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Reinventing Science and Technology Entrepreneurship Education: The Role of Human and Social Capitals

1. Introduction

With globalization, rapid technological change, and advanced telecommunications, people have become increasingly connected, and the economy is increasingly knowledge- and intellectual-based. This leads to more opportunities for innovation but also more uncertainty, which calls for increased entrepreneurial skills and the ability to adapt to meet these challenges (Heinonen and Poikkijoki, 2006). As commonly outlined by the literature in this millennium, entrepreneurship and entrepreneurial venture are the key to innovation, productivity, and effective competition (Bruyat and Julien, 2000).

Two streams of literature have generated great interest in supporting the entrepreneurial process for venture creation. On the one hand, a large body of literature emphasizes the importance of human and social capitals for understanding the determinants of venture creation (Davidsson and Honig, 2003; Parker, 2011; Estrin et al., 2016; Milosevic, 2018). On the other hand, there has been increasing interest from researchers about the role of education in achieving entrepreneurial intentions, which gives rise to the field known as entrepreneurship education (Shook et al., 2003; Kuratko, 2005; Lee et al., 2011; Maresch et al., 2016). This means that change in academic programs related to entrepreneurship as well as the educational setting must be considered. Changes in educational approaches call for processes that favor innovation and entrepreneurial activities (Bruyat and Julien, 2000). In addition, changes should incorporate approaches that favor individual human capital and social capital for entry into entrepreneurship. Human capital, both general and specific (Becker, 1964; Davidsson and Honig, 2003), gives individuals entrepreneurial and managerial experiences as well as academic education. Social capital brings trust and other resources important to venture success (Hayter, 2016) by being connected both to strong and weak ties (Granovetter, 1985).

Despite the blossoming research on these two streams of literature, there are several areas that need further exploration. For example, recently several academic entrepreneurship programs have been developed. Faced with the multiplication of such programs and the increasing resources therefore allocated to them, Fayolle et al. (2006) proposed a common framework to evaluate the design of these programs. They found that the assessed entrepreneurship education programs had a strong measurable impact on the entrepreneurial intentions of students. However, they outlined that trained students need to be more guided in their behavior to become more entrepreneurial. These authors call for designing better specific skills, content, and teaching approaches for the efficiency and effectiveness of entrepreneurship education programs.

In the same vein, Maresch et al. (2016) discussed the question of what makes entrepreneurship education effective. They show that entrepreneurship education has in general a positive impact on the entrepreneurial intention of students coming from diversified disciplines (business, science, and engineering), but it has a greater effect on a specific targeted group (business students). Their findings reveal the need for didactic approaches in entrepreneurship education to be tailored to the specific needs of distinct groups of students. Additionally, at the lower secondary level of education, Moberg (2014) also highlighted the positive influence of education in entrepreneurship on pupils' entrepreneurial intentions. He emphasized the role of supportive teaching styles and action-based teaching methods in entrepreneurship education at this level.

Although this interesting array of studies examines entrepreneurship education effectiveness, there remain several questions that need a broader insight, particularly considering the rapid and global change that characterizes today's economy. This leads us to ask the following question:

How do academic structures shape their entrepreneurship education programs to anticipate the rapid and global change in the business environment and increase entrepreneurial intention?

To answer this question, our work is part of an approach that emphasizes the link between the world of business and academia by proposing innovative pedagogical issues that later evolve into the creation of programs that will be adapted to focus on innovation and entrepreneurship. At the beginning, these academic programs deal more with formal education or a general human capital transfer approach, and later they evolve into an approach relying more on specific human capital transfer.

Thus, we complement the described research stream in several ways. We focus explicitly on an unexplored setting using an original case study. We adopt a qualitative perspective, from recently implemented programs focusing on innovation and entrepreneurship issues at Kedge Business School (Kedge BS).¹ Our case consists of three pedagogical programs developed since 2011: the "Management Internship" (MI), the "Open Innovation Certificate" (OIC), and the "Specialized Master Management of Innovation and Health" (SMIH).² We discuss the benefits and challenges of these innovative programs for graduate education. This case study highlights innovative issues in entrepreneurship education and shows how a business school mobilizes its expertise in education and builds on a series of pedagogical initiatives to help students respond to current challenges in terms of innovation and entrepreneurship in a changing business environment.

We also propose a framework by pooling several individuals coming from different disciplines within an entrepreneurial education program that favors idea generation, knowledge sharing, and venture creation. A successful entrepreneurial program requires the creation of an environment in which participants form and preserve a mutual and interdependent relationship as collaborators (Yoon et al., 2015) and receive training based on a distinctive learning method (Mustar, 2009). The content and the cognitive entrepreneurial skills, as well as the structure of the network (high density) in which participants are embedded, are essential to entrepreneurial development.

This framework emphasizes both the role of human and social capitals implemented within an entrepreneurship education program. Following Becker (1964) and Parker (2011) human capital can be thought of as general or specific. General human capital deals with a variety of occupations and industry, whereas specific human capital focuses more on individuals and deals more with a sector. Social capital can play a major role in creating trust and bridging networks in order to access resources (Granovetter, 1985; Coleman, 1988; Kogut, 2000). Trust contributes to building confidential strategic resources, which improve performance, whereas creating networks is related to ties. These ties affect the bonding or bridging of social capital. We distinguish here between strong and weak ties. Strong ties refer to close relationships, such as parents and intimate friends, who mainly bring trustworthy access to financing supports and specific knowledge. Weak ties refer to other relationships that enable access to other types of information and resources dealing with competition, markets, and so on.

¹ At Kedge BS, innovation and entrepreneurship are linked and constitute an educational pathway in the Programme Grandes Ecoles (PGE) program.

² In French: "l'Internat du Management," "le Certificat Open Innovation," and "le Mastère Spécialisé Management de l'Innovation et de la Santé."

Overall, the structure and quality of these social ties among participants shape entrepreneurial actions by creating unique opportunities and access to those opportunities (Uzzi, 1996).

Depending on the transfer of human capital between general and specific, and regarding the nature of social ties between strong versus weak, we build a matrix that identifies four situations. These situations shape the trajectories of the educational program's setting, which may be adopted by academic institutions.

