embedding Ethical and Sustainable Thinking in the Entrepreneurial Mindset</i>	<i>Described and implementation of the ethical thinking competence</i> "The purpose of this study was to perform a high-level benchmarking of learning outcomes achieved at Proacademy against The Entrepreneurship Competence Framework (EntreComp)" "This paper aims to make an analysis of the current curriculum for bachelor degree from a faculty, from the perspective of the EntreComp framework, through a comparative method"	<i>Farrell, Kathleen</i>	<i>1</i>
<i>Entrepreneurial competences : comparison of Proacademy and EntreComp</i>		<i>Teneva, Irena</i>	<i>1</i>
<i>Entrepreneurial Competences in Economical Engineering Curriculum in Romania</i>		<i>Strauti, Gabriela;Dumitrache, Victor-Marian;Taucean, Ilie Mihai</i>	<i>1</i>
<i>Entrepreneurial competences: Comparing and contrasting models and taxonomies</i>	<i>Comparison of competences models with the EntreComp</i>	<i>Gianesini, Giovanna;Cubico, Serena;Favretto, Giuseppe;Leitão, João</i>	<i>1</i>
<i>Entrepreneurship education for a sustainable future</i>	<i>Used for the model of Entrepreneurship Education</i>	<i>Lindner, Johannes</i>	<i>1</i>
<i>Investigating attitudes of entrepreneurs towards the use of information and communication technologies in Croatian SMEs in two Northern Adriatic counties</i>	<i>As a reference for the concept of attitudes and development a questionnaire of attitudes towards the use of ICT for business.</i> <i>Reference for practical training in the wanted! Initiative. "Wanted! es una experiencia educativa en el ámbito de la educación superior no reglada, donde reunimos a estudiantes con diferentes perfiles: creativo, tecnológico y empresarial"</i>	<i>Babic, S. Golob, M.</i>	<i>1</i>
<i>IX Jornadas de innovación e Investigación Docente</i>		<i>Ramos, Asunción Rodríguez</i>	<i>1</i>
<i>Quelle formation pour enseigner les paradoxes d'une action entrepreneuriale ambidextre?</i>	<i>As a reference for entrepreneurship education</i>	<i>Raveleau, Benoît;Mammar, Sihem;Duperray, Paola</i>	<i>1</i>
<i>Soft skills and ICT (Information and communication technologies) in the international brokering entrepreneurship</i>	<i>Considering as reference for the competences of the ENINBRO model developed</i>	<i>Kaikaryte-Moysidou, Laura</i>	<i>1</i>
<i>THE ROLE AND CONTRIBUTION OF LIFELONG LEARNING STYLE ON MILLENNIALS' GENERATION</i>	<i>IF4TM - ERASMUS+. Reference considered for the projects</i>	<i>Mandic, Vesna</i>	<i>1</i>
<i>Training pioneering entrepreneurs in urban agriculture: a model of curriculum based on the URBAN GREEN TRAIN project experience (ERASMUS+)</i>	<i>Application for an Urban Green Training Course</i>	<i>Magrefi, F.;Geoffriau, E.;Kahane, R.;Poelling, B.;Orsini, F.;Pennisi, G.;Bazzocchi, G.;Renting,</i>	<i>1</i>

			H.;Hoekstra, F.;Morgenstern, R.;Dubbeling, M.;Lorleberg, W.;Gianquinto, G	
	Компетентност предприемачество: референтна рамка, образователни отражения в подготовката на студенти педагози	Described	Simeonova, Katya	1
Total 2018				16
2019	ANÁLISIS DE LAS COMPETENCIAS EDUCATIVAS PARA EVALUAR A LAS PERSONAS EMPRENDEDORAS	Aplication to assessment over a self-assessment tool of the Regional Government (Junta de Extremadura, 2017)	Palos-Sanchez, Pedro R.;Baena-Luna, Pedro;Casablanca Peña, Amparo	1
	Articulating entrepreneurial competencies in the undergraduate curricular	Used to evaluate learning outputs	Dinning, Track	1
	Can Self-Leadership Be Used to Foster the Entrepreneurship Competence Framework?	Adaptation of self-leadership approach to the EntreComp	Brandt, T; Da Silva Gomes, JF;Polbitsyn, S	1
	Combining technology and entrepreneurial education through design thinking: Students' reflections on the learning process	To reinforce the competences of a proposed model, similar to EntreComp	Lynch, Matthew;Kamovich, Uladzimir;Longva, Kjersti K;Steinert, Martin	1
	Developing a Customizable Serious Game and Its Applicability in the Classroom	"The project builds on the theoretical framework of the European Union, namely the Entrecomp framework, which enlists the competences of entrepreneurship".	Kéri, Anita	1
	Developing workplace research skills to bridge the innovation gap between University and Industry	Used to alined the learning outcomes of a program	Hamburg, Ileana;Vladut, Gabriel	1
	Economic Education as a Factor of Entrepreneurial Competence Formation of Senior Students in Modern Society	As a reference for the entrepreneurship as a concept and description of the framwork This paper presents	Kovchyn, Natalia	1
	EntreCompOnto: An Ontology for Semantic Representation of Entrepreneurship Competences	EntreCompOnto, an ontology based on the EntreComp framework	Piedra, N.;Caro, E. T.	1
	Entrepreneurship education in Romania. Realities and perspectives in secondary and high school	Used to evaluate learning outcomes of the Romanian educational curillicum "At our university there is currently an initiative to expose more students to entrepreneurial experiences during their undergraduate studies. The project is supporting an educational shift from telling the students what they need to know in the future to engaging them in value-creating processes now. The initiative follows the EntreComp model"	Domilescu, Gabriela	1
	Facilitating entrepreneurial experiences through a software engineering project course	"Basically, in the present study we designed a gamification platform based on priority entrepreneur competencies obtained from the European Commission (2017) that carries out the "EntreComp Conceptual	Burden, Håkan;Steghöfer, Jan-Philipp;Svensson, Oskar Hagvall	1
	Gamified platform framing for entrepreneur competencies	Torres-Toukoudidis, Angel;Robles-Bykbaev, Vladimir;Cajamarca, Mario;Romero-Rodríguez, Luis M.;Chaljub, Jeanette;Pablo Salgado, Juan		1

	<i>Model" consisting of 3 competence areas and 15 dimensions with 442 indicators in 8 micro levels of proficiency"</i>		
<i>La sensibilisation à l'esprit d'entreprendre dans l'enseignement secondaire du système éducatif : Quelques balises pour son évaluation tirées d'une revue de la littérature scientifique</i>	<i>Link between the Entrepreneurship Scan, a tool for assesment, and the EntreComp. Recommendations pour l'évaluation d'impact de programmes d'éducation à l'entrepreneuriat Following the EntreCoop framework, TeenEmprende interrelates and interconnects three competence areas: "ideas and opportunities", "resources" and "into action".</i>	<i>Dejardin, Marcus</i>	<i>1</i>
<i>Sustainable Entrepreneurial Culture Programs Promoting Social Responsibility: A European Regional Experience</i>		<i>Sánchez-Hernández, M Isabel;Maldonado-Briegas, Juan José</i>	<i>1</i>
<i>Teorie sociologice e trasformazioni sociali</i>	<i>Described</i>	<i>Pendenza, Massimo;Romania, Vincenzo;Ricotta, Giuseppe;Iannone, Roberta;Susca, Emanuela Garbutt, Jane;Antes, Alison L.;Mozersky, Jessica;Pearson, James;Grailer, Joseph George;Toker, Emre;DuBois, James M</i>	<i>1</i>
<i>Validating curricular competencies in innovation and entrepreneurship for biomedical research trainees: A modified Delphi approach</i>	<i>The goal of this panel was to validate the EntreComp Framework as a whole for biomedical researchers</i>	<i>Selimi, Aybeyan;Useini, Arafat</i>	<i>1</i>
<i>Yenilikçi Eğitim ile Dijital Yetkinlik ve Girişimcilik Becerilerinin Geliştirilmesi – Kuzey Makedonya Örneği</i>	<i>Described</i>		
<i>Total 2019</i>			<i>16</i>
<i>Total general</i>			<i>52</i>

Annex III – Questionnaire sent to Actúaupm participants

T1 – Before the program

actúaUPM

Estimado participante,

Esta encuesta forma parte de una investigación de la UPM sobre la intención y las capacidades emprendedoras en colaboración con el Programa de Emprendimiento UPM, ActúaUPM.

