What do we call "successful entrepreneurship education"? Towards a systemic model for the assessment of entrepreneurial competencies

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Abstract: In this paper we develop a systemic model for the assessment of competency-based entrepreneurship education. We use the validation process of an entrepreneurial project to structure and frame a set of entrepreneurial competencies, in order to assess their development. Hence, activities performed in a context, interacting with relevant stakeholders, generate evidence both for learning assessment and for the development of the entrepreneurial process. First, we study entrepreneurial education and its current assessment methodologies. These are often outcome-based and limited in their insights on the evolution of the learning process. We then present the systemic model in detail, including the entrepreneurial competencies, activities, outputs and criteria required for their assessment. The system follows the structure of an entrepreneurial process, with the validation becoming the interface for the assessment of entrepreneurial competencies. The students develop outcomes based on class content, based on hypotheses, and then validate these by interacting with the stakeholders, generating evidence that can be used to assess specific entrepreneurial competencies. Next, we discuss some of the benefits and limitations of this approach for entrepreneurship education, particularly in the case of sustainable, social or non-market bound ventures. Guidelines for the implementation of the evaluation plan close this study.

Keywords: entrepreneurship, entrepreneurial education, competencies, assessment.

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1. Introduction

Entrepreneurial education is going through a period of unprecedented growth, an expansion that has been global and pervasive to different disciplines and knowledge areas (Kuratko, 2005; Solomon, 2007; Turner & Gianodis, 2018). Morris, Kuratko and Cornwall (2013) estimated the number of higher education institutions offering entrepreneurship programs around the world to be above 3000, a figure one could easily deem conservative given that, a decade earlier, Katz (2003) had set the number of U.S. schools offering entrepreneurship programs at over 1600.[2] Far from being limited to "traditional" ventures, this phenomenon has also been observed in the realm of social entrepreneurship, with the number of such programs in the U.S. growing almost tenfold between the 1990s and the early 2010s (Milway & Goulay, 2013).

The expansion of entrepreneurship programs addresses the demands of students, firms and society at large, and is led by the agreement that entrepreneurial activity is the main driver of economic development and social change (Audretsch & Thurik, 2001; Mueller, 2007; Carree & Thurik, 2010; Schaltegger & Wagner, 2011; Santos, 2012; Fritsch, 2013; Schaltegger, Lüdeke-Freund & Hansen, 2016). In that spirit, social and sustainable entrepreneurship have frequently been presented as pathways towards solving systemic social and environmental problems, moving entrepreneurial activities beyond their market-bound, profit-driven canonical domains (Nicholls, 2008; Zahra et al., 2009; Daci et al., 2009; York & Venkataraman, 2010). However, such impressive growth does not mean the debate around *what* and *how* to teach in entrepreneurship programs has been settled.[3]

Indeed, considerable research efforts have focused on those questions, and although their findings have sometimes been inconclusive or equivocal,[4] there is sufficient agreement in the literature to consider that entrepreneurial competencies can be affected through training and educational programs (Gorman, Hanlon & King, 1997; Henry, Hill & Leitch, 2005; Kuratko, 2005; Samwel Mwasalwiba, 2010; Neck & Greene, 2011; Nabi et al., 2017). Or, as Henry, Hill and Leitch (2005) put it in their survey of the trends, styles and teaching

[2] A complete survey on the breadth and diversity of entrepreneurship programs around the world can be found in Valerio et al. (2014). Here we focus entirely on the university setting, looking at programs designed to train students in entrepreneurship in the context of formal undergraduate education.
[3] Among several others, Edelman et al. (2008), Fayolle (2013), and Piperopoulos and Dimov (2015) explore the pedagogical challenges inherent to entrepreneurial education.
[4] Arguments on this line can be found in Klein and Bullock (2006) and Lautenschläger and Haase (2011), who survey the contradicting evidence on the effect of entrepreneurship programs.

philosophies found in entrepreneurial education, the consensus establishes that “at least some parts of entrepreneurship can be taught”.

On the other hand, attempts to measure the impact of entrepreneurial education have produced even less conclusive results. “If entrepreneurship can be taught, what is it being taught for?”, is a question that entrepreneurship educators still debate. To be clear, researchers and instructors continue to wonder which are the objectives of entrepreneurship programs and how one can know if these are being accomplished. Commonly, assessment methodologies for entrepreneurial education have focused on entrepreneurial outcomes, both at the individual and aggregate levels. Namely, examining indicators linked to venture creation (number of start-ups launched, funded or incubated by students who complete the program, rate of students who are self-employed, etc.), or measuring some traits and characteristics understood to capture a subject’s inclination towards entrepreneurial action (self-efficacy, locus of control, proactiveness, entrepreneurial intent, entrepreneurial attitudes, etc.)

Yet, meta-analyses on the relationship between entrepreneurship programs and entrepreneurial outcomes (Martin, McNally & Kay, 2013; Walter & Block, 2016), intent (Schlaegel & Koenig, 2013; Maresch et al., 2016), and intentions (Bae et al., 2014), are mixed at best. Furthermore, the insights generated from assessments focused on activities and indicators obtained well after the instructional process has concluded, are fundamentally limited when trying to extrapolate them to the design of entrepreneurship programs. To be clear, very robust controls and extremely detailed data would be needed in order to know which components of an entrepreneurship course played a role in the creation of a venture or its successful operation, particularly if these activities occur after taking the course. Otherwise, the hypothesis that someone created a venture time after taking an entrepreneurship course, is hard to validate.

Moreover, although there are many studies on the impact of entrepreneurship programs once these have been completed by the students, relatively few exist on how to assess the instructional process as it takes place. In simpler words, the literature may help one determine whether an entrepreneurship course might have played a role in the entrepreneurial activities of a student, but it is not clear what “successful” entrepreneurial education would mean in terms of a learning process. Researchers and educators are still figuring out how to define the success of an entrepreneurship process. Even if one would take an informal,

overarching goal of entrepreneurship programs to be “to create more entrepreneurs”, what that would entail in the context of a learning program taking place in undergraduate education, needs to be clarified. To some extent and in the light of that evidence, it could be argued that a clear and solid framework for the evaluation of entrepreneurial learning is yet to be developed.