Clearly, for academic institutions to anticipate the current fast-paced and global changes they must implement advanced academic technology and develop entrepreneurship centers to encourage interaction and innovation among participants by mixing human and social capitals in their entrepreneurial education programs. This will be supported in decades to come with the rapid evolution of digital technologies (Nambisan, 2017), opening up fascinating innovation opportunities for entrepreneurs (Rippa and Secundo, 2019).

Our article is structured as follows. First, we develop our theoretical framework in which we discuss entrepreneurship education as linked to human and social capitals. Second, we present our methodological elements articulated for a case study analysis and the collection and treatment of our data. Third, we provide the results of our analyses before discussing them and concluding.

2. Theoretical framework

2.1. Entrepreneurship education and entrepreneurial intention

In the present-day knowledge economy and time of rapid technological change, the impact of entrepreneurship education has become important to foster the entrepreneurial behavior necessary for economic development agendas (Fayolle and Linan, 2014; Maresch et al., 2016). As commonly known, entrepreneurship or an entrepreneurial venture is a driver for innovation, technological progress, economic growth, and job creation (Bruyat and Julien, 2000). In addition, globalization and advanced telecommunications and technology lead to more opportunities as well as more uncertainty (Leyden et al., 2016), which call for more entrepreneurial skills and abilities to adapt with these challenges and uncertain future (Heinonen and Poikkijoki, 2006).

Thus, since the new millennium, the purpose of entrepreneurship education has expanded and is considered to an effective way to promote and increase interest in entrepreneurship among students (Nwankwo et al., 2012). Academic institutions have increasingly developed a great interest in varied programs, including courses dealing with entrepreneurship and new-venture creation (Solomon et al., 2002; Kuratko, 2005; Verzat et al., 2009). These courses should foster positive thinking, initiative, creativity, and social networking (Al-Atabi and Deboer, 2014). Overall, they should be a major driver for entrepreneurial intention, that is, intentions toward starting a high-growth business in general (Hmieleski and Corbett, 2006) or, when dealing with students, being engaged in entrepreneurial practices after graduation (Adekiya and Ibrahim, 2016).

The rapid and global change in technology has undeniably accelerated this trend and challenge. Applying technologies, and more particularly digitalization, has become crucial in the educational setting (Solomon et al., 2002; Rippa and Secundo, 2019). Digital technologies are profoundly reshaping markets and society (Nambisan, 2017). This change context calls for updating programs and training students to acquire relevant knowledge and skills. Therefore, alongside traditional face-to-face teaching, distance learning has been deployed. The use of suitable digital platforms, such as Massive

Open Online Courses (MOOCs), offers new opportunities to take entrepreneurship courses and provides broad access for both business and non-business students (Al-Atabi and Deboer, 2014). Additionally, digital platforms facilitate and promote cooperation and sharing (Hanseth and Lyytinen, 2010).

In fact, one main issue about education in entrepreneurship is that it covers the entire scope of business administration and involves students coming from many disciplines, such as business, science, and engineering (Zeithaml and Rice, 1987). This gives rise to the creation of entrepreneurship centers inside, or close to, academic institutions in order to encourage collaboration and project development. This should privilege collective team-based work rather than individual work. These programs should help students or participants gain additional skills as a complement to traditional teaching by supporting learning by doing and providing opportunities for students to interact and work together (Fiet, 2000). Such programs call for the use of innovative models and content in teaching (Shepherd, 2004; Phan et al., 2009).

As defined by Heinonen and Poikkijoki (2006, p. 84) “*The aim of entrepreneurship education is to integrate the skills and attributes of an entrepreneurial individual with the entrepreneurial process and related behavior.*” Interaction between academic institutions and other stakeholders becomes necessary for entrepreneurial process, especially with the emergence of the knowledge-based global economy. In this context, intellectual capital—as an intangible asset—is increasingly becoming a crucial element for corporate survival and an important driver of firm value (Viedma and Enache, 2008; Mudambi, 2008) compared with physical and financial forms of capital—or tangible capital assets. Thus, entrepreneurship education should lead to having superior ability in entrepreneurial intention and consequently venture emergence, leading to our first hypothesis:

Proposition 1: *Entrepreneurship education has a positive impact on entrepreneurial intention among both business and non-business students.*

2.2. Human and social capitals

One major issue supporting the relationship between entrepreneurship education and entrepreneurial behavior is human capital theory (Becker, 1964). Human capital represents “*the skills and knowledge that individuals acquire through investment in schooling, on-the-job training, and other types of experience*” (Bae et al., 2014, pp. 219–220). Furthermore, it is becoming clear that success in entrepreneurship is dependent not only on the entrepreneur’s skills and knowledge but also on the network of other individuals with whom that person is connected. The network refers to social capital theory (Granovetter, 1985; Coleman, 1988), that is, the networks and relationships that entrepreneurs can rely on for support (Bhagavatula et al., 2010). An atmosphere of trust and relationships derived from this social capital should help the entrepreneur to access resources and expertise, on the one hand, and to overcome uncertainties and complexities, on the other hand. Thus, the entrepreneur may be able to increase skills and knowledge throughout the network and exploit more opportunities.

Experience, practical learning, and training courses are commonly recognized as useful to entrepreneurial activity. Strengthening such human capital by pooling entrepreneurs or students from different disciplines leads to the creation of high-quality ventures (Maresch et al., 2016). Thus, entrepreneurship education as a driver for entrepreneurial attitudes promotes an adequate environment for interaction and collaboration, which enhances individual skills and knowledge (Davidsson and Honig, 2003). Positive externalities will have to come from this social network, with entrepreneurs looking for opportunities to exploit them (Estrin et al., 2016). Thus, human capital becomes fundamental in the entrepreneurial process, particularly for the identification and exploitation of

opportunities that can generate positive external effects, and its role becomes important in making choices for venture creation (Parker, 2009). To achieve the best returns in entrepreneurship activity from the role of human capital embedded in a network structure, greater focus should be put on programs and policies related to education.

Programs should take into account the nature of the transfer of human capital in order to better form an environment in which idea generation, knowledge sharing, and business creation are energized or boosted (Yoon et al., 2015). The types of human capital can be distinguished between general and specific. General human capital deals with formal education and professional experience, whereas specific human capital deals with task competencies and skills or what is known as task-specific human capital (Gibbons and Waldman, 2004). In this vein, Milosevic (2018) outlines the importance of four major task-specific human capital characteristics: scientific research background, previous start-up experience, previous venture capital, and investment banking experience. Participants holding such specific human capital features would have positive impact on entrepreneurial intention and venture outcome.