Queremos recompensar tu colaboración participando en el sorteo de un móvil Xiaomi Mi6 y 10 packs de libros de emprendimiento.

La investigación incluye dos encuestas (una ahora y otra que recibirás en el mes de septiembre). Para entrar en el sorteo es necesario rellenar las dos. Los premiados recibirán la notificación en el email facilitado. Todos los datos se tratarán de manera confidencial y sólo serán utilizados en el marco de esta investigación.

Rellenarla te llevará menos de 10 minutos y **tu participación es importante para mejorar los programas de apoyo al emprendimiento como ActúaUPM** ¡Muchas gracias!

¡Comenzar! pulsa Enter #

Email (necesario para enviarte la segunda encuesta y participar en el sorteo): _____

Indica tu nivel de acuerdo sobre estos aspectos, en relación a la actividad emprendedora, de 1 (totalmente en desacuerdo) a 7 (totalmente de acuerdo)

		1	2	3	4	5	6	7
A1	Si tuviera la oportunidad y los recursos, me encantaría empezar un negocio	☐	☐	☐	☐	☐	☐	☐
A2	Ser emprendedor me supondría una gran satisfacción	☐	☐	☐	☐	☐	☐	☐
A3	Ser emprendedor implica más ventajas que desventajas para mí	☐	☐	☐	☐	☐	☐	☐
A4	Una carrera como emprendedor es atractiva para mí	☐	☐	☐	☐	☐	☐	☐
A5	Entre varias opciones, preferiría ser emprendedor	☐	☐	☐	☐	☐	☐	☐
A6	Personalmente considero el emprendimiento una carrera altamente deseable para gente con mi background educativo y profesional	☐	☐	☐	☐	☐	☐	☐
S1	Conozco a mucha gente en mi universidad que ha empezado satisfactoriamente sus propios negocios	☐	☐	☐	☐	☐	☐	☐
S2	En mi universidad, se anima activamente a la gente a perseguir sus propias ideas	☐	☐	☐	☐	☐	☐	☐
S3	En mi universidad conoces a mucha gente con buenas ideas para nuevos negocios	☐	☐	☐	☐	☐	☐	☐
S4	En mi entorno hay una buena infraestructura de soporte para ayudar el lanzamiento de nuevos negocios	☐	☐	☐	☐	☐	☐	☐
C1	Comenzar una compañía y mantenerla viable sería fácil para mí	☐	☐	☐	☐	☐	☐	☐
C2	Soy capaz de controlar el proceso de creación de un nuevo negocio	☐	☐	☐	☐	☐	☐	☐
C3	Conozco los detalles prácticos necesarios para poner en marcha una compañía	☐	☐	☐	☐	☐	☐	☐
C4	Si intentara empezar un negocio, tendría grandes posibilidades de tener éxito	☐	☐	☐	☐	☐	☐	☐
C5	Sería muy difícil para mí desarrollar una idea de negocio	☐	☐	☐	☐	☐	☐	☐
C6	Tengo las capacidades y habilidades necesarias para triunfar como emprendedor.	☐	☐	☐	☐	☐	☐	☐
C7	Estoy preparado para empezar una compañía viable	☐	☐	☐	☐	☐	☐	☐

C8	<i>Sé cómo desarrollar un proyecto emprendedor</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
I1	<i>Estoy preparado para hacer cualquier cosa para ser emprendedor</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
I2	<i>Mi meta profesional es ser emprendedor</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
I3	<i>Haré cualquier esfuerzo para empezar y mantener mi propio negocio</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
I4	<i>Tengo la determinación de crear mi propio negocio en el futuro</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
I5	<i>He pensado seriamente empezar mi propio negocio</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
I6	<i>Tengo la firme intención de empezar mi negocio algún día</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E1	<i>La cultura en mi ciudad/región es altamente favorable hacia la actividad emprendedora</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E2	<i>El rol del emprendedor en la economía está generalmente infravalorado en mi ciudad/región</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E3	<i>La mayoría de personas en mi ciudad/región considera inaceptable ser emprendedor</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E4	<i>En mi ciudad/región, la actividad emprendedora se considera que vale la pena a pesar de los riesgos</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E5	<i>En mi ciudad/región habitualmente se piensa que los emprendedores tienen ventaja sobre otros.</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E6	<i>Mi familia valora el emprendimiento por encima de otras actividades y carreras</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E7	<i>Mis amigos valoran el emprendimiento por encima de otras actividades y carreras</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
E8	<i>Mis compañeros valoran el emprendimiento por encima de otras actividades y carreras</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
F1	<i>Tengo amigos y conocidos que ya han empezado negocios y esa experiencia me influye positivamente para querer ser emprendedor</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R1	<i>Yo sigo el dicho "el que arriesga, no gana"</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R2	<i>Si una tarea parece interesante la elegiré aunque no esté seguro de pueda gestionarla.</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R3	<i>Incluso cuando sé que mis opciones son limitadas lo intento</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R4	<i>Expreso mi opinión incluso si la mayoría de la gente tiene un punto de vista opuesto</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R5	<i>Tener éxito me hace tomar riesgos altos</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R6	<i>Soy bastante cauto cuando hago planes y cuando los llevo a cabo</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R7	<i>No tengo mucha afinidad con las decisiones atrevidas</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R8	<i>No me gusta mucho llevar las cosas al límite, prefiero estar en mi zona de confort</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R9	<i>En mi trabajo sólo abordo pequeñas metas de forma que pueda alcanzarlas sin dificultad</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R10	<i>Mis decisiones son siempre tomadas con cuidado y precisión</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
R11	<i>Tiendo a imaginar consecuencias negativas de mis acciones</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
P1	<i>Creo que ser emprendedor está básicamente relacionado con capacidades y habilidades personales, y que la educación formal no tiene nada que ver.</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
<i>¿Cómo te puntuarías en las siguientes habilidades? (1 nada capacitado, 7 muy capacitado)</i>		
O1	<i>Identificar oportunidades para crear valor y necesidades que deben abordarse</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O2	<i>Desarrollar ideas creativas y resolutivas</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O3	<i>Visualizar futuros escenarios para guiar los esfuerzos y las decisiones</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O4	<i>Reconocer el potencial que una idea tiene para crear valor</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O5	<i>Evaluar las consecuencias e impacto de las ideas, oportunidades y acciones</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O6	<i>Identificar y evaluar mis fortalezas y debilidades, individuales y en equipo</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O7	<i>Determinación para llevar a cabo mis ideas, siendo fuerte bajo presión, adversidad y fracasos temporales</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O8	<i>Sacar el máximo partido de recursos limitados</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O9	<i>Habilidades de liderazgo</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O10	<i>Habilidades de comunicación</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O11	<i>Habilidades multidisciplinares</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O12	<i>Conocimientos digitales</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O13	<i>Conocimientos legales</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O24	<i>Conocimientos económicos y financieros</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O15	<i>Desarrollo de nuevos productos y servicios</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O16	<i>Definición de prioridades y planes de acción</i>	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

017	Tomar decisiones en entornos de incertidumbre, ambigüedad y riesgo	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
018	Habilidades de networking profesional	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
019	Trabajo en grupo	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
020	Resolver problemas (en el sentido de resolución de conflictos, gestión de desacuerdos y toma de decisiones)	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
021	Aprender sobre la marcha	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
022	Aprender de los errores	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Si decidieras lanzar un negocio, ¿aprobaría la gente de tu entorno tu decisión? Indícalo de 1 (lo desaprobaban totalmente) a 7 (lo aprobarían totalmente)		
S5	Tu familia cercana	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
S6	Tus amigos	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
S7	Tus compañeros	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Sobre tu experiencia anterior:

1. Ya he fundado una startup y se mantiene viable (Sí / No)
2. Fundé una startup pero fracasó (Sí / No)
3. He trabajado en una startup como empleado (Sí / No)
4. He trabajado antes pero no en una startup (Sí / No)
5. Nunca he trabajado antes (Sí / No)
6. He cursado otros cursos de educación emprendedora antes de este programa (Sí / No)

Sobre tu background:

1. Cuál es tu edad?
2. Por favor, indica tu sexo a) Hombre b)Mujer
3. Lugar de nacimiento (Ciudad y país).....
4. Principal lugar de residencia en los tres últimos años (ciudad y país)
5. ¿Cuál es el nivel más alto de estudios de tu familia?
 - a. Educación Primaria
 - b. Educación secundaria
 - c. Grado Universitario
 - d. Otro _____
6. Selecciona las ocupaciones más relevantes de tus padres:
 - a. Empleado del sector privado
 - b. Empleado del sector público
 - c. Profesional autónomo o emprendedor
 - d. Otro: _____
7. ¿Han sido alguna vez tus padres profesionales autónomos o emprendedores?
 - a. Sí
 - b. No
8. ¿Actualmente trabajas como profesional autónomo?
 - a. Sí
 - b. No
9. ¿Qué carrera/grado has hecho o estás cursando? _____

10. ¿Cuál es tu situación?

- a. El máximo curso en el que estoy matriculado es 1º
- b. El máximo curso en el que estoy matriculado es 2º
- c. El máximo curso en el que estoy matriculado es 3º
- d. El máximo curso en el que estoy matriculado es 4º
- e. He finalizado el Grado
- f. Estoy haciendo un Máster
- g. He finalizado un Máster
- h. Otro _____

11. Si tienes estudios adicionales, por favor selecciona (múltiples respuestas posibles):

- a. Grado de Económicas, administración de empresas o gestión
- b. Grado de Humanidades o Ciencias sociales distinta de las anteriores
- c. Grado técnico o científico
- d. Ninguna de ellas

12. ¿En qué universidad has estudiado o estás estudiando tu carrera?

13. ¿En qué universidad (si es el caso) has desarrollado tus estudios de post-grado?

T2 – After the program

actúaUPM

Estimado participante,

Esta encuesta forma parte de una investigación de la UPM sobre la intención y las capacidades emprendedoras en colaboración con el Programa de Emprendimiento UPM, actúaupm.

La recibes porque completaste la que enviamos en junio y ¡necesitamos tu ayuda participando en esta segunda parte!

Son 5 minutos.

Como recordarás, tu colaboración tiene premio: sorteamos un móvil Xiaomi MI5 y 10 packs de libros de emprendimiento. Para entrar en el sorteo es necesario que rellenes ésta también. Los premiados recibirán la notificación en el email facilitado. Todos los datos se tratarán de manera confidencial y sólo serán utilizados en el marco de esta investigación.

Tu participación es importante para mejorar los programas de apoyo al emprendimiento como actúaupm ¡Muchas gracias!

¡Comenzar! pulsa Enter

Email de contacto (por favor, incluye el mismo en el que has recibido esta segunda encuesta. Es necesario para participar en el sorteo)

En la presente edición de la Competición actúaupm, ¿eres miembro de un equipo que ha presentado el plan de negocio?

Indica tu nivel de acuerdo sobre estos aspectos, en relación a la actividad emprendedora, de 1 (totalmente en desacuerdo) a 7 (totalmente de acuerdo)

		1	2	3	4	5	6	7
A1	Si tuviera la oportunidad y los recursos, me encantaría empezar un negocio	☐	☐	☐	☐	☐	☐	☐
A2	Ser emprendedor me supondría una gran satisfacción	☐	☐	☐	☐	☐	☐	☐
A3	Ser emprendedor implica más ventajas que desventajas para mí	☐	☐	☐	☐	☐	☐	☐
A4	Una carrera como emprendedor es atractiva para mí	☐	☐	☐	☐	☐	☐	☐
A5	Entre varias opciones, preferiría ser emprendedor	☐	☐	☐	☐	☐	☐	☐
A6	Personalmente considero el emprendimiento una carrera altamente deseable para gente con mi background educativo y profesional	☐	☐	☐	☐	☐	☐	☐
S1	Conozco a mucha gente en mi universidad que ha empezado satisfactoriamente sus propios negocios	☐	☐	☐	☐	☐	☐	☐
S2	En mi universidad, se anima activamente a la gente a perseguir sus propias ideas	☐	☐	☐	☐	☐	☐	☐
S3	En mi universidad conoces a mucha gente con buenas ideas para nuevos negocios	☐	☐	☐	☐	☐	☐	☐
S4	En mi entorno hay una buena infraestructura de soporte para ayudar el lanzamiento de nuevos negocios	☐	☐	☐	☐	☐	☐	☐
C1	Comenzar una compañía y mantenerla viable sería fácil para mí	☐	☐	☐	☐	☐	☐	☐
C2	Soy capaz de controlar el proceso de creación de un nuevo negocio	☐	☐	☐	☐	☐	☐	☐
C3	Conozco los detalles prácticos necesarios para poner en marcha una compañía	☐	☐	☐	☐	☐	☐	☐
C4	Si intentara empezar un negocio, tendría grandes posibilidades de tener éxito	☐	☐	☐	☐	☐	☐	☐
C5	Sería muy difícil para mí desarrollar una idea de negocio	☐	☐	☐	☐	☐	☐	☐
C6	Tengo las capacidades y habilidades necesarias para triunfar como emprendedor.	☐	☐	☐	☐	☐	☐	☐
C7	Estoy preparado para empezar una compañía viable	☐	☐	☐	☐	☐	☐	☐
C8	Sé cómo desarrollar un proyecto emprendedor	☐	☐	☐	☐	☐	☐	☐
I1	Estoy preparado para hacer cualquier cosa para ser emprendedor	☐	☐	☐	☐	☐	☐	☐
I2	Mi meta profesional es ser emprendedor	☐	☐	☐	☐	☐	☐	☐
I3	Haré cualquier esfuerzo para empezar y mantener mi propio negocio	☐	☐	☐	☐	☐	☐	☐
I4	Tengo la determinación de crear mi propio negocio en el futuro	☐	☐	☐	☐	☐	☐	☐
I5	He pensado seriamente empezar mi propio negocio	☐	☐	☐	☐	☐	☐	☐
I6	Tengo la firme intención de empezar mi negocio algún día	☐	☐	☐	☐	☐	☐	☐
E1	La cultura en mi ciudad/región es altamente favorable hacia la actividad emprendedora	☐	☐	☐	☐	☐	☐	☐
E2	El rol del emprendedor en la economía está generalmente infravalorado en mi ciudad/región	☐	☐	☐	☐	☐	☐	☐
E3	La mayoría de personas en mi ciudad/región considera inaceptable ser emprendedor	☐	☐	☐	☐	☐	☐	☐
E4	En mi ciudad/región, la actividad emprendedora se considera que vale la pena a pesar de los riesgos	☐	☐	☐	☐	☐	☐	☐
E5	En mi ciudad/región habitualmente se piensa que los emprendedores tienen ventaja sobre otros.	☐	☐	☐	☐	☐	☐	☐
E6	Mi familia valora el emprendimiento por encima de otras actividades y carreras	☐	☐	☐	☐	☐	☐	☐
E7	Mis amigos valoran el emprendimiento por encima de otras actividades y carreras	☐	☐	☐	☐	☐	☐	☐
E8	Mis compañeros valoran el emprendimiento por encima de otras actividades y carreras	☐	☐	☐	☐	☐	☐	☐
F1	Tengo amigos y conocidos que ya han empezado negocios y esa experiencia me influye positivamente para querer ser emprendedor	☐	☐	☐	☐	☐	☐	☐
R1	Yo sigo el dicho "el que arriesga, no gana"	☐	☐	☐	☐	☐	☐	☐
R2	Si una tarea parece interesante la elegiré aunque no esté seguro de pueda gestionarla.	☐	☐	☐	☐	☐	☐	☐
R3	Incluso cuando sé que mis opciones son limitadas lo intento	☐	☐	☐	☐	☐	☐	☐
R4	Expreso mi opinión incluso si la mayoría de la gente tiene un punto de vista opuesto	☐	☐	☐	☐	☐	☐	☐
R5	Tener éxito me hace tomar riesgos altos	☐	☐	☐	☐	☐	☐	☐
R6	Soy bastante cauto cuando hago planes y cuando los llevo a cabo	☐	☐	☐	☐	☐	☐	☐
R7	No tengo mucha afinidad con las decisiones atrevidas	☐	☐	☐	☐	☐	☐	☐
R8	No me gusta mucho llevar las cosas al límite, prefiero estar en mi zona de confort	☐	☐	☐	☐	☐	☐	☐
R9	En mi trabajo sólo abordo pequeñas metas de forma que pueda alcanzarlas sin dificultad	☐	☐	☐	☐	☐	☐	☐
R10	Mis decisiones son siempre tomadas con cuidado y precisión	☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐

R11	Tiendo a imaginar consecuencias negativas de mis acciones	
P1	Creo que ser emprendedor está básicamente relacionado con capacidades y habilidades personales, y que la educación formal no tiene nada que ver.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
¿Cómo te puntuarías en las siguientes habilidades? (1 nada capacitado, 7 muy capacitado)		
O1	Identificar oportunidades para crear valor y necesidades que deben abordarse	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O2	Desarrollar ideas creativas y resolutivas	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O3	Visualizar futuros escenarios para guiar los esfuerzos y las decisiones	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O4	Reconocer el potencial que una idea tiene para crear valor	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O5	Evaluar las consecuencias e impacto de las ideas, oportunidades y acciones	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O6	Identificar y evaluar mis fortalezas y debilidades, individuales y en equipo	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O7	Determinación para llevar a cabo mis ideas, siendo fuerte bajo presión, adversidad y fracasos temporales	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O8	Sacar el máximo partido de recursos limitados	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O9	Habilidades de liderazgo	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O10	Habilidades de comunicación	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O11	Habilidades multidisciplinarias	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O12	Conocimientos digitales	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O13	Conocimientos legales	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O14	Conocimientos económicos y financieros	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O15	Desarrollo de nuevos productos y servicios	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O16	Definición de prioridades y planes de acción	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O17	Tomar decisiones en entornos de incertidumbre, ambigüedad y riesgo	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O18	Habilidades de networking profesional	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O98	Trabajo en grupo	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O20	Resolver problemas (en el sentido de resolución de conflictos, gestión de desacuerdos y toma de decisiones)	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O21	Aprender sobre la marcha	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
O22	Aprender de los errores	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Si decidieras lanzar un negocio, ¿aprobaría la gente de tu entorno tu decisión? Indícalo de 1 (lo desaprobarían totalmente) a 7 (lo aprobarían totalmente)		
S5	Tu familia cercana	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
S6	Tus amigos	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
S7	Tus compañeros	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

References

- A.T. Kearney. (2015). *A Portrait of 21st-Century Business Leadership*.
- Aadland, T., & Aaboen, L. (2020). An entrepreneurship education taxonomy based on authenticity. *European Journal of Engineering Education*, 0(0), 1–18. <https://doi.org/10.1080/03043797.2020.1732305>
- Acs, Z., Estrin, S. Mickiewicz, T., & Szerb, L. (2014). The Continued Search for the Solow Residual : The Continued Search for the Solow Residual: The Role of National Entrepreneurial Ecosystem. *IZA. Discussion Paper Series.*, (8652).
- Acs, Z. J., Audretsch, D. B., Braunerhjelm, P., & Carlsson, B. (2012). Growth and entrepreneurship. *Small Business Economics*.
- Ács, Z. J., Autio, E., & Szerb, L. (2014). National Systems of Entrepreneurship: Measurement issues and policy implications. *Research Policy*.
- Agudo, A., Chaparro, J., Hernandez, A., Iglesias, S., Marin, D., Navarro, E., ... Portillo, J. (2014). De la idea a la empresa. El difícil camino de las iniciativas empresariales universitarias. Retrieved from <https://www.researchgate.net/publication/262818037>
- Ahmad, N., & Hoffmann, A. N. (2008). *A Framework for Addressing and Measuring Entrepreneurship. OECD Statistics Working Paper*.
- Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. (Englewood Cliffs, Ed.). NJ: Prentice-Hall.
- Ajzen, Icek. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Al Mamun, A., Binti Che Nawi, N., Dewiendren, A. A., & Fazira Binti Shamsudin, S. F. (2016). Examining the effects of entrepreneurial competencies on students' entrepreneurial intention. *Mediterranean Journal of Social Sciences*, 7(2), 119–127. <https://doi.org/10.5901/mjss.2016.v7n2p119>
- ANDE. (2013). *Entrepreneurial Ecosystem Diagnostic Toolkit. Aspen Network of Development Entrepreneurs*.
- Arenal, A., Ramos, S., Feijoo, C., Moreno, A., & Armuña, C. (2017). Entrepreneurship Policy

- Agenda in the EU explained. A Contribution to Understand the Entrepreneurial Path and the Way Forward. In European Institute for Advanced Studies in Management (Ed.), *Research in Entrepreneurship and Small Business XXXI Conference*.
- Asheim, B. T., & Isaksen, A. (2002). Regional Innovation Systems: The Integration of Local “Sticky” and Global “Ubiquitous” Knowledge. *Journal of Technology Transfer*, 27(1), 77–86.
- Audretsch, D. B., Bönte, W., & Keilbach, M. (2008). Entrepreneurship capital and its impact on knowledge diffusion and economic performance. *Journal of Business Venturing*, 23(6), 687–698.
- Audretsch, D., & Thurik, R. (2004). A Model of the Entrepreneurial Economy. *International Journal of Entrepreneurship Education*, 2(2), 143–166.
- Autio, E., Keeley, R. H., Klofsten, M., Parker, G. G. C., & Hay, M. (2001). Entrepreneurial Intent among Students in Scandinavia and in the USA. *Enterprise and Innovation Management Studies*, 5(2), 13–21. <https://doi.org/10.1080/1463244011009463>
- Bacigalupo, M., Kampylis, P., Punie, Y., & Van den Brande, G. (2016). *EntreComp: the Entrepreneurship Competence Framework*. Publication Office of the European Union. <https://doi.org/10.2791/593884>
- Bandura, A. (1989). Human Agency in Social Cognitive Theory. *American Psychologist*, 44(9), 1175–1184.
- Bandura, A. (1994). Self-Efficacy. *Encyclopedia of Human Behaviour*, 4, 71–81. <https://doi.org/http://dx.doi.org/10.1016/B978-012164730-8/50095-2>
- Bartlett, M. S. (1954). A note on multiplying factors for various chi-squared approximations. *Journal of the Royal Statistical Society*, 16, 296–298.
- Bartram, D. (2005). The great eight competencies: A criterion-centric approach to validation. *Journal of Applied Psychology*, 90(6), 1185–1203. <https://doi.org/10.1037/0021-9010.90.6.1185>
- Bechard, J., & Gregoire, D. (2005). Entrepreneurship education revisited: the case of higher education. *Academy of Management Learning and Education*, 4(1), 22–43.
- Bernardez, M. (2009). The power of entrepreneurial ecosystems : extracting booms from busts. *PII Review*, 2(2), 12–45.
- Bethlehem, J. (2009). *Applied Survey Methods: A Statistical Perspective*. *Applied Survey Methods*.