Intent, attitudes and entrepreneurial intentions can be measured periodically, for instance at the beginning and end of the program, but are not immediately linkable to a learning plan and its contents. Furthermore, one can wonder if the evolution of such measures is a sufficient indicator to assess learning in this context. That is, if the goal of an entrepreneurship program is to prepare the student for future entrepreneurial activities by endowing them with the knowledge and skills that might help them in the venture creation process, if and when they decide to become entrepreneurs, motivational indicators and personal traits do not seem to be the most accurate for the assessment of an instructional process.

Even if we were to take subsequent entrepreneurial activities and their outcomes as sufficient indicators to assess the impact of entrepreneurship courses, we would only be considering the subset of students who actually engage in entrepreneurial activities after completing the program, if not only those whose ventures manage to survive and operate in traditional and established markets, leaving aside most arts, social, and sustainable entrepreneurship efforts. What could an instructor say on the learning results achieved by the remaining subset of students? Have they developed the skills necessary to engage in entrepreneurial activities despite their not having become entrepreneurs yet? Does it make sense to define “success” as a learning process leaving this subset aside?

While we do not intend to go against the truism that outstanding students do not necessarily make “good” entrepreneurs, we believe that the converse cannot be true either. Entrepreneurial educators should be able to assess the development of entrepreneurial competencies even in spite of subsequent activities and outcomes, ideally within the learning spaces and in parallel to the learning process. In total, we acknowledge that the question of how we define successful entrepreneurial education is not a simple one to answer. Until sustained research efforts are devoted to understanding how to assess entrepreneurship programs as learning processes, entrepreneurial education faces a dilemma: while more

entrepreneurship programs are being offered around the world, the debate on the quality underlying such expansion remains open.[5]

In this paper we attempt to contribute to the literature on the evaluation of entrepreneurial education from a perspective that puts an emphasis on the learning process. We propose a critical study on the models underlying the evaluation of entrepreneurship programs. With that goal we look at project-based, experiential programs where the students develop entrepreneurial competencies through the execution of actions in their context, which are predominant in undergraduate entrepreneurship programs, and propose a framework for the evaluation of entrepreneurial education which provides instructors with the structure to assess the effectiveness of the learning process as it takes place.

This study, conceptual in nature, develops and presents a framework involving the thirteen entrepreneurial competencies defined by Morris, Webb, Fu and Singhal (2013), since these authors put forth a normative and comprehensive set of entrepreneurial competencies in the educational domain. In order to achieve this, we structure a systemic evaluation model following Urban and Trochim (2009), comprising the four basic elements needed for their assessment: a description, the activities through which they manifest in the learning process, the instruments needed to evaluate them, and the assessment criteria. A relevant methodological reference is found in the way Corwin, Graham and Dolan (2015) develop a systemic evaluation model for Course-based Undergraduate Research Experiences (CUREs). These are courses designed to immerse science undergraduate students in research experiences, often carried out in laboratories outside the classroom. CUREs share with entrepreneurship several essential features: the learning activities occur outside the class, the students are autonomous in their actions and only supervised by an instructor, the learning activities must involve the context and diverse stakeholders in their assessment, etc. The authors base their model in learning and evaluation theory, and present a systemic framework where each competency is linked to an activity and outcome, thus providing the structure needed for their assessment.

This novel framework for the evaluation of entrepreneurial competencies is robust and flexible, to the extent that it is formulated in a conceptual dimension. Furthermore, its adoption by any experiential or project-based entrepreneurship program is simple, since we propose that the validation process in the development of an entrepreneurial project can be

[5] Johannisson (2016) develops an interesting discussion on the issues that arise as a result of such an expansion.

used as the backbone of the evaluation framework. By validation we mean the series of interactions between the entrepreneurship team and its context/stakeholders in order to check the hypothesis made in the ideation and business generation processes. Therefore, our proposal can be implemented as the frame for an evaluation plan adjusted to most programs basing their learning pedagogies in the project-based, experiential model. We conclude the paper with the discussion of some guidelines for the practical implementation of the evaluation plan, as well as future research paths.

2. Entrepreneurship, education and entrepreneurial competencies

For a long time, the question of whether entrepreneurship can be taught has been answered by stating that it depends on what you mean by entrepreneurship and, most importantly, how you teach it (Neck & Greene, 2011). Nevertheless, even the most agnostic views of entrepreneurship education admit that successful entrepreneurial activity can be positively affected by the competencies an entrepreneur possesses (Rauch et al., 2005; Unger et al., 2011; Martin, NcNally & Kay, 2013; Maresch et al., 2016). Furthermore, entrepreneurship programs are generally thought to help develop such competencies (Kuratko, 2005). Thus, entrepreneurial training can be claimed to hold certain effects on those who take it.

Talking about the university setting, Gorman, Hanlon, and King's (1997) seminal examination of the field was one of the first to suggest that formal educational programs have a positive influence on the development of an entrepreneurial mindset. At the very least, entrepreneurship programs are considered to be a mean to foster creativity and innovation, opportunity detection skills, and critical thinking (Levie & Autio, 2008; European Commission, 2010; Oosterbeek, Van Praag & Ijsselstein, 2010). All of these abilities are ostensibly thought to be involved in entrepreneurial activities, and are often characterized as competencies rather than traits or attitudes.

It is important to note that competencies in entrepreneurship are not the same as entrepreneurial traits. The latter focus on (possibly innate) characteristics of the individual, while competencies relate to the underlying cognitive and behavioral aspects of actions and processes, and can be developed. Indeed, competencies only make sense when conceived as the observable results of processes involving knowledge, behaviors, attitudes and skills,

which become measurable when a task is performed. (Man, Lau & Chan, 2002; Mitchelmore & Rowley 2010). This distinction is essential in an educational context.

For instance, *Need for achievement* and *Locus of control* are two of the most recurring entrepreneurial traits in the literature, whereas *Opportunity recognition* and *Resource leveraging* represent two common entrepreneurial competencies. *Resource leveraging* can be observed and assessed through activities taking place during the instructional process, or even inside the classroom. Moreover, performance standards and guidelines can be constructed for each specific competency, assessing the student's progress through their actions. On the other hand, *Locus of control* is an individual-level, state variable that may or may not be involved in entrepreneurial processes and whose development is much harder to assess. Hence, the cognitive and behavioral processes that implement a competency, their action-based nature and the possibility to involve them in an evaluation framework, make entrepreneurial competencies ideal to integrate in a learning plan.