For the reasons just outlined, entrepreneurship education programs should be designed in a way that attracts and integrates such profiles. These participants develop a mutual and interdependent collaboration through trust relationships that lead to the formation of strong social capital. As stressed by Davidsson and Honig (2003), social capital—consisting of both strong and weak ties—is a robust predictor for entrepreneurial venture. A socially strong tie refers to close personal contacts, such as parents and friends, who own businesses. They offer a strong driver for trust and financial support. A socially weak tie refers to simple community networks, such as competitors and suppliers, who provide access to a variety of resources (Seghers et al., 2012; Grichnik et al., 2014).

However, academic education programs could be a suitable driver for the creation of strong networks of relationships among participants as well as the entities from where these participants are coming. In fact, several forms of educational resources contribute to the dynamic entrepreneurial processes, especially from a point of human and social capitals. In sum, high levels of social and human capital are strong predictors determining venture emergence as well as entrepreneurial intention (Grichnik et al., 2014), leading to our next hypothesis:

Proposition 2. *Pooling both business and non-business students within specific entrepreneurial programs increases human and social capital outcomes leading to a positive impact on entrepreneurial intention.*

Interaction between academic institutions and different individuals coming from diverse disciplines then becomes necessary, particularly in terms of the relevance of social exchange as a driver for social capital (Emerson, 1972). The structure of these interactions, drawn across a given network, may have an impact on the outcome of the entrepreneurial intention or the emergence of a venture. As explained by Granovetter (1985), Coleman (1988), and Burt (2000), the structure of the network influences these outcomes and could be a major driver to strengthen social capital. In fact, resources and expertise that individuals can access are embedded within particular positions in a social network. Individuals connected both to strong and weak ties are more likely to succeed in venture creation than those who are not (Davidsson and Honig, 2003; Grichnik et al., 2014). Additionally, an individual can then derive two aspects of information from his or her network (Shipilov and Li, 2008): information about new business opportunities available in the network of relationships (Burt, 1992) and information about partner cooperativeness (Kogut, 2000).

From the viewpoint of a social capital network, participants tend to rely on their strong tie network in the beginning in order to gain access particularly to financial resources; thereafter, they will approach their weak tie network in order to get other required resources (Grichnik et al., 2014; Hayter, 2016). The two dimensions of human capital transfer should also contribute to the outcome of the educational programs. Academic programs tend to be more formal education oriented at the beginning and thereafter deal more with specific skills. That is why, respectively, the two dimensions of human and social capitals lead to a positive impact on the entrepreneurial intention.

Human capital, both general and specific (Becker, 1964; Davidsson and Honig, 2003), gives individuals entrepreneurial and managerial experiences as well as an academic education. Social capital brings trust and other resources important to entrepreneurial intention by being connected both to strong and weak ties (Granovetter, 1985), leading to our next hypothesis:

Proposition 2a. *General human capital with strong tie networks lead to a positive impact on entrepreneurial intention.*

Proposition 2b. *Specific human capital and weak tie networks lead to a positive impact on entrepreneurial intention.*

Proposition 2c. *Specific human capital and strong tie networks lead to a positive impact on entrepreneurial intention.*

3. Method

3.1. A case study analysis

We seek to answer the following research question: How do academic institutions shape their entrepreneurship education programs for technologists and business students to anticipate the rapid and global change in the business environment and increase entrepreneurial intention? To answer this question we use a mainly qualitative perspective to analyze the case of successful innovative programs developed since 2011 at Kedge Business School (France).

Kedge BS is a French business school and considered to be a Grande Ecole. Located in Bordeaux, Marseille, Toulon, and Paris, as well as two campuses in China (Shanghai and Suzhou), the school was created in 2013 as a result of a merger between two business schools: BEM (ESC Bordeaux, founded in 1874) and Euromed (ESC Marseille, founded in 1872). Following the merger, Kedge BS is now the largest business school in France. With the triple accreditation (AACSB, AMBA, EQUIS), Kedge BS is a recognized institution in the country.

Forbes France ranks Kedge BS among the best business schools “to learn entrepreneurship.” The quarterly welcomes “great entrepreneurial momentum” born from the interconnection that Kedge fosters among stakeholders in its territories. With its expertise in innovation and entrepreneurship, Kedge “dominates the other schools in terms of registration of companies with 393 companies created between 2015 and 2017.”³

³ Source: Forbes.fr (April 13, 2018). <https://www.forbes.fr/entrepreneurs/top-10-des-ecoles-de-commerce-pour-apprendre-a-entreprendre/>

Kedge's interest in education entrepreneurship is expressed by the presence of the Daniel Carasso Kedge Accelerator, which is composed of the Business Nursery, created in 2012 and shepherding more than 70 start-ups per year; Business Pulse, which shepherds ten start-ups per year; as well as an innovation Lab or i-Lab. The Business Nursery recruits projects, based on ideas and start-ups created by Kedge students, and supervises their development. The Business Pulse aims to support innovative and mature projects by mainly providing services such as coaching, networking, and fund-raising. The i-Lab is a meeting space to share collaborative and innovative creation. It offers spaces for coworking, co-design, and a Fab lab (fabrication laboratory).

We adopt a case-based exploratory method to tackle a phenomenon that is poorly understood (Eisenhardt, 1989), has multiple and complex elements (Dodgson et al., 2008), and evolves over time (Langley, 1999). We focus on three pedagogical programs: the Management Internship (MI), the Open Innovation Certificate (OIC), and the Specialized Master Management of Innovation and Health (SMIH). These pedagogical programs correspond to three chronological phases that take into account changes in economic and academic environments (development of digitization, inclusion of innovation, and entrepreneurship in training programs) and that have led to rethinking the educational approaches of transdisciplinarity, diversity, and collaboration, including technological tools.

We emphasize that the educational objectives of these three programs are oriented toward innovation and entrepreneurship and that they are closely linked to the three aforementioned entrepreneurship structures, that is, the Business Nursery, two Business Pulses (one in Marseille and one more recently in Bordeaux), and the i-Lab (in Toulon).