Hoboken, NJ: Wiley. <https://doi.org/10.1002/9780470494998>

- Bird, B. (1995). Toward a theory of entrepreneurial competency. *Advances in Entrepreneurship, Firm Emergence, and Growth*, 2, 51–72.
- Blank, S. (2010). What's A Startup? First Principles. Retrieved September 16, 2015, from <http://steveblank.com/2010/01/25/whats-a-startup-first-principles/>
- Boyles, T., & College, M. (2012). 21st century knowledge, skills, and abilities and entrepreneurial competences: a model for undergraduate entrepreneurship education. *Journal of Entrepreneurship Education*, 15, 41–55.
- Brockhaus, R. H. (2001). *Entrepreneurship education : a global view*. Ashgate. Retrieved from https://books.google.es/books/about/Entrepreneurship_Education.html?id=KNp6QgAACAAJ&redir_esc=y
- Burgoyne, J. G. (1993). The competence movement : Issues , stakeholders and prospects. *Personal Review*, 22(6), 6–13.
- Busenitz, L. (2003). Entrepreneurship Research in Emergence: Past Trends and Future Directions. *Journal of Management*. [https://doi.org/10.1016/S0149-2063\(03\)00013-8](https://doi.org/10.1016/S0149-2063(03)00013-8)
- Busenitz, L. W., Plummer, L. a., Klotz, A. C., Shahzad, A., & Rhoads, K. (2014). Entrepreneurship Research (1985-2009) and the Emergence of Opportunities. *Entrepreneurship: Theory and Practice*, (September 2015). <https://doi.org/10.1111/etap.12120>
- Camelo-Ordaz, C., Diáñez-González, J. P., & Ruiz-Navarro, J. (2016). The influence of gender on entrepreneurial intention: The mediating role of perceptual factors. *BRQ Business Research Quarterly*, 19(4), 261–277. <https://doi.org/10.1016/j.brq.2016.03.001>
- Campo, J. L. M. (2011). Analysis of the influence of self-efficacy on entrepreneurial intentions. *Prospect*, 9(2), 14–21.
- Carlsson, B., Braunerhjelm, P., McKelvey, M., Olofsson, C., Persson, L., & Ylinenpää, H. (2013). The evolving domain of entrepreneurship research. *Small Business Economics*.
- Carr, J. C., & Sequeira, J. M. (2007). Prior family business exposure as intergenerational influence and entrepreneurial intent: A Theory of Planned Behavior approach. *Journal of Business Research*, 60(10), 1090–1098. <https://doi.org/10.1016/j.jbusres.2006.12.016>
- Chen, C. C., Gene Greene, P., & Crick, A. (1998). Does entrepreneurial self-efficacy distinguish

- entrepreneurs from managers? *Journal of Business Venturing*, 13(4), 295–316.
- Cheng, M.-I., Dainty, A. R. J., & Moore, D. R. (2003). The differing faces of managerial competency in Britain and America. *The Journal of Management Development*, 2(6), 527-537(11).
- Cohen, B. (2006). Sustainable valley entrepreneurial ecosystems. *Business Strategy and the Environment*.
- Comisión de las Comunidades Europeas. (2006). Recomendación del Parlamento Europeo y del Consejo sobre las competencias clave para el aprendizaje permanente. *Diario Oficial de La Unión Europea*, 30.12.2006(394), 10–18.
- Cooke, P., Uranga, M. G., & Etxebarria, G. (1997). Regional innovation systems: Institutional and organizational dimensions. *Research Policy*, 26, 475–491.
- Costa, S. F., Santos, S. C., Wach, D., & Caetano, A. (2018). Recognizing Opportunities across Campus: The Effects of Cognitive Training and Entrepreneurial Passion on the Business Opportunity Prototype. *Journal of Small Business Management*, 56(1), 51–75. <https://doi.org/10.1111/jsbm.12348>
- Council of the European Union. (2018). Council Recommendation of 22 May 2018 on key competences for lifelong learning. *Official Journal of the European Union*, (C 189/1), 1–13. Retrieved from [https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604\(01\)&rid=7](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&rid=7)
- DeTienne, D. R., & Chandler, G. N. (2004). Opportunity Identification and Its Role in the Entrepreneurial Classroom: A Pedagogical Opportunity Identification and Its Role in the Entrepreneurial Classroom. *The Academy of Management Learning and Education*, 3(3), 42–257. <https://doi.org/10.5465/AMLE.2004.14242103>
- Díaz-Casero, J., Sanchez, M., & Postigo, M. (2002). Mujer Y Creación De Empresas En Extremadura : Un Análisis Comparativo. *Ayala Calvo, J.C. y Grupo de Investigación FEDRA*, 1180–1198.
- Díaz-García, M. C., & Jiménez-Moreno, J. (2010). Entrepreneurial intention: the role of gender. *International Entrepreneurship and Management Journal*, 6(3), 261–283. <https://doi.org/10.1007/s11365-008-0103-2>
- Dimov, D. (2007). Insight to opportunity intention: the importance of person-situation learning match. *Entrepreneurship: Theory and Practice*, 31(4), 561–583.

<https://doi.org/10.1111/j.1540-6520.2007.00188.x>

- Ensley, M. D., & Hmieleski, K. M. (2005). A comparative study of new venture top management team composition, dynamics and performance between university-based and independent start-ups. *Research Policy*, 34(7), 1091–1105. <https://doi.org/10.1016/j.respol.2005.05.008>
- Entrialgo, M., & Iglesias, V. (2016). The moderating role of entrepreneurship education on the antecedents of entrepreneurial intention. *International Entrepreneurship and Management Journal*, 12(4), 1209–1232. <https://doi.org/10.1007/s11365-016-0389-4>
- Epstein, R. (1996). *Cognition, creativity, and behavior : selected essays*. Praeger.
- Erkkilä, K. (2000). *Entrepreneurial education: mapping the debates in the United States, the United Kingdom and Finland*. Abingdon: Taylor & Francis.
- European Commission/EACEA/Eurydice. (2016). Entrepreneurship Education at School in Europe. *Luxembourg: Publication Office of the European Union Publications Office of the European Union*, (Eurydice Report). <https://doi.org/10.1787/9789264044104-7-en>
- European Commission. (2012). *Rethinking Education: Investing in skills for better socio-economic outcomes*.
- European Commission. (2015). *Entrepreneurship education: A road to success*. Retrieved from http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8056&lang=en&tpa_id=1042&title=Entrepreneurship-Education:--A-road-to-success
- European Commission. (2016). *A NEW SKILLS AGENDA FOR EUROPE. Working together to strengthen human capital, employability and competitiveness*. Com(2016)381/F1 - En.
- European Commission, & EUC. (2012). Report on the results of public consultation on The Entrepreneurship 2020 Action Plan. *European Commission*, (2015), 1–28.
- European Council. (2006). Recommendation of the European Parliament and the Council on key competencies for lifelong learning. *Official Journal of the European Union*, (March 2002), 10–18. Retrieved from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:394:0010:0018:en:PDF>
- Fay, M. P., & Proschan, M. A. (2010). Wilcoxon-Mann-Whitney or t-test? On assumptions for hypothesis tests and multiple interpretations of decision rules *. *Statistics Surveys*, 4, 1–39. <https://doi.org/10.1214/09-SS051>