2.1 Defining competencies in education

Though the definition of competencies has been somewhat elusive even within the learning sciences, the consensus understands them precisely in the same terms entrepreneurial action is conceived. In the definition by the U.S. Department of Education's National Center for Education Statistics, a competency is "a combination of skills, abilities, and knowledge needed to perform a specific task" (U.S. Department of Education, 2001, p.1). Hence, competency-based learning is believed to be best suited for concrete and context-specific skills. This is the case of entrepreneurial activities. Moreover, competency-based learning can provide a framework for self-assessment, guided-learning and the evaluation of competencies following performance standards. This underscores the fitness of the competency-based approach for entrepreneurship education.

Due to their essentially practical and experiential nature, competency-based learning models have been adopted with increasing intensity in the life sciences and health (Frank, Mungroo, Ahman, Wang, De Rossi & Horsley, 2010), and in recent years have started to be considered in entrepreneurial education (Morris et al., 2013). The advantages of competency-based models derive from the integrative, experiential and context-relevant nature of the learning process, for the students execute some actions in their relevant contexts.

Unsurprisingly, competency-based pedagogical models have a significant presence in entrepreneurial education.

Indeed, when focusing on entrepreneurship and competencies we find that, in a study of competency-based entrepreneurial education Morris, Webb, Fu, and Singhal (2013) adopt an analogous definition for the term, taking a competency to refer to "the knowledge, skills, attitudes, values, and behaviors that people need to successfully perform a particular activity or task". Therefore, it is possible to see how a competency-based approach to entrepreneurial education arises as a natural evolution of experiential programs that highlight learning via the execution of entrepreneurial activities. For example, those structured around an entrepreneurship project can be understood to explicitly or implicitly follow a competency-based approach.

In fact, when defined as a process, entrepreneurship entails the effective performance of a certain set of actions in a context (McMullen & Shepherd, 2006). Broadly: identifying a business opportunity, modeling a business to capitalize on the opportunity, and acquiring the resources needed to launch the venture. However, these are supplemented by a set of transversal abilities essential to their achievement: resilience, dealing with ambiguity, communicating with the customers, networking, etc. All of these combine the individual and team levels, with overlapping temporalities and scopes, and levels of abstraction. Such convergence makes the definition of entrepreneurial competencies a complex task, let alone their assessment. In the following section we discuss how competencies have been introduced in entrepreneurial education and the set of entrepreneurial competencies the research posits as fundamental from a normative/instructional perspective.

3. Competency-based entrepreneurial education: Core competencies

The analysis of entrepreneurship from the perspective of competencies is fairly recent, and initially focused on the competencies involved in the successful establishment of a new venture (Colombo & Grilli, 2005; Martin, McNally & Kay, 2013). That is, outside the classroom and with newly established ventures.

Bird (1995) was the first to suggest that some knowledge, skills and attitudes might combine and result in the creation and eventual survival of a new venture. Successive works have tried to identify and categorize the cognitive and attitudinal components observed in

successful entrepreneurial activities. Among these the most common competencies identified include: opportunity detection, resource acquisition, interpersonal skills, and a plethora of other abilities, often overlapping with managerial competencies. Nevertheless, researchers have made the effort to separate entrepreneurial competencies, *i.e.* those involved in the creation of a new venture, from the ones that might be deemed as more "managerial" in nature, since they entail running the venture.

Two studies are crucial for the definition of entrepreneurial competencies. Man et al. (2002) propose six areas and three constructs where different skills and attitudes related to entrepreneurial activities can be included. The ones pertaining to competencies are: Opportunity competencies, Relationship competencies, Conceptual competencies, Organizing competencies, Strategic competencies and Commitment competencies. On a similar line, Mitchelmore and Rowley (2010) establish six entrepreneurial competencies from their analysis, being: Identification of a viable market niche, Product innovation and development, Idea generation, Environmental scanning, Opportunity recognition, and Formulation of a strategy to seize the opportunity.

Both of those papers outline a broad framework for the analysis of competencies in entrepreneurship, although completely apart from educational considerations. That is, they look at the competitiveness of entrepreneurs already in the market. It is not until Morris et al. (2013) that said competencies are envisioned and systematized from the perspective of education. This is why we build our evaluation framework on the foundation of that paper.

Unlike preceding works which focused on the performance of ventures, their survival, growth and competitiveness, Morris et al. (2013) develop a set of core competencies from an analysis of the entrepreneurial education literature and then validate these via a learning implementation. The competencies these authors put forth are:

1. *Opportunity Recognition*
2. *Opportunity Assessment*
3. *Risk Management/Mitigation*
4. *Conveying a Compelling Vision*
5. *Tenacity/Perseverance*
6. *Creative Problem Solving/Imaginativeness*
7. *Resource Leveraging*
8. *Guerrilla Skills*
9. *Value Creation*
10. *Maintain Focus yet Adapt*
11. *Resilience*

12. *Self-Efficacy*
13. *Building and Using Networks*[6]

We can see that these competencies include different combinations of action, skill, and attitude-based components, and might entail different levels of abstraction – *i.e.* concrete actions, overarching attitudes or cognitive processes. However, the main difference with respect to competencies identified from the study of ventures and entrepreneurs is that these thirteen competencies are normative. That is, they do not describe how an entrepreneur is, but how she should be; thus. Thus, they outline the areas of entrepreneurial development which could be considered when designing an entrepreneurship course's learning plan.

Hence, propped by the understanding that education and training can foster entrepreneurial competencies (Kuratko, 2005), many entrepreneurship programs in the university setting have worked under such an approach. That is, across a diverse array of methodologies -- not always in an explicit of systematic manner, and to varying extents --, entrepreneurial education has aimed at the development of a set of competencies comprising skills, attitudes, knowledge, and abilities thought to be involved in the activation and execution of entrepreneurial processes.[5] In short, a convergence of cognitive and behavioral elements which guide context-specific actions and have proven complex to structure, instrument and assess in terms of a learning process, its outcomes and evaluation (Neck & Greene, 2011; Fayolle, 2013).