3.2. Data collection and treatment

Regarding the primary data, we gathered materials from all stakeholders in all programs. First, we had multiple exchanges with two key respondents at Kedge BS: the director of hybrid innovation and digital intelligence, who managed the MI program from its creation and who developed and prototyped the OIC and the SMIH, and the project leader in the Department of Innovation in Teaching and Learning Experience. Beyond informal interactions that enabled us to share general information about the studied programs, we had formal interview sessions of 4 hours' duration: 2 hours in November 2017 and 2 hours in November 2018. After the first session, a written synthesis of each program was sent to us, and we organized it along the following four themes: description of the program, genesis of the project, educational content, and skills covered.

In addition, we collected data on the feedback from students and partner firms about the programs in which they participated. In this respect, we benefitted first from quantitative student assessments of courses that were generated according to the quality process induced by the accreditation frameworks (AACSB, EQUIS) since 2012 for the MI and 2018 for OIC and SMIH.

On the basis of dimensions linked to human and social capital issues from our literature review, we also asked former students in November 2018 for qualitative responses about the consistency of the education program. We asked students to provide us feedback on the ability of the program to respond to a market need, create proximity with the company, allow the exploration of the future through scenarios, develop diverse multidisciplinary courses in the class, develop new skills and competencies, develop the professional network, and develop an entrepreneurship mindset and/or activity. We received 11 qualitative responses: 3 from the MI program, 5 from the OIC, and 3 from SMIH.

On the partner firm side, we collected eight qualitative responses for the MI and OIC programs. From the MI, we received feedback from Sartorius Stedim (HR business partner, project leader vaccines),

Airbus Hélicoptère (tech data policy manager), and Gemalto (innovation strategy director). From the OIC, we received feedback from Airbus Hélicoptère (vice-president training & flight operations; digital transformation leader), Genesink (research project manager), and MCO Congrès Marseille (development officer).

In addition, we collected secondary data (documents presenting the programs, certification documents such as accreditation, the school website, and so on). Table 1 presents the main elements of the data collected.

Primary Data	Nature of Data	Respondents	Period/Duration
Program heads and staff	Interviews	- Director of hybrid innovation and digital intelligence (Kedge BS) - Project leader (Department Innovation in Teaching and Learning Experience, Kedge BS)	Nov 2017 2 hours meeting + informal interactions Nov 2018 2 hours meeting + informal interactions
Students	- Course assessment (quantitative) - Feedback (qualitative)	MI OIC, SMIH MI (3), OIC (5), SMIH (3)	2012 to 2016 2018 Nov 2018
Partner firms	- Assessment grids - Feedback (qualitative)	MI MI (4), OIC (4)	2012 to 2016 Nov 2018
Secondary Data			
General information	Official and communication documents presenting the programs, certification documents such as accreditation, the school website, and so on		

Table 1: Synthesis of elements of data collection

Data analysis follows qualitative criteria (Miles and Huberman, 1994; Yin, 2003; Eisenhardt and Graebner, 2007) based on thematic content approach. Following Miles and Huberman's (1994) requirements, the collected material was coded by highlighting a grid that enables tackling the following themes from our propositions: profile of students (business/non-business), nature of the education program (specific/general), human capital outcomes (specific/general), social capital outcomes (weak/strong ties), and entrepreneurial skills/entrepreneurial orientation. To avoid any subjectivity in the treatment of data collected, only the academic coauthors participated in the coding and interpretation of the data.

4. Results

4.1. A necessary paradigm change to build innovation and entrepreneurship education programs

4.1.1. The MI: A pedagogical innovation inspired by medicine education transposed to innovation and entrepreneurship

As of 2006, Kedge had developed several double-degree programs with a network of engineering schools (ESIL, ISEN, Polytech Marseille, ISARA, Ecole des Mines de Saint Etienne, Ecole des Mines

d'Alès, etc.). It thus integrated scientific expertise into the training of its managers. In 2010, EQUIS reported highlights and weaknesses in the capacity of the school to innovate in teaching (which can be observed in the rankings on the pedagogy criterion). At that time, the market became more difficult and required transdisciplinary profiles. The report of the Commission Innovation 2030 insisted on the need to develop training with innovative methods:

Our education system must be itself innovative to reveal the talents, make and give confidence. (...) The innovations that will most effectively meet the expectations of society will result from crosses between disciplines and will constitute innovative systems combining several technological and non-technological solutions in a single product and/or service. Hybridization between technological innovations and services, convergence between societal trends and the approximation of various sectors are often factors in [the] success for products and services.

(Extracts from the report of the Commission Innovation 2030, Lauvergeon et al.2013)

Professors in strategic management at the business school⁴ developed the main principles of the MI program that were inspired by the three-phased model of doctor training in France:

- Externship: learning the basics (two semesters/basics in online learning)
- Internship: learning in the company/school (five semesters/three 6-month internships)
- Fellowship: young executive in a company who comes back to school to be educated in managerial practices/post-graduate training

The idea of the MI is based on certain principles of operationalization, postulating concepts such as openness and diversity with business environments and innovation in teaching methods. Appendix 1 presents in detail these principles as formulated by the initiators of the program.

The premise was to position a multidisciplinary team—engineers/managers/designers (Toulon)—on an innovation mission characterized by the development of new skills. At the same time, students followed six courses in diversification of business opportunities (innovation/external growth/internationalization/consolidation, etc.). Another original component was that every professor needed to bring his/her own disciplinary vision in a cross-sectional case study.

In 2011, the first prototyping of the MI was achieved with 30 students, encouraged by the director general of the business school. In 2012, the MI program started with 60 students/year leading to success shown by the fact that all students were placed professionally and the companies were convinced by the positive outcome of the training. The MI was implemented between 2011 and September 2016. The companies offered an operational mission (2 to 3 months) to a group of preselected students. At the end of the mission, the company chose the student it wanted to continue working with. The selected student continued training inside the company with a flexible framework that adapted to the pace of the mission. The student had coaching in personal development and had specific academic monitoring, and operational support. This support continued during the first years of the student's career, so the former interneer ended up by receiving post-graduate training based on the student's evolution in the company.

The program was stopped in September 2016 to allow program restructuring. At the end of the program, the results were as follows: 170 students trained, 40 missions realized, 34 internships

⁴ Jean Jacques Michelin and Pierre Maggini

offered, and 9 fixed-term contracts/permanent contracts proposed by partner companies. Table 2 presents key MI figures.