- Fayolle, A. (2013). Personal views on the future of entrepreneurship education. *Entrepreneurship and Regional Development*, 25(7–8), 692–701. <https://doi.org/10.1080/08985626.2013.821318>
- Fayolle, A., & Gailly, B. (2008). *From craft to science: Teaching models and learning processes in entrepreneurship education*. *Journal of European Industrial Training* (Vol. 32). <https://doi.org/10.1108/03090590810899838>
- Feld, B. (2012). *Startup communities : building an entrepreneurial ecosystem in your city* /. John Wiley & Sons, Inc.
- Fernández-Pérez, V., Montes-Merino, A., Rodríguez-Ariza, L., & Galicia, P. E. A. (2019). Emotional competencies and cognitive antecedents in shaping student's entrepreneurial intention: the moderating role of entrepreneurship education. *International Entrepreneurship and Management Journal*, 15(1), 281–305. <https://doi.org/10.1007/s11365-017-0438-7>
- Ferreira, M. P., Reis, N. R., & Miranda, R. (2015). Thirty years of entrepreneurship research published in top journals: analysis of citations, co-citations and themes. *Journal of Global Entrepreneurship Research*, 5(1), 17. <https://doi.org/10.1186/s40497-015-0035-6>
- Freeman, C. (1995). The ' National System of Innovation ' in historical perspective. *Cambridge Journal of Economics*, 19, 5–24.
- Fuentes, F. J., Saco de Larriva, F. J., & Rodríguez, P. (2013). *Estudio sobre el Perfil Emprendedor en el Alumnado Universitario de Córdoba*.
- Gelderen, M. Van, Brand, M., Praag, M. Van, Bodewes, W., Poutsma, E., & Gils, A. Van. (2008). Explaining entrepreneurial intentions by means of the theory of planned behaviour. *Career Development International*, 13(6), 538–559. <https://doi.org/10.1108/13620430810901688>
- Gianesini, G., Cubico, S., Favretto, G., & Leitão, J. (2018). Entrepreneurial Competences: Comparing and Contrasting Models and Taxonomies (pp. 13–32). https://doi.org/10.1007/978-3-319-89336-5_2
- Gibb, A. (2002). In pursuit of a new “enterprise” and “entrepreneurship” paradigm for learning: Creative destruction, new values, new ways of doing things and new combinations of knowledge. *International Journal of Management Reviews*, 4(3), 233–269. <https://doi.org/10.1111/1468-2370.00086>
- Global Entrepreneurship Research Association. (2017). *Global Entrepreneurship Monitor - Global Report 2016/17*. Retrieved from <http://www.gemconsortium.org/report/49812>

- Global Entrepreneurship Research Association. (2018). *GEM Global Entrepreneurship Monitor 2017/2018*. (GEM Consortium, Ed.) (Global Rep).
- Global Entrepreneurship Research Association. (2019). *Global Entrepreneurship Monitor: Global Report 2018/2019. Global Entrepreneurship Monitor*. Retrieved from <http://www.gemconsortium.org/report/50012>
- Graham, P. (2012). Startup = Growth. Retrieved September 16, 2015, from <http://www.paulgraham.com/growth.html>
- Gutterman, A. S. (2015). A Guide for Growth-Oriented Entrepreneurs.
- Haase, H., & Lautenschläger, A. (2011). The ‘ Teachability Dilemma ’ of entrepreneurship. *International Entrepreneurship and Management Journal*, 7(March 2010), 145–162. <https://doi.org/10.1007/s11365-010-0150-3>
- Hannon, P. D. (2005). Philosophies of Enterprise and Entrepreneurship Education and Challenges for Higher Education in the UK. *The International Journal of Entrepreneurship and Innovation*, 6(2), 105–114. <https://doi.org/10.5367/0000000053966876>
- Hargittai, E. (2006). Differences in actual and perceived online skills: the role of gender. *Social Science Quarterly*., 87(2), 432–448.
- Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural Equation Modelling: Guidelines for Determining Model Fit. *Electronic Journal of Business Research Methods*, 6(1), 53–60. <https://doi.org/10.1037/1082-989X.12.1.58>
- IEG World Bank. (2013). *World Bank Group Support for Innovation and Entrepreneurship. An Independent evaluation*.
- Isenberg, D. J. (2010). The big idea: How to start an entrepreneurial revolution. *Harvard Business Review*.
- Jack, S. L., & Anderson, A. R. (2002). The effects of embeddedness on the entrepreneurial process. *Journal of Business Venturing*, 17(5), 467–487. [https://doi.org/10.1016/S0883-9026\(01\)00076-3](https://doi.org/10.1016/S0883-9026(01)00076-3)
- Jones, C., & English, J. (2001). A contemporary approach to entrepreneurship education. *Education + Training*, 46(8/9), 416–423. <https://doi.org/10.1108/00400910410569533>
- Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika*, 39, 31–36.

- Kelley, D., Singer, S., & Herrington, M. (2016). *GEM Report 2015/2016*.
- Kline, R. B. (2011). *Principles and Practice of Structural Equation Modeling*. The Guildford Press. New York: The Guildford Press. <https://doi.org/10.5840/thought194520147>
- Knockaert, M., Ucbasaran, D., Wright, M., & Clarysse, B. (2011). The relationship between knowledge transfer, top management team composition, and performance: The case of science-based entrepreneurial firms. *Entrepreneurship: Theory and Practice*, 35(4), 777–803. <https://doi.org/10.1111/j.1540-6520.2010.00405.x>
- Kolb, D.A. (1984). *Experiential learning: experience as the source of learning and development*. New Jersey: Prentice-Hall.
- Kolb, David A, & Boyatzis, R. E. (2000). *Experiential learning theory: previous research and new direction*, (216).
- Kolvereid, L., & Isaksen, E. (2006). New business start-up and subsequent entry into self-employment. *Journal of Business Venturing*, 21(6), 866–885. <https://doi.org/10.1016/j.jbusvent.2005.06.008>
- Krueger, N. F., & Brazeal, D. V. (1994). Entrepreneurial Potential and Potential Entrepreneurs. *Entrepreneurship Theory and Practice*, 18(3), 91–104. <https://doi.org/10.2139/ssrn.1505244>
- Krueger, N. F., Reilly, M. D., & Carsrud, A. L. (2000). Competing models of entrepreneurial intentions. *Journal of Business Venturing*, 15(5–6), 411–432. [https://doi.org/10.1016/S0883-9026\(98\)00033-0](https://doi.org/10.1016/S0883-9026(98)00033-0)
- Kuratko, D F, & Hodgetts, R. M. (2004). *Entrepreneurship: Theory, Process, Practice*. Thomson/South-Western. Retrieved from <https://books.google.es/books?id=10C8QgAACAAJ>
- Kuratko, Donald F. (2005). The emergence of entrepreneurship education: development, trends and challenges. *Entrepreneurship: Theory & Practice*, 9(5), 577–597.
- Lackéus, M. (2015). *Entrepreneurship in education: What, why, when, how. Background paper for OECD-LEED*. Retrieved from http://www.oecd.org/cfe/leed/BGP_Entrepreneurship-in-Education.pdf
- Landström, H., Harirchi, G., & Åström, F. (2012). *Entrepreneurship: Exploring the knowledge base. Research Policy*.
- Langowitz, N., & Minniti, M. (2007). The entrepreneurial propensity of women. *Entrepreneurship*:

- Theory and Practice*, 31(3), 341–364. <https://doi.org/10.1111/j.1540-6520.2007.00177.x>
- Lee, H., Lee, J., & Shim, K. (2016). Entrepreneurial characteristics: A systematic literature review. *Pacific Asia Conference on Information Systems, PACIS 2016 - Proceedings*.
- Lerner, M., & Almor, T. (2003). Relationships among strategic capabilities and the performance of women-owned small ventures. *Journal of Small Business Management*, 40(2), 109–125. <https://doi.org/10.1111/1540-627x.00044>
- Liñán, F. (2008). Skill and value perceptions: How do they affect entrepreneurial intentions? *International Entrepreneurship and Management Journal*, 4(3), 257–272. <https://doi.org/10.1007/s11365-008-0093-0>
- Liñán, F., & Chen, Y. W. (2009). Development and cross-cultural application of a specific instrument to measure entrepreneurial intentions. *Entrepreneurship: Theory and Practice*, 33(3), 593–617. <https://doi.org/10.1111/j.1540-6520.2009.00318.x>
- Liñán, F., & Fayolle, A. (2015). A systematic literature review on entrepreneurial intentions: citation, thematic analyses, and research agenda. *International Entrepreneurship and Management Journal*, 11(4), 907–933. <https://doi.org/10.1007/s11365-015-0356-5>
- Liñán, F., Rodríguez-Cohard, J. C., & Rueda-Cantuche, J. M. (2011). Factors affecting entrepreneurial intention levels: A role for education. *International Entrepreneurship and Management Journal*, 7(2), 195–218. <https://doi.org/10.1007/s11365-010-0154-z>
- Lortie, J., & Castogiovanni, G. (2015). The theory of planned behavior in entrepreneurship research: what we know and future directions. *International Entrepreneurship and Management Journal*, 935–957. <https://doi.org/10.1007/s11365-015-0358-3>
- Lorz, M., Mueller, S., & Volery, T. (2013). Entrepreneurship Education: a Systematic Review of the Methods in Impact Studies. *Journal of Enterprising Culture*, 21(02), 123–151. <https://doi.org/10.1142/S0218495813500064>
- Lundvall, B.-Å. (1992). *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning*. National systems of innovation Towards a theory of innovation and interactive learning.
- Malecki, E. J. (2011). Connecting local entrepreneurial ecosystems to global innovation networks: open innovation, double networks and knowledge integration. *International Journal of Entrepreneurship and Innovation Management*.

- Man, T. W. ., Lau, T., & Chan, K. . (2002). The competitiveness of small and medium enterprises. *Journal of Business Venturing*, 17(2), 123–142. [https://doi.org/10.1016/s0883-9026\(00\)00058-6](https://doi.org/10.1016/s0883-9026(00)00058-6)
- Markman, G. D., Baron, R. A., & Balkin, D. B. (2005). Are perseverance and self-efficacy costless? Assessing entrepreneurs' regretful thinking. *Journal of Organizational Behavior*, 26(1), 1–19. <https://doi.org/10.1002/job.305>
- Mason, C., & Brown, R. (2014). *Entrepreneurial ecosystems and growth oriented entrepreneurship*.
- McCallum E., Weicht R., McMullan L., Price, A., Bacigalupo, M., & O'Keeffe, W. (2018). *EntreComp into Action: get inspired, make it happen. Scientific and Technical Research Reports*. Luxembourg: Publications Office of the European Union. <https://doi.org/10.2760/574864>
- Minniti, M. (2014). Perceptual Variables and Nascent Entrepreneurship Perceptual Variables and Nascent Entrepreneurship, (June). <https://doi.org/10.1007/s11187-005-1984-x>
- Minniti, M., & Nardone, C. (2007). Being in Someone Else ' s Shoes : the Role of Gender in Nascent Entrepreneurship, 223–238. <https://doi.org/10.1007/s11187-006-9017-y>
- Mitchelmore, S., & Rowley, J. (2010). Entrepreneurial competencies : a literature review and development agenda. *International Journal of Entrepreneurial Behaviour & Research* 16(2), 92–111. <https://doi.org/10.1108/13552551011026995>
- Mitchelmore, S., & Rowley, J. (2013). Entrepreneurial competencies of women entrepreneurs pursuing business growth. *Journal of Small Business and Enterprise Development*, 20(1), 125–142. <https://doi.org/10.1108/14626001311298448>
- Morris, M. H., Webb, J. W., Fu, J., & Singhal, S. (2013). A competency-based perspective on entrepreneurship education: Conceptual and empirical insights. *Journal of Small Business Management*, 51(3), 352–369. <https://doi.org/10.1111/jsbm.12023>
- Morton, C., Huang-Saad, A., & Libarkin, J. (2016). Entrepreneurship education for women in engineering: a systematic review of entrepreneurship assessment literature with a focus on gender. In *American Society for Engineering Education*. <https://doi.org/10.18260/p.26725>
- Mueller, S. (2011). Increasing entrepreneurial intention: effective entrepreneurship course characteristics. *International Journal of Entrepreneurship and Small Business*, 13(1), 55. <https://doi.org/10.1504/ijesb.2011.040416>

- Nelson, R. R. (1993). *National Innovation Systems: A Comparative Analysis*. *booksgooglecom*.
- O'Shea, R. P. (2007). Delineating the anatomy of an entrepreneurial university: the Massachusetts Institute of Technology experience. *R & D Management*, 37(1), 1–16.
- Oosterbeek, H., van Praag, M., & Ijsselstein, A. (2010). The impact of entrepreneurship education on entrepreneurship skills and motivation. *European Economic Review*, 54(3), 442–454. <https://doi.org/10.1016/j.euroecorev.2009.08.002>
- Oyeku, O., Oduyoye, O., Kabouh, M., Elemo, G., Karimu, F., & Akindoju, A. (2014). On Entrepreneurial Self Efficacy and Entrepreneurial Success: A Conceptual and Theoretical Framework. *European Journal of Business and Management*, 6(26), 95–103. Retrieved from <http://iiste.org/Journals/index.php/EJBM/article/view/14986>
- Parry, B. S. (1998). Just What Is a Competency? And Why Should You Care? *Training*, 35(6), 58–64.
- Patricia, P., & Silangen, C. (2016). The effect of entrepreneurship education on entrepreneurial intention in Indonesia. *DeReMa Jurnal Manajemen*, 11(1), 67–86.
- Prahalad, C. K. (2004). *The Fortune at the Bottom of the Pyramid: Eradicating Poverty through Profits*. Barnes & Noble. Retrieved from <http://www.barnesandnoble.com/w/fortune-at-the-bottom-of-the-pyramid-c-k-prahalad/1102112584>
- Price, R. W. (2004). *Roadmap to entrepreneurial success : powerful strategies for building a high-profit business*. American Management Association.
- Quality Assurance Agency for Higher Education. (2018a). *Enterprise and entrepreneurship education: Guidance for UK Higher Education Providers*. handbook publication QAA. Retrieved from www.qaa.ac.uk
- Quality Assurance Agency for Higher Education. (2018b). *Enterprise and Entrepreneurship Education: guidance for UK Higher Education Providers*.
- Rae, D. (2005). Entrepreneurial learning: a narrative-based conceptual model. *Journal of Small Business and Enterprise Development*, 12(3), 323–335. <https://doi.org/10.1108/14626000510612259>
- Rasmussen, E. A., & Sørheim, R. (2006). Action-based entrepreneurship education. *Technovation*, 26(2), 185–194. <https://doi.org/10.1016/j.technovation.2005.06.012>

- Rhodes, R. E., Blanchard, C. M., & Matheson, D. H. (2006). A multicomponent model of the theory of planned behaviour. *British Journal of Health Psychology*, 11(Pt 1), 119–137. <https://doi.org/10.1348/135910705X52633>
- Rideout, E. C., & Gray, D. O. (2013). Does entrepreneurship education really work? A review and methodological critique of the empirical literature on the effects of university-based entrepreneurship education. *Journal of Small Business Management*, 51(3), 329–351. <https://doi.org/10.1111/jsbm.12021>
- Riyanti, B. P. D., Sandroto, C. W., & D.W, M. T. W. (2016). Soft Skill Competencies, Hard Skill Competencies, and Intention to Become Entrepreneur of Vocational Graduates. *International Research Journal of Business Studies*, 9(02), 119–132.
- Robles, L., & Zárraga-Rodríguez, M. (2015). Key competencies for entrepreneurship. *Procedia Economics and Finance*, 23(October 2014), 828–832. [https://doi.org/10.1016/S2212-5671\(15\)00389-5](https://doi.org/10.1016/S2212-5671(15)00389-5)
- Rodríguez, I. D., & Vega, J. A. (2016). La educación para el emprendimiento en el sistema educativo español. Año 2015. *Ministerio de Educación, Cultura y Deporte*, 137. <https://doi.org/030-16-017-X>
- Rohrmann, B. (1997). Risk Orientation Questionnaire : Attitudes towards risk decisions, 1997.
- Rotman, J. L. (2006). Design Thinking and how it will change management education: an interview and discussion. *Academy of Management Learning & Education*, 5(4), 512–523.
- Sánchez Cañizares, S. M., & Fuentes García, F. J. (2010). Gender differences in entrepreneurial attitudes. *Equality, Diversity and Inclusion: An International Journal*, 29(8), 766–786. <https://doi.org/10.1108/02610151011089519>
- Sánchez, J. C. (2013). The impact of an entrepreneurship education program on entrepreneurial competencies and intention. *Journal of Small Business Management*, 51(3), 447–465. <https://doi.org/10.1111/jsbm.12025>
- Santos, F. J., Roomi, M. A., & Linan, F. (2016). About gender differences and the social environment in the development of entrepreneurial intentions. *Journal of Small Business Management*, 54(1), 49–66. <https://doi.org/10.1111/jsbm.12129>
- Santos, G., Marques, C. S., & Ferreira, J. J. M. (2018). What are the antecedents of women's entrepreneurial orientation? *International Entrepreneurship and Management Journal*, 14(4),