Most entrepreneurship programs have overcome that challenge by structuring their content and learning plans as venture creation processes, where the students must work in the conceptualization and development of an entrepreneurial project during the course. This, once again, consolidates and favors the competency-based approach. In a nutshell, the entrepreneurial competencies that emerge and play a role in successful entrepreneurial activity, can appear during the venture-creation simulation process, and be affected by the training taking place in the classroom. In the following section we comment on the pedagogical approaches sustaining these models and programs.

[6] The complete description of these competencies is available in Morris et al. (2013).

4. Competency-based entrepreneurial education: Teaching approaches

A look at the literature suggests three main approaches to entrepreneurial education: teaching "about", "for" and "through" entrepreneurship. The first emphasizes the cognitive aspects (*i.e.* an awareness of entrepreneurship as an activity and strives for a level of familiarity with its conceptual and theoretical foundations), the second stresses the practical components (*i.e.* learning by actually carrying out entrepreneurial activities), and the third highlights the setting where the instructional activities take place and the learning objectives acquire relevance (*i.e.* carrying out entrepreneurial activities with real customers, obtaining resources and feedback in the field, from primary sources, etc.).

Only the last two pedagogical approaches are truly fitted for the competency-based paradigm. Indeed, while the first approach ("about") aligns with most cognitivist pedagogies, the last two fall under the umbrella of the experiential approach. The distinction between the two is given by the fact that the former ("for") entails all forms of venture-creation simulations, irrespective of the context where these take place, and the latter ("through") insists that the activities must occur in a relevant context. To be clear, the first could be the case of classroom-bound simulations, where the second requires the participation of stakeholders/customers and some out-of-the-classroom groundwork.

In recent years, out of the many pedagogical approaches available, the experiential paradigm has become the prevailing teaching methodologies in entrepreneurial education. This due among other things to its potential to increase knowledge retention, motivation, and to induce the generation of significant learning in students (Corbett, 2005; Bell, 2015). Indeed, the benefits of entrepreneurship programs centered on the identification and development of business opportunities are well known in the literature (Carrier, 2007; Martin et al., 2013; Neck, Greene & Brush, 2014). It comes as no surprise then that a significant number of entrepreneurship programs in formal education involve some degree of practice-based curricula.

In general, the experiential approach mixes theoretical lectures with applied activities like the development of business plans in groups (Jones & Iredale, 2010; Rassmusen & Sorheim, 2006, Sherman et al. 2008). Therefore, experiential entrepreneurship programs at the undergraduate level focus on the process of creating a new venture, building their learning plans and teaching models around the acquisition of the skills and knowledge necessary to such end. In fact, often these programs either are part of teaching tracks

structured as a venture-creation simulation, lead into capstone entrepreneurship courses where students must develop a business idea, or involve some form of project-based enterprise creation activities.

It would not be a stretch to claim that most educational efforts focused on entrepreneurship acknowledge the practical and experiential nature of such an endeavor; a nature best served (if not favored) by the experiential approach. Aside from the business school and management departments ecosystems, at the undergraduate level, experiential, project-based approaches have successfully been applied to foster the development of entrepreneurial competencies in engineering, ICT and computer science (da Cruz & Alvaro, 2013; Kline et. al., 2014; Wheadon & Duval-Couetil, 2014), arts (Brandenburg et. al., 2016) as well as in the entrepreneurial training of scientist (Satell, 2017).

Then again, although the content and structure of a competency-based, experiential entrepreneurship course is at this point quite transparent and standard – largely following the stages of a venture creation process –, the same cannot be said about the assessment of those learning processes. It is true that many of these programs finish with a presentation or pitch of the entrepreneurship project developed through the course, at times in an exclusively academic setting and others with guest evaluators, with varying standards and requirements in each case. Yet, no clear framework to assess and monitor student learning is available beyond regularly scheduled progress presentations. Hence, the challenge is to build a structure of activities and indicators to integrate each of the entrepreneurial competencies in this process and, thusly, assess learning through them. With this in mind we devote the following section to discuss the learning assessment methodologies currently available for competency-based models.

5. **Competency-based evaluation in entrepreneurial education**

One of the main challenges faced by competency-based pedagogical models is learning assessment, the evaluation of said competencies (Voorhees, 2001). Competencies are manifested through actions and acquire meaning in a context, which puts traditional, cognitivist and behaviorist evaluation strategies at odds with competency-based learning plans. In the competency-based approach, quite diverse instruments and agents need to

become involved at the different stages of evaluation, since learning is defined as a progressive, multidimensional and systematic practice.

Nonetheless, competencies correlate with their performance, and can be monitored and measured in comparison to standards derived from individual-based diagnoses or other empirical constructs. The structure necessary to assess a competency entails four basic elements: A description of the competency, the activities where or through which the competency will be manifested, the instruments needed to evaluate the competency, and the standards or criteria for the assessment; a framework that can be incorporated in an entrepreneurship learning plan.

Boyatzis is the pioneer of the competency approach in management education. Although his studies do not focus on entrepreneurship per se, his work has largely shown that a cluster or set of competencies associated with outstanding (managerial) performance can be identified and developed via training (Boyatzis, Stubbs & Taylor, 2002; Boyatzis, 2008). As a matter of fact, Boyatzis' work is so groundbreaking, and relevant for our analysis, because he was one of the leading researchers who started analyzing sets of competencies and their evolution instead of examining a single competency at a time.

The evaluation of entrepreneurial competencies has often followed the single-competency path, focusing at times on competencies such as opportunity recognition, product innovation, creativity, resource and risk management, self-efficacy, etc. These studies are usually articulated around longitudinal measures, pre and post-treatment comparison or quasi-experimental designs where some students are subject to a treatment. (DeTienne & Chandler, 2004; Sánchez, 2011; 2013). Valuable and significant as they are, those studies still offer but a partial perspective on the assessment of entrepreneurship education in general, and entrepreneurial competencies in particular.