Key Figures	Starting date	Number of students/year	Number of sessions/year	Number of missions/year	Number of business partners
Management	2011	60	2	12	25
Internship			(Semester 1 and 2)		

Table 2: Key MI figures

4.1.2. The development of specific programs based on the MI program philosophy

4.1.2.1 The Open Innovation Certificate (OIC)

In April 2016, the director of innovation programs (director of hybrid innovation and digital intelligence) decided to use the MSc program, given its success, to prototype an OIC, a transdisciplinary and trans-generational training course combining master level 2 students from the business school and senior business executives for a period of 1 month. Young learners would bring their creativity, and senior executives would offer their expertise. This mixture fosters the acceleration of the emergence of innovations but also their implementation. The main goal was to enable students to learn innovation methods and techniques that they could then implement by developing a project. They could choose either to rely on innovation in the public domain to work on a new use and a new target (Abell's tri axes) or rely on a personal project or one provided by an external partner (company, organization, PhD student, fellow student, etc.).

In April 2017, the OIC was opened on the Bordeaux campus. The certificate was developed in Marseille with success in the field of health, so HR managers offered the opportunity to Kedge BS to design specific training for the scientists they recruited. Table 3 presents key OIC figures.

Key Figures	2015/2016	2016/2017	2017/2018
Open Innovation Certificate	45 students (Marseille)	75 students (40 in Marseille; 35 in Bordeaux)	80 students estimation (40 in Marseille; 40 in Bordeaux)

Table 3: Key OIC figures

4.1.2.2 The Specialized Master Management of Innovation and Health (SMIH)

At the request of some in the health industries, the SMIH started in September 2017 with 15 scientists from Bac+5 to Bac+10 (post-doc) levels. All participants were placed and funded by companies that were seeking high-expertise profiles throughout the value chain of health, from those capable in molecule discovery to patient management. The SMIH offers scientific experts a dual science-management competency that relies on an essential skill in this health area: innovation. The term *health* must be understood in a very broad sense, because it concerns all companies and organizations operating in the different areas of the industry (biotechnology, pharmaceutical industries, devices, and medical equipment) and the management of patients and users (hospitals, care facilities, schools and health services, social services). The SMIH focuses on the development of the following dimensions: the ability to manage complexity, hybridization and transdisciplinarity, and the ability to innovate and to capture value.

Kedge BS's successes in the various undertaken missions pushed the pole of competitiveness so that Eurobiomed invited Kedge BS to collaborate on its education programs.⁵ Table 4 presents the key SMIH figures.

Key Figures	Starting date	Number of students	Number of training hours/60 days	Duration of the internship	Duration of the transdisciplinary mission in the company
Specialized Master Management of Innovation and Health	2017	15 scientists	350 h	6 months	90 days

Table 4: Key SMIH figures

4.2. The interplay between human and social capitals for entrepreneurial intention

After developing the chronology and the main principles associated with each education program, we now characterize them, first through the profile of participants (business/non-business) and then through the nature of human capital (general/specific) and social capital (weak/strong).

4.2.1. Pooling both business and non-business students within specific entrepreneurial programs increases human and social capital outcomes

4.2.1.1. General human capital and strong tie networks in the MI program

- Pooling business and non-business students

At the time of its creation in 2011, the MI was aimed at students in the ESC program,⁶ who were the first offered the opportunity to join this project. Today, it targets students at the master 1 level of the PGE program.⁷ The student profiles are multidisciplinary (managers, engineers, designers, etc.) and they have a high potential because of their cross-disciplinary and diversified skills. The program fits into a context of diversity in talent, training, sensibilities, and social origins. Thanks to Kedge BS's many partnerships with management or engineering schools in France and abroad, students can come from various training backgrounds and nationalities. In terms of participant selection, the company defines the profile (training, culture, skills) of eligible candidates. A company mission of 2 to 3 months with a high value and international orientation is carried out by groups of six students, who are motivated by the company and its sector of activity and are preselected by the school on the basis of the criteria established in advance by the company. At the end of this phase, the company chooses the candidates who will continue their mission in the company.

- General human capital

Pedagogy is based on an inductive approach. The participants in the education program can choose their courses according to the issues encountered in the company. The company will guide them as well in their learning: from the field to the acquisition of knowledge (see details in Appendix 2). The

⁵ Several presentations were given in 2017: in April at the national Congress Eurobiomed of medical settings of Nîmes on the theme "Challenges of open innovation for businesses: Theoretical approach, best practices and examples of initiatives," in October at the Agora Innov'in Med, in November at the Congress of the Interpro Health Future Show, and in December at the National Congress of Collective Intelligence.

⁶ ESC: Ecole Supérieure de Commerce

⁷ With the new denomination of business schools becoming management schools, this program is at the heart of their activities. It is accessible after a preparation program and offers obtaining a Bac+5 level in 3 years.

MI aims to develop several skills, including entrepreneurship and intrapreneurship; analysis, synthesis, and decision-making; innovation; cross-disciplinary and transdisciplinary approaches; trade, social negotiation, and complex systems; written and oral communication; exploration and anticipation; project management; multiculturalism; and common and social responsibility.

- Strong social capital

Building a network of partners is necessary to create a context of diversity, pooling academia and business so that students/learners benefit from real experiences and challenge their learning. Through the development of a number of missions, participating companies also have benefits through mobilizing students from the three programs. In a general way, the context of the missions offers several opportunities, such as the detection of high-potential profiles (multiple competencies, such as engineers/managers, association presidents, entrepreneurs, etc.), increasing the time spent in the company by taking into account peaks of activity; reliable recruitment of young graduates; acceleration of their operationality; the possibility to retain talents in the long term; implementation of inductive training, companionship (from the field to the acquisition of knowledge); and finally accessing a lifelong learning setting. Some of the partners are involved in two or even three of the programs analyzed.

More precisely, the missions in the MI education program are diverse in nature. Some examples are integration of human factors in helicopter flight (Airbus Hélicoptères); ADC (antibody drug conjugate) development (Sartorius Stedim); transport of hot organs (Sartorius Stedim); diversification of the company through innovation: developing pure blue methylene (Provepharm); study of the connected objects market and the choice of a business segment (Gemalto); choice of priority countries for the international development of the Onet group; and an implantation strategy for a maritime hub in Africa (CMA CGM). The partner companies include the following: Airbus Hélicoptères, Sartorius Stedim, Gemalto, Onet, CMA CGM, SNCF, La Varappe, Castorama, GEM Industrie, Genes'Ink, Adrexo, and Concept Emballage.