807–821. <https://doi.org/10.1007/s11365-017-0481-4>

- Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson Education, UK. Pearson Education, UK.
- Schildt, H. A., Zahra, S. A., & Sillanpää, A. (2006). Scholarly communities in entrepreneurship research: A co-citation analysis. *Entrepreneurship: Theory and Practice*.
- Schlaegel, C., & Koenig, M. (2014). Determinants of entrepreneurial intent: a meta-analytic test and integration of competing models. *Entrepreneurship Theory and Practice*, 38(2), 291–332.
- Schneider, C. G. (2015). *A 21st Century Framework for Quality College Learning Already Exists*.
- Schulte, R. (2007). Kann man Entrepreneurship an Universitäten lehren? Überlegungen zur akademischen Ausbildung im unternehmerischen Denken und Handeln. In *Entrepreneurial Leadership* (pp. 257–276). Wiesbaden: DUV. https://doi.org/10.1007/978-3-8350-5475-2_15
- Sen, H., Yilmaz, V., & Ari, E. (2018). Factors affecting the entrepreneurial intentions of women entrepreneur candidates: a structural equation model. *Journal of Business Research Turkey*, 10(1), 275–293.
- Shah, S., Burton, D., & Chin, P.-L. (2016). Human Capital | Kauffman.org. Retrieved May 29, 2016, from <http://www.kauffman.org/microsites/state-of-the-field/topics/background-of-entrepreneurs/human-capital>
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*.
- Shapero, A., & Sokol, L. (1982). The Social Dimensions of Entrepreneurship. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1497759
- Shinnar, R. S., Giacomini, O., & Janssen, F. (2012). Entrepreneurial perceptions and intentions: the role of gender and culture. *Entrepreneurship: Theory and Practice*, 36(3), 465–493. <https://doi.org/10.1111/j.1540-6520.2012.00509.x>
- Short, J. C., Ketchen, D. J., Shook, C. L., & Ireland, R. D. (2010). The concept of “Opportunity” in entrepreneurship research: past accomplishments and future challenges. *Journal of Management*, 36(1), 40–65. <https://doi.org/10.1177/0149206309342746>
- Sommer, L., & Haug, M. (2011). Intention as a cognitive antecedent to international entrepreneurship-understanding the moderating roles of knowledge and experience.

- International Entrepreneurship and Management Journal*, 7(1), 111–142.
<https://doi.org/10.1007/s11365-010-0162-z>
- Souitaris, V., Zerbini, S., & Al-Laham, A. (2007). Do entrepreneurship programmes raise entrepreneurial intention of science and engineering students? The effect of learning, inspiration and resources. *Journal of Business Venturing*, 22(4), 566–591.
<https://doi.org/10.1016/j.jbusvent.2006.05.002>
- Spencer Jr., L. M., & Spencer, S. M. (1993). *Competence at Work: Models for Superior Performance*. New York: John Wiley & Sons, Inc.
- Stam, E. (2014). *The Dutch entrepreneurial ecosystem*. Utrecht. Retrieved from ssrn.com/abstract=2473475
- Thrane, C., Blenker, P., Korsgaard, S., & Neergaard, H. (2016). The promise of entrepreneurship education: Reconceptualizing the individual-opportunity nexus as a conceptual framework for entrepreneurship education. *International Small Business Journal*.
<https://doi.org/10.1177/0266242616638422>
- Thurik, R. (2009a). Entrepreneurship: Entrepreneurship, economic growth and policy. In *Entrepreneurship, Growth, and Public Policy*.
- Thurik, R. (2009b). Entrepreneurship: Entrepreneurship, economic growth and policy. In Z. J. Acs, D. B. Audretsch, & R. J. Strom (Eds.), *Entrepreneurship, Growth, and Public Policy* (pp. 219–249). Cambridge University Press.
- Tiago, F. G. B., Costa Dias Faria, S. M., de Almeida Couto, J. P., & Pinheiro Melo Borges Tiago, M. T. (2014). From entrepreneurial intention to action: cross-countries empirical evidences. *European Scientific Journal*, 1(September), 385–394.
- Unger, J. M., Rauch, A., Frese, M., & Rosenbusch, N. (2011). Human capital and entrepreneurial success: A meta-analytical review. *Journal of Business Venturing*, 26(3), 341–358.
<https://doi.org/10.1016/j.jbusvent.2009.09.004>
- Valerio, A., Parton, B., & Robb, A. (2014). *World Bank-Entrepreneurship Education and Training Programs around the World*. <https://doi.org/10.1596/978-1-4648-0202-7>
- Vesper, K. H., & Gartner, W. B. (1997). Measuring progress in entrepreneurship education. *Journal of Business Venturing*, 12(5), 403–421. [https://doi.org/10.1016/S0883-9026\(97\)00009-8](https://doi.org/10.1016/S0883-9026(97)00009-8)
- Vogel, P. (2013). The Employment Outlook for Youth: Building Entrepreneurship Ecosystems as a

- Way Forward. *Conference Proceedings of the G20 Youth Forum*. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2357856
- Von Kortzfleisch, H. F. O., Zerwas, D., & Mokanis, I. (2013). Potentials of Entrepreneurial Design Thinking For Entrepreneurship Education, *106*, 2080–2092. <https://doi.org/10.1016/j.sbspro.2013.12.237>
- Westhead, P., & Solesvik, M. Z. (2004). Entrepreneurship education and entrepreneurship intention: Do female students benefit? *Journal of Business Ethics*, *44*(April), 0–103. <https://doi.org/10.1063/1.2756072>
- Wilson, F., Kickul, J., & Marlino, D. (2007). Gender, entrepreneurial self-efficacy, and entrepreneurial career intentions: implications for entrepreneurship education. *Entrepreneurship Theory and Practice*, (617), 387–407.
- Wilson, K. (2008). Chapter 5 Entrepreneurship Education in Europe. *Entrepreneurship and Higher Education-OECD*, 1–20.
- World Economic Forum. (2009). *Educating the Next Wave of Entrepreneurs. Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century*.
- World Economic Forum. (2014a). *Enhancing Europe's Competitiveness Fostering Innovation-driven Entrepreneurship in Europe. Insight Report*. Retrieved from http://www3.weforum.org/docs/WEF_EuropeCompetitiveness_FosteringInnovationDrivenEntrepreneurship_Report_2014.pdf
- World Economic Forum. (2014b). *Entrepreneurial Ecosystems Around the Globe and Early-Stage Company Growth Dynamics*. Switzerland.
- World Economic Forum. (2018). *The Future of Jobs Report. Executive Summary* (Vol. 5). <https://doi.org/10.1177/1946756712473437>
- Xavier, S. R., Guelich, U., Kew, P., Nawangpalupi, C., & Velasco, A. (2014). *Asean Regional Entrepreneurship Report 2014/2015. Policy Opportunities for inclusiveness and sustainable entrepreneurial growth. The Global Entrepreneurship Monitor 2014 Global Report*.