In methodological and pedagogical terms, the most significant precedent for what we propose is found in the medical sciences and undergraduate-researcher trainee programs. In particular, Course-based Undergraduate Research Experiences (CUREs) provide us with a reference where students must develop some skills and attitudes by autonomously acting outside the classroom, with learning assessment being significantly linked to such activities. Although the evaluation process in CUREs is outcome based, these outcomes can be linked to learning activities in the process and, thus, systemic models for the whole cluster of competencies developed.

This approach aligns with the intuitions proposed by researchers working on the competency-based model of entrepreneurial education (Sánchez, 2013). Identifying the outputs of certain activities in the entrepreneurial process and linking them to specific competencies, stresses the importance of the attitudinal and cognitive aspects involved, and contributes to the development of indicators for learning assessment. In the process of studying the mechanisms underlying the development of certain entrepreneurial competencies, Corwin, Graham and Dolan's (2015) models for CUREs competencies, outcomes and activities have been instrumental. What differentiates us and indeed allows us to go one step further, is that all the competencies and activities are integrated in the development of an entrepreneurial project, which follows a quite standard cycle and is open to transactions with the environment. This, arguably, makes our proposal simpler to adopt and apply in a classroom-wide setting than the whole internship-type nature of CUREs, wherein the formative process mostly takes place outside of the class.

To the best of our knowledge there is no model involving the set of entrepreneurial competencies for their evaluation, nor linking them to specific components, stages and activities of the entrepreneurial process, so that an evaluation framework is structured. In the following section we take the thirteen entrepreneurial competencies proposed by Morris et al. (2013) and present a systemic model for their assessment.

6. A systemic evaluation framework for the assessment of entrepreneurial competencies

Following Bechard and Gregoire (2005) and Nabi et al. (2017) pedagogical analyses of entrepreneurial education, we can say that the underpinning pedagogical model for competency-based programs essentially is psycho/socio-cognitive. We can hold this because learning takes place from the interaction of the individuals and their context, through the application of the knowledge and skills developed in the course in the solution of socially relevant problems. Indeed, Bechard and Gregoire (2005) see the learning process as the instructional intervention that can influence how students allocate the resources at their disposal into problem resolution. This aligns with the essence of entrepreneurial activities.

What is challenging about the evaluation of entrepreneurial competencies is that, by nature, these develop from repeated interactions with the environment. Undergraduate

students who lack experience in the field may be in a particularly complex situation without a structure framing all the activities, even if they are otherwise capable of executing them. Some script and guidelines become essential for the successful completion of the learning process. This is also relevant for instructors, who can involve all the competencies in the development of the students' projects, while providing a frame for the analysis of the evidence obtained by them from their interactions.

We believe that an entrepreneurial project's validation process provides entrepreneurship programs with the structure to allow for this, since what a validation process entails is a permanent interaction between the student and his context, often in transactions derived from classroom activities. For instance, when obtaining feedback for new services, eliciting user needs or estimating the potential market demand for a product, the students validate the hypotheses resulting from the learning activities. These validation activities are common in entrepreneurial projects, involve one or more competencies and connect to learning content and activities. Moreover, all courses and training programs conceived as venture creation processes or simulations already incorporate some measure of validation. Hence, what we propose is a framework to arrange the process so that validation can be part of the students' entrepreneurial competencies assessment.

We invoke Gidden's (1984) structuration theory, like Morris et al. (2013), to develop the scripts and scales with which to assess entrepreneurial competencies. Indeed, we believe that it is possible to use validation as the process which structures the set of evaluation activities for a competency-based entrepreneurship course. Furthermore, we posit that the set of entrepreneurial competencies proposed by Morris et al. (2013) can be integrated in such a framework by following what authors like Corwin have done when building evaluation models for course-based undergraduate research experiences (CUREs). That is, including in the model the activities and indicators needed for the evaluation, so that the environment and its stakeholders are involved via the execution of the evaluation activities, whose results are systematized in the form of a business plan. In short, comprising the whole structure (description, activities through which they manifest, instruments and criteria) needed for the assessment of competencies by the way of the validation process.

What we propose is: to first identify a competency, link it to an activity in the development of the entrepreneurship project, define an outcome from the activity as a result, and to establish a validation space for that outcome to be assessed using the scripts derived

from the interaction with the relevant stakeholders. The validation of such outcomes involves the analysis of the evidence generated when these are confronted with a stakeholder/customer; in a word, brought to the validation space where the ideation and business generation hypotheses will be checked using primary evidence. It is in that space where the interactions with stakeholders occur, often around or through the outcome generated from the activity. This allows the validation of the hypotheses made while creating the entrepreneurial outcome, to frame the assessment of the competencies associated with the activity. Finally, all the results from the validation process are logged in a business plan, which allows the assessment to be a continuous and evolutionary.