4.2.1.2. Specific human capital and strong tie networks in the OIC program

- Pooling business and non-business students

The OIC program is open to transdisciplinary students at Kedge BS with a master 2 level (MS/Msc, representing more than 500 students) and who wish to work for 6 weeks on innovation and entrepreneurship projects offered by start-ups in the field of health and e-health or by large biotech groups such as Sartorius Stedim and Sanofi, among others. The specialized master 2 students choose among several certificates offered by Kedge BS, the OIC being the only one in innovation and entrepreneurship based on solving problem tasks without knowledge or prior solutions.

- Specific human capital

The educational approach is inherently transdisciplinary. The educational choice here relies on the learning-by-doing approach, which is part of the educational DNA of the business school. In addition, starting from the premise that it is contradictory to teach innovation without innovating, the OIC mobilizes innovative teaching methods such as peer learning, social learning, flipped classroom, and inductive pedagogy. The OIC is based on three pillars of theoretical teaching that bring the conceptual foundations of learning through experience as part of the teaching approach and the involvement of experts whose goals are to broaden the horizons of the explored topics (see Appendix 3 for details). The OIC aims to develop the following skills: enhance ideas and innovations in the form of

marketable products or services; develop, manage, and accelerate projects through open innovation; find funding sources adapted for innovative projects; develop a new business segment in a company; prepare to become project leader; and develop agile and collaborative managerial skills.

- Strong social capital OIC

The students in the OIC program work on missions such as designing the patient's path (APHM), startup micro finance in Guinea, relaxation space and cognitive stimulation (human UP/neural UP), social tourism and university residences, and virtual coaching and professional orientation. The main partners are Eurocopter, Gemalto, Sartorius Stedim, La Varappe, and Human Up.

4.2.1.3. Specific human capital and weak tie networks in the SMIH program

- Pooling business and non-business students

The SMIH is dedicated to future managers from different initial training backgrounds: management, scientists (engineers, biologists, biomedical, biotechnology), health (pharmacy, medicine, dental), paramedic (physical therapy, nursing), and other training (health law, political science, architecture, etc.). The selection of candidates is made through application and interview with a national external recruitment push aimed at candidates who have at least a degree of Bac+5 level.

- Specific human capital

In the interest of overall consistency in the system, innovation, and entrepreneurship, importance is focused on teaching methods that aim to achieve the learning objectives: inverted class, reversed class, peer learning. The teaching program is divided into several parts: the theoretical part is designed to provide students with conceptual and theoretical bases to use in their future business. Expert conferences are designed to address business change issues. Finally, the trade shows visits enable students to become familiar with the latest technological advances in the health field. The program also provides a module for soft skills development as well as long-term experience in a company. The training ends with defense of a professional thesis, which is intended to reflect the acquisition of professional foundations and personal reflections of the student about the faced issues (see Appendix 4 for details). In terms of skills covered, the SMIH helps participants consider new skills and develop strategic and managerial expertise to innovate in health, such as to anticipate and stimulate creativity for new services to users, identify and respond to user expectations, pilot new models for innovation (open innovation, social innovation, etc.), reinvent company strategy, manage multidisciplinary teams in complex environments, interact with the regulatory bodies (national, international), generate value through new national and international markets, create responsible value for the whole of society (CSR), and broadcast innovations to transform uses and values.

- Weak social capital

SMIH participants who come from companies are considered to have weak social capital. Industrial and academic partners are Sartorius, Innatepharma, Provepharm, Sanofi, Genepred, Bordeaux Inp, Master Biotin, Polytech Marseille, and Institut Paoli-Calmettes.

4.2.2. Both human and social capitals lead to a positive impact on entrepreneurial intention

From analyzing student assessments and feedback from former students in each program and from partner firms, training is based on tight partnerships with companies who offer a collective project management logic and challenges in an innovation context that contribute to students developing real new (far beyond regular) skills and competencies.

More precisely, from former students' points of view, even if they are not yet entrepreneurs, given their recent access to the job market, their feedback for the theme "the outcomes in terms of developing an entrepreneurship mindset and/or activity" reveal human and social capitals expressed in terms of autonomy, maturity, inventiveness, innovation, collective intelligence, and network. These outcomes are highlighted in the following quotes about the three programs.

"The Management Internship program is an educational innovation that far exceeds the expectations of students by providing a level of learning; gain maturity and professional posture at the height of the requirements of the companies. The MI brought me—but also to other students in my class—tools and above all a unique professional intelligence. This program is for me—was, I should say now—inventiveness, originality, and differentiation of Kedge Business School in pedagogical terms. It is precisely because of the MI that I occupy my current position and level of responsibility assigned to me beyond out of school average." (former MI student/R.C., global product manager—Sartorius Stedim Biotech)

"Thanks to my mission, I discovered the exciting aerospace sector and have not left since. In addition to skills, working on the improvement of the supply of training for helicopter pilots, this first step has laid the foundation for my professional network. Knowledge of the environment as well as the success of this initiative have played a key role to getting an internship in the same company. This new project was the implementation of innovations on a type of flight simulator in coordination with a start-up. The goal was to test the feasibility of such an implementation on a flight simulator's average fidelity. Five years later, these themes were taken up by the OEMs on high-fidelity simulators and are now on the market." (former MI student/A.L., marketing officer—Thales Training & Simulation)

"I was lucky to be part of one of the first promotions to integrate the management internship; if the teaching followed had already more than satisfied me during this semester, today I can clearly measure the contribution of these 6 months on the rest of my career. Indeed, I managed to obtain an internship in private equity almost exclusively thanks to this 'elitist' program." (former MI student/F.L., junior convertible bonds sales—Kepler Cheuvreux)

"The Open Innovation Challenge allowed us to interact with a company with different needs in their area. Throughout the course, we were always treated as an employee and not as a simple group of students. We had intended to carry out a market study for G&G Company. We had never worked in the biological environment, and it was a discovery for all of us. The fact that each member of the group is from a different sector has allowed us to expand our working methods and our points of view. Thanks to the diversity of the courses, as far as I am concerned, I discovered the functioning of a marketing study and the steps necessary for its creation. We have been challenged throughout the course; we had to work and move forward together, which eventually created links. We are still in contact and I know that if I need assistance on a project that requires skills that I don't have, I can count on them. With the Open Innovation Certificate, I have confirmed my desire to create my business as a result of my studies." (former OIC student/C.C., teaching assistant—Epitech)

"During the Company Open Innovation Challenge of Kedge Business School, I had the opportunity to meet students from the school in the second year of [the] master [program]. This proximity with different profiles than mine has allowed me to have a new vision of the entrepreneurial environment. Moreover, the quality of teachers and their interventions taught me a lot, especially on the commercial and legal business aspects. Working with a company offering an innovative solution in the field of medicine made me understand how an innovative company has to work to meet a market need. This challenge also allowed me to increase my professional network. Indeed, I kept in touch with several players in the training, so their advice seemed relevant. Finally, this training has developed my ability to entrepreneuring and the different lessons that I could draw from it serve me today in my academic and professional experiences." (former OIC student/L.L.R., freelance developer)

“At the start of the challenge, while we were groping a lot on our subject, we experienced moments of discouragement. But, motivated by the importance of the company, which had submitted its problem to us, and conscientious in our work, we persevered. And this is what undoubtedly made the quality of our work: whatever happens, whatever the constraints, we wanted to present to Airbus Helicopters a project—if not completely feasible—which at least is robust. I think this is a good lesson to learn: the ability to undertake is intimately linked to the motivation of team members. We all wanted to take up this challenge. We did not only take it as a ‘homework’ for the school, but as an opportunity to show a prestigious company that we were able, in just a few weeks, to respond to a problem that occupied them. Finally, we were no longer students participating in a school challenge, but consultants responding to a client need.” (former OIC student /M.I, digital marketing manager —Nice-Matin)

“Finally, our ability to undertake entrepreneurial activities has greatly increased. Courses on entrepreneurship, strategy, finance, etc. really helped us understand how the creation of a society could be. More importantly in my view, this training has not only improved our ability to undertake entrepreneurial activities but especially our desire to launch a business.” (former SMIH student/J.L.-H., consultant)

“Personally the course on intellectual property made me want to undertake an entrepreneurial activity if I find the idea! But beyond that: working in project mode requires understanding, husking, articulating, prioritizing and formatting so finally [we] carried out a work regardless of the subject and in a constructive approach to add value, and so we are shaping a way to go about things like a business leader.” (former SMIH student/S.L, hospital specialist delegate)

“The training helps to plan for the medium and long term, both in terms of business and health development and on a personal level. Perhaps an addition of short-term possibilities and events directly following the master are to be highlighted.” (former SMIH student/A.J., evaluation and coordination project manager—Sartorius Stedim Biotech)

From the partner firms’ perspectives, beyond the general satisfaction about the educational program and the partnership with the school, human and social capitals are completed by dimensions linked to motivation, innovation, novelty, detection of talents, problem-solving, and work in uncertainty and complexity, as shown in the following selected quotes from the MI and OIC programs.

“The Management Internship has first brought a new vision for our market problem because students came from different cultures and schools. The regular exchange between students and marketing teams has been particularly rich for the two parties. Students did a remarkable job of conduct and analysis of interviews to understand the real problems of customers in different countries, which has helped our teams design innovative solutions. Another interesting aspect is to detect interesting talents for our company, by having a first experience of working with them.” (MI partner firm/Gemalto, M.G., innovation strategy director)

“Multidisciplinary teams of the Management Internship [prove] commitment, distance, critical thinking. They have learned to work in uncertainty and complexity. They managed to get the external competence necessary for the implementation of the proposed solution, especially in integrating in the human UP start-up project, specializing in physio and neurosciences. We have recruited in internship all the candidates; some left for international voluntary experience. I have personally recommended two students who work to date at our partner Thales.” (MI partner firm/Airbus Helicopters, R.C., tech data policy manager)

“At Genes'Ink we are really delighted to have been able to participate in the Open Innovation Kedge Certificate. Students we worked with were very motivated and brought the innovative approach we've been waiting for to answer to our problem.” (OIC partner firm/Genesink, M.B., research project manager)

“The solution proposed by the student group is original, innovative and makes it possible to perpetuate over the year the dynamics of the health network around our event Innov’in Med. The students showed creativity, situational intelligence and motivation. They have developed their network of contacts in the health and events sector.” (OIC partner firm/MCO Congrès Marseille, H.B., business development officer)

These new skills and competencies are necessary and particularly relevant for the success of future students’ entrepreneurial activities, including intrapreneurial projects in current companies.

5. Discussion and conclusion

The purpose of our research is to provide a methodological framework leading to a better understanding of how academic structures must anticipate and set up programs oriented toward innovation and entrepreneurship dealing with rapid and global change. We shed light on the role of both human and social capitals as well as their aspects in order to identify and exploit entrepreneurial opportunities, especially among business, science, and engineering graduates. In order to generalize our claims about the features of such programs, we document the case of one French business school, namely Kedge BS, and we propose a framework mixing the aspects of social capital and the nature of transfer of human capital (see Figure 1). Four types of entrepreneurship programs may be identified through the crossover of human and social capitals. This article outlines three cases of entrepreneurship programs.

		Social capital	
		Weak	Strong
Human capital	General		Create and implement a formal education program with pedagogical innovation based on business partnerships. Example: MI (Kedge students)
	Specific	Create and implement a specific education program corresponding to a specific external demand. Example: SMIH (scientists and engineers)	Add specific missions to an existing specialized education program. Example: OIC (Kedge students)

Figure 1: A framework for entrepreneurship education

The three cases show a natural evolution of academic entrepreneurial programs that offer entrepreneurship in an educational setting. These programs evolve in a direction that favors the increase of entrepreneurial intention, the development of entrepreneurial networks, and offering more opportunities for the creation of entrepreneurship ventures. Human and social capitals are at the heart of such an entrepreneurial education program setting and also are key drivers to vitalizing entrepreneurship.

A general transfer of human capital and a strong social network characterizes the first program (MI). Thus, throughout the Management Internship, as described, participants pursue formal education courses with closer links in terms of coaching and apprenticeship with companies. It is a basic academic program usually set up by a business school. Taking this as a starting point, new programs can be designed to offer more specific entrepreneurship education topics (Kuratko, 2005; Fayolle et al., 2008).