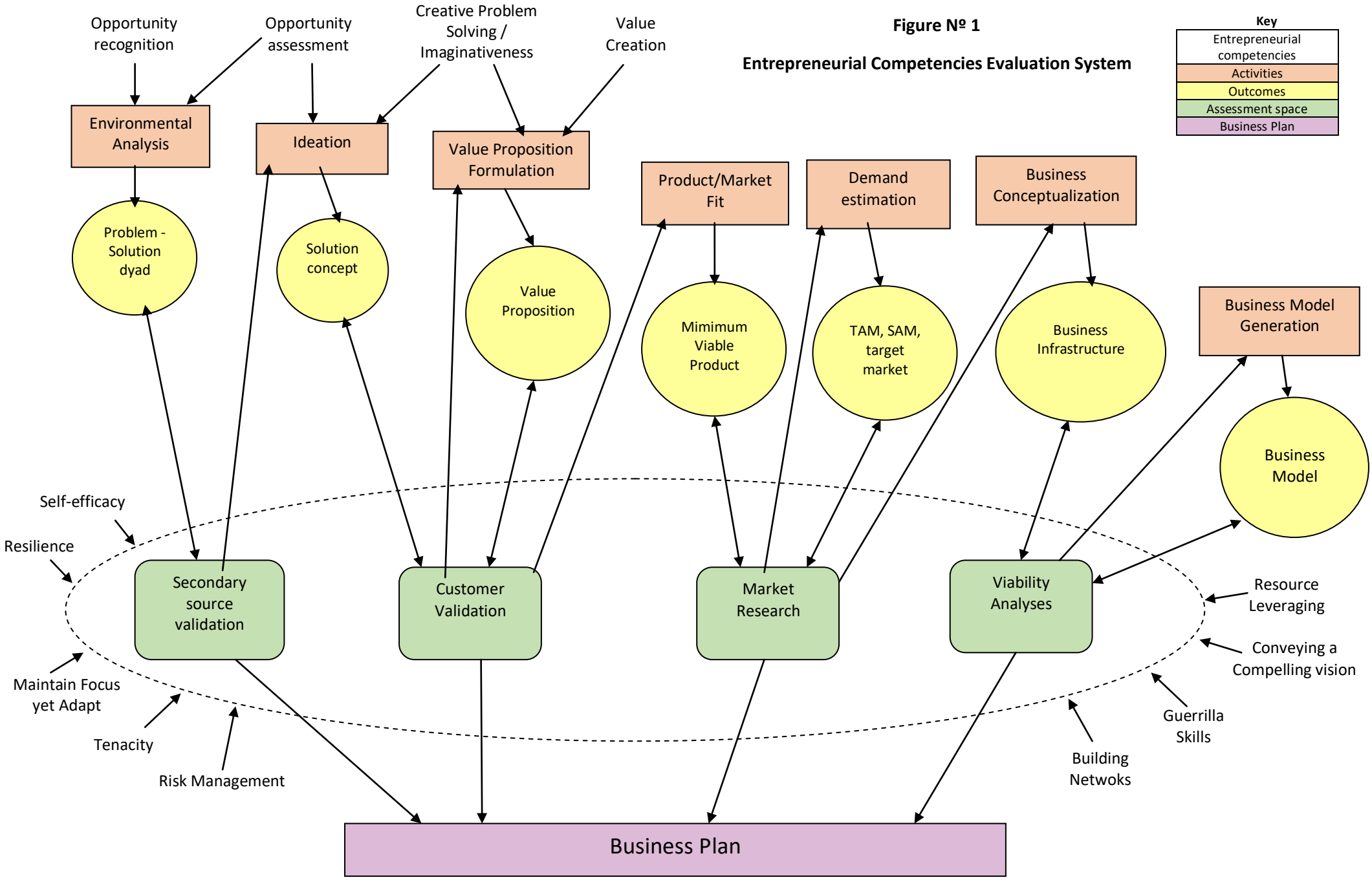
Next, we present a systemic evaluation model created following Urban and coauthors' systemic approach to evaluation (Urban et al. 2014), in the spirit of what Corwin, Graham and Dolan (2015) did for the desired outcomes of CUREs, and integrating Morris et al.'s (2013) entrepreneurial competencies. The sequence and structure of the model seek to reflect the creation of a venture, with stages like *Ideation*, *Value Proposition Formulation* or *Business Conceptualization* included in the process.[7]

In each of these stages some hypotheses are made, for instance on the interest of some customers for a new service or on the financial viability of a project. The venture-creation process requires these hypotheses to be validated in order to move ahead. This validation process demands generating or finding some evidence from interactions with the context. The model we present next groups all the validation activities in a validation space and uses them as the interface between the development of the project and learning assessment.

[7] We do not describe the seven stages of the entrepreneurship process in this paper, but we believe that they are fairly standard in entrepreneurial education and that, thus, their denomination might help understand what each activity entails.

Figure Nº 1

Entrepreneurial Competencies Evaluation System



Our model can be understood as representing two interconnected systems: the first involving the development process of an entrepreneurial project, the second comprising the assessment of a learning process. The first of these appears in the upper part of the figure, with the second included in the dotted-line ellipse appearing just below. The first system represents a process starting with the detection of an opportunity (upper left corner) and concludes with the generation of a business model, comprising several steps and iterations in-between. We can also visualize the model as the outputs, activities and spaces through which specific entrepreneurial competencies can be assessed. For instance, a Solution Concept is the result of the Ideation stage of the project development. In order to move ahead with the project, the Solution Concept must be validated, which happens through interactions with some potential customers, in the Customer Validation stage. The results from those interactions are evidence for the instructors to assess, continuing with our example, competencies like Opportunity Recognition, Opportunity Assessment, and Creative Problem Solving.

We can see that the thirteen entrepreneurial competencies (presented in textboxes with no contour or filling), are wholly integrated in the system. Some directly linked to activities in the entrepreneurial process (presented in orange boxes), for they are most directly involved with the tasks and knowledge entailed by these, or connected globally to the validation process (the dashed oval), if the nature of the competencies is more transversal. That is the case of *Resilience* or *Network Building*, present across the whole venture-creation process, whereas *Opportunity Assessment* or *Creative Problem Solving* are more intensely present in the ideation stages. Naturally, this does not mean that these disappear in later stages, given the systemic nature of the whole construction, just that their assessment might be best pursued in those stages.

The seven activities included in the model are intended to represent the canonical stages of an entrepreneurial process, going from the exploration of the context in order to detect opportunities, to their capitalization via a business model. In our systemic evaluation model, these activities can be seen to move along the vertical axis, getting closer to the validation space as they become increasingly concrete. For instance, the scripts and indicators for the *Demand Estimation* stage are based in market figures and customer projections rather than a shortlist of potential opportunities, as would be the case of the *Environmental Analysis* stage. Thus, the latter appears quite further up left in the figure.

In the yellow circles we present the outputs of each activity, in all cases concrete results of the activities producing them. That is: A Value Proposition, a Cost Structure, a Minimum Viable Product, etc. Here is where the assessment framework we propose truly comes about. Let's consider by the way of an example that we want to evaluate the Solution Concept developed by a student. How would one proceed? We suggest this process to be carried out via the validation of the specific outcome. To be precise, to carry the assessment forward by presenting the Prototype to their customers and then analyzing their feedback to either mover ahead or to improve it by iteration. This is why we include bidirectional arrows between the Outcomes and the Validation Spaces (presented as green boxes). It is in this transaction, taking place in a very specific context, where the highest level of learning takes place, and reflect such learning in the development of the project.

In terms of evaluation, a space for self-assessment is open. The students can reflect on their performance in the activity linked to the outcome. Also, with this assessment structure, the specific competency becomes more evident without losing track of the other competencies involved in the entrepreneurial set. On the question of which standards to set for the assessment, it is the stakeholders themselves who do it, capped by the scope restrictions of the program (if it is a simulation, etc.) For instance, *Imaginativeness* can be considered a competency mastered by the student if the customers, through the Customer Validation process, consider the Solution Concept presented to them to be original enough, or if an industry analysis produces evidence to support such conclusions. Finally, a log with all the progress and outcomes from the validation process is kept and systematized in a business plan, represented in the graph's lower segment.

By following the process this model presents, learning assessment becomes context-relevant because what validates the deliverables and the student's actions is hypotheses validation itself. For instance, the competency associated to opportunity detection will be assessed through the evidence obtained by the students from the market: "Is their opportunity derived from an uncovered need or problem? How is the problem solved today? Why would they be the best option instead of the rivals? Where is the market they target? What is its estimated size? Can primary and secondary sources be provided to answer such questions?" This evidence, resulting from context-relevant actions, where the cognitive and behavioral aspects developed in the learning process have been enacted, emerges from the project's customer validation itself.

This is to say that, by answering those questions through the engagement with relevant sources, amid a validation process, the students generate some evidence. This evidence has a two-fold value: for the instructor to assess the learning process, and as insights for the students to modify their own actions so that these become more effective, hence improving the value-generating character of their projects. And that is precisely how a competency is developed: through actions executed in a context. Again, the evidence obtained from validating the project can be assessed quite transparently, either allowing a student to move ahead in the venture-creation process or to pivot and reconsider the hypotheses in question.

Indeed, it is validation, a process essentially entwined with venture creation under a value-centric entrepreneurial paradigm, what provides us with a way to structure competency-based learning assessment. The context and how students interact with it, how they decide and react in the light of the evidence and resources acquired, becomes a major part of the evaluation process. It is the customers, the market – in a word the context – what is really evaluating the efficacy and the development of the student's entrepreneurial competencies, and often doing so in a manner richer than class-bound, graded activities ever could. Or, at least, provide significant evidence for an instructor to assess such competencies.

We believe this shift towards a systemic view of project development, its validation and assessment, to be a contribution to the study of entrepreneurial education and its evaluation. Moreover, entrepreneurship programs as offered today would require no great changes in the pedagogy or didactics to implement the model; especially those following the experiential and competency-based approaches. A process-based evaluation plan structured through customer, environment, and stakeholder validation might have positive impacts on the quality of entrepreneurial outcomes qua learning results, but also on the actual products of entrepreneurial activities beyond the classroom. We discuss some of these issues, as well as the potential challenges and limitations entailed, in the following section.

7. Discussion: On the evaluation of entrepreneurial education

To use a simple analogy, studies on the relevance and impact of entrepreneurship programs have frequently envisioned them as something of a black box. If one looks at the literature, it seems that it is possible to discuss whether the learning objectives of an entrepreneurship program have been achieved only through ex-post measures and outcomes. That is, examining entrepreneurial activities occurring once the students have completed the program, comparing the students' attitudes and motivations before and after participating in the program, or looking at the outcomes derived from the ventures they created. And even if these ex-post indicators could work, it is less clear how an instructor could assess the evolution and progress of the learning process as it takes place.[8] In the words of Nabi et al. (2017), the analysis of the impact of entrepreneurial education still focuses on outcome measurements.

Indeed, the analysis and discussion of entrepreneurship programs in terms of their effects and effectiveness has tended to focus on mid-to-long term outcomes. In particular, the literature has explored how entrepreneurial education contributes to entrepreneurial intentions (von Graevenitz et al., 2010; Liñan & Fayolle, 2015), successive entrepreneurial activity (Nabi et al., 2006; Bae et al. 2014; Walter & Block, 2016), entrepreneurial attitudes and behavior (Pittaway & Cope, 2007; Rauch & Hulsink, 2015), and the broader social impacts of such courses – *i.e.* job creation, economic growth, employability, etc. (Greene, Katz & Johannisson, 2004; Bosma, Acs, Autio, Coduras, & Levine, 2008; Rideout & Gray, 2013; Morris, Neumeyer & Kuratko, 2015).

Nevertheless, while extensive research has been devoted to examining the effect of entrepreneurship education on entrepreneurial outcomes, there is less clarity on how to evaluate the learning process within the educational models sustaining these programs. At the very least, an *ex post* examination of entrepreneurial competencies is bound to be noisy in terms of the insights it could generate for the design and improvement of entrepreneurial education programs. Several factors outside the control of an instructor can affect entrepreneurial activities and traits after completing the course. A number of outcome-based approaches fail to acknowledge this.

[8] For the most comprehensive and recent study in this line see Nabi, Liñan, Fayolle, Krueger and Walmsley (2017).

Moreover, despite the fact that most entrepreneurship programs in the university setting follow the experiential model, they often stick to outcome-based assessment systems. This implies a contradiction, for evaluation processes that put an emphasis on the outcomes are by definition antithetical to experiential learning. Going back to Kolb's (1984) seminal articulation of experiential pedagogy, the centrality of the process over the outcomes is put forth as crucial, in opposition to assessment methodologies prevalent under the cognitivist and behaviorist paradigms, and which favor outcome-based perspectives.

In one of the few conceptual precedents on the assessment of entrepreneurial competencies in formal education, Boyatzis warns of the risks of putting so much emphasis on the outcomes, for that may "blur how the change actually occurs" (Boyatzis, 2008), a problem we believe has been pervasive in the assessment of entrepreneurial education in the university setting. Many evaluations focus on a venture's bottomline, reducing the assessment to some financial indicators. This was one of our main motivations for trying to develop a systemic model for the evaluation of entrepreneurial competencies, which could highlight the process-based nature of entrepreneurship education over discrete outcomes. The framework for most of the venture creation actions that should be included in such an evaluation process is already available and widespread among entrepreneurship programs, which made the need for a complementary assessment process all the more salient.

While the non-linearity of the entrepreneurial process can be captured by a systemic model like we propose, it was still necessary to try and link each competency to at least one activity and its outcome. This would provide some insights for the instructor to assess the development of the competency, as well as establishing the four structural components for its assessment. Yet, the majority of the entrepreneurial competencies identified by the literature are transversal. We acknowledge this as a limitation of our design. Nevertheless, the business plan that works as a progress log for the development of the entrepreneurial project, can be used to counter that weakness. Periodical and detailed examinations of the business plan could stand as assessment moments for transversal competencies, not immediately or explicitly linked to an activity and its outcome.

Learning cannot be defined exclusively in terms of outcomes, which has been the predominant measure of success in entrepreneurial education to this day. Outcomes under the experiential learning model are simply a matter of record. Indeed, they could be logged in a business plan that summarizes and compiles all the venture creation activities and their

validation. All the adaptations and transactions that, per Kolb and his followers are part of the learning process, can be involved through the validation of the venture creation process. Furthermore, the hypotheses and *a prioris* formulated in the ideation and business model conceptualization are tested through real world evidence, examined and transformed. This, in essence, is what we propose with our systemic model of entrepreneurial competencies assessment.

The issue of assessment methodologies becomes even more salient when considering programs emphasizing the social and sustainable aspects of the entrepreneurial competencies. While the competencies proposed by Morris et al. (2013) do not exclude sustainable and social ventures per se, how they would work in that context is not trivial. First, a fundamental adjustment is necessary in the criteria of how an opportunity is detected, moving from a perspective where a competitive advantage is the raison d'être of venture creation, to another where the creation of shared value is more relevant than market power.

There are several ways to address this in our model. One, by finding explicit and complementary competencies for the set we have already identified. If these supplemental competencies were transversal, like Empathy, Value Co-creation or Environmental Responsibility, it would not be hard to add them to our current model, linked to the validation process and with its outcomes registered in the business plan. The second alternative to involve social and sustainable aspects in the assessment would entail keeping the current design and set of competencies, but supplementing the validation process with wider stakeholders and different viability criteria.

Then again, this alternative is not simple to implement in the classroom, for it requires special guidance from the lecturer when the student reflects on the feedback obtained through the validation process. They may instinctively know what a "good business" is or whether the consumers find value in what is being offered or not, but some conceptual basis and criteria must be included in the learning plan for them to fully understand what social innovation or sustainable entrepreneurial models entail.

When the business plan is one of the main learning outcomes of the program, it implies that the evaluation criteria these are subject to often focus on "the bottom-line": the return rate for potential investors, the size of the market, and a number of financial indicators.[9] Moreover, business plan models as standard as the Business Model Canvas, a staple of entrepreneurial education (which in some cases has been adapted to account for the

social impacts of new ventures), continue to boil down to market-based criteria when being evaluated. This is a factor that entrepreneurial educators cannot overlook when defining what a successful learning process is, not to mention adjacent pedagogical questions like the fitness of binary (pass/fail) or graded evaluation systems when it is the process of developing a set of entrepreneurial competencies what should be assessed.

The qualitative nature of the evaluation process as proposed by our model, as well as its embeddedness in the students' context, is not a minor feature. Indeed, a non-binary (pass/fail), non-graded evaluation assessment might be beneficial to the development of entrepreneurial competencies like *Resilience* and *Tenacity*. Furthermore, it is the information obtained from secondary and primary sources that sets the standards for each competency to be assessed. In fact, the assessment of competencies becomes a process itself, and not a discrete moment for students to be tested using some singular instrument. For example, value creation as a competency continues to be developed from the opportunity detection stage up to the business model generation phase. What changes is how and what is validated as each respective stage's indicator, with the context fundamentally integrated in the evaluation process via the project's validation. The development of the entrepreneurial project evolves as the interactions with the stakeholders and customers enrich and expand. The validation and evaluation processes reflect that in our model, as they move from trying to detect a need that could be exploited as an opportunity, to validating a minimum viable product or carrying out a financial analysis.

Finally, our model might help to involve in the assessment those students who do not carry out entrepreneurial activities after the program. A fault most *ex-post*, outcome-based measurements cannot avoid. Albeit indirectly, this also lets us assess the entrepreneurial competencies of all the students who may become entrepreneurs at some point but fall outside of traditional market measures. For instance, because they created a non-for-profit venture, are arts entrepreneurs or operate in the informal market.

To summarize, we think that the systemic model we propose, incorporating and linking entrepreneurial competencies to venture-creation activities, and combining them with the validation of specific outcomes as an interface for learning assessment, might be a valuable tool in the design of entrepreneurship programs and their evaluation plans, thus bringing new arguments to the debate on the value and impact of entrepreneurial education.

8. Concluding remarks and suggestions for future research

Although the most direct extensions of this work have been discussed in the preceding section, there are still some other refinements worth considering. First, addressing the practical implementation of the model presented, for it currently exists at a level of abstraction that leaves considerable blanks to fill, particularly pertaining "how" exactly to carry out the evaluation of an entrepreneurship program under this framework. Indeed, this is a conceptual study which proposes a general framework for the assessment of the set of entrepreneurial competencies. An evaluation plan, briefly put, needs to be developed to complement the model in its practical dimension.

Generating empirical support for the connections we hypothesize in the model is similarly crucial. There is theoretical support for our model as it largely follows the logic and structure of an entrepreneurial process, but empirical evidence would be an asset when advocating our model. Additionally, being able to discuss how our model relates to trait-based frameworks would be valuable to put it in a wider perspective. For instance, the literature suggests that competencies can be envisioned as variables of the construct entrepreneurial intent, and that might be an avenue worth exploring.

Finally, in this paper we support the notion that entrepreneurial action demands a combination of knowledge, skills, behaviors and attitudes, all informed by an environment but which must also aspire to transform it. Such framework allows for the analysis of social and environmental entrepreneurship as well, but those are two dimensions that expand the already considerable complexities of entrepreneurship education. By putting forth a systemic model for the evaluation of entrepreneurship programs, via entrepreneurial competencies, we attempt to contribute to research-based entrepreneurial education. Especially to the efforts to build a definition for "successful" entrepreneurship education, something we consider essential in a context where the explosion of entrepreneurship as an activity and educational endeavor seems unstoppable.

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