The second program, the Open Innovation Certificate, mixes specific human capital and strong ties. Participants develop and foster projects through open innovation and are able to attract financial support. In addition, a huge effort can be made to value ideas and innovation in order to create new markets and commercialized services. Strong social network ties become an essential driver for the program success. In fact, a key to entrepreneurial success is the ability of the person to exploit social networks. Consequently, participants in such programs need supervision to not only identify and develop entrepreneurial opportunities but also manage their social network (Leyden et al., 2016), which give them the ability to easily access needed resources. Our claim seems to deal with the general trend that considers social ties to be a major driver for entrepreneurial development (Davidsson and Honig, 2003). They provide funding, talented employees, capable distributors, and, in general, offer a path to long-term performance of entrepreneurial ventures (Shane and Stuart, 2002).

The third program, the Specialized Master in Management of Innovation and Health, involves specialized human capital and weak social network ties. Participants should acquire innovative specific managerial skills and competencies in the health sector. Prior experience within the sector is also required. Such entrepreneurial education programs may be a strong driver for the intention to create an innovative entrepreneurial venture in the health domain. In fact, the program aims to create favorable conditions for the emergence of generalized trust (Uslaner, 2002) and an entrepreneurship attitude (Mirandaa et al., 2017) among participants, which facilitate the development of a mutual and interdependent collaboration between them. It enables actors to move out of familiar relationships to more specific and closer relationships. Such frameworks lead to the identification of more entrepreneurial opportunities. Our claim agrees with Kwon and Arenius's (2010) finding in particular that a weak tie to investment affects the perception of entrepreneurial opportunity, which is consistent with Granovetter's (1973) arguments about the strength of weak ties and Burt's (1992) concept of structural holes.

Overall, this framework provides an encompassing basis for integrating theories of human capital, distinguishing between general versus specific, and theories of social capital, distinguishing between strong and weak ties, to generate an enhanced understanding of sustained entrepreneurial education programs.

Most prior work emphasizes how human capital and social capital are essential for the entrepreneurial process, and our evidence is consistent with this claim (Davidsson and Honig, 2003; Estrin et al., 2016; Milosevic, 2018). However, we determined that according to the feature of the entrepreneurship education program that an academic structure is willing to set up, it would be more interesting to identify and specify the required aspect respectively from human and social capitals. In fact, in the extant literature, the dominant focus has been either on human capital or social capital without the aforementioned distinction in depth.

We claim that the framework provided in this study should help academic structures to identify and stratify which type of entrepreneurship education programs should be implemented and developed. Knowing about training issues, for example, an academic institution could better adapt its program. In

addition, pooling different students from various disciplines is not an easy task. Therefore, to set up such training programs, academia must take into account the heterogeneous characteristics of participants and learn how to meld them into a single program in order to increase their entrepreneurial intentions.

We believe that entrepreneurship education programs should be able to integrate several forms of adaptation in order to identify and exploit opportunities, especially with the current rapid and global technological advances. Education technology and digitalization have widely been broadcasted and that may be a good driver to implement such programs (Barr et al., 2009; Rippa and Secundo, 2019). These programs help knowledge diffusion as well as specifying what needs to be delivered to the students, teachers, and researchers. For example, Al-Atabi and Deboer (2014) show how the use of an online platform such as a MOOC is a good thing to teach entrepreneurship and other similar courses dealing with applied science and engineering. The future of business schools and other academic institutions should alter the designs of older entrepreneurial programs to be more dynamic rather than a static longitudinal perspective based on a continuum of innovation and creativity (Kuratko, 2005). In the same vein, Mustar (2009) points out that one of the requirements of such an educational model is to have a training system that is flexible and evolving. Furthermore, the more interaction among participants through digital academic platforms is developed, the more that entrepreneurial intentions will evolve and give rise to innovation (Rippa and Secundo, 2019).

Entrepreneurship education programs also must integrate the interactions among different actors embedded in a community of networks to help graduates to access resources, expertise, and skills in order to achieve the goals of the programs. Facilitating exchanges and collaboration is a major challenge for academic institutions. Our claim agrees with recommendations stressed by Penuel et al. (2009), who showed that analyzing the internal structure of the school community was necessary to help distribute access to resources and expertise by emphasizing the role of social capital.

Finally, as widely supported by the literature, we highlighted the role of human capital in augmenting entrepreneurial activities. However, we have stressed that academic institutions should design their entrepreneurship education programs and adapt their training courses according to the nature of the required human capital, that is, general or specific. The impact of general or specific human capital is different according to the context of the program, as stressed by some authors (for example, Davidsson and Honig, 2003; Estrin et al., 2016; Milosevic, 2018).

Our study is not without limitations. First, the focus was primarily on entrepreneurship education programs from the educational structure point of view; we have not paid attention to participants' sides. Tracking participants after their academic experience and integrating their feedback continuously and regularly may be an additionally interesting way to assess the implemented program. Second, our perspective did not consider the role of other stakeholders. Further institutional investigation as well as the involvement of policymakers should be integrated and discussed in the proposed framework. These actors play an important role in funding new technologies and entrepreneurship in general. Finally, our qualitative study could be further supported and strengthened by a quantitative analysis. In addition, our longitudinal work does not have a sufficient perspective on the experience, especially because the academic context continues to evolve. Pedagogical program settings call for more standardization versus innovation.

This research suggests several directions for future research. First, we plan to investigate commercialization strategies for ideas. Entrepreneurship education programs should bring not only entrepreneurial intention to participants but also teach them how to develop strategies for new idea

commercialization as well as how to deal with intellectual property. Second, our study suggests that both human capital and social capital are positive drivers for the success of entrepreneurship ventures. In addition, several actors articulate that the entrepreneurial process evolves rapidly in an environment characterized by increased uncertainty and opportunities, which calls for a model going beyond the famous Silicon Valley or triple-helix or multiple-helix approaches. That's why identifying the mechanisms by which the entrepreneurial process comes out and succeeds remains an area for further investigation.

REFERENCES

- A.A. Adekiya, F. Ibrahim, Entrepreneurship intention among students: The antecedent role of culture and entrepreneurship training and development, *The International Journal of Management Education* 14 (2016) 116–132.
- M. Al-Atabi, J. DeBoer, Teaching entrepreneurship using Massive Open Online Course (MOOC), *Technovation* 34 (2014) 261–264.
- T.J. Bae, S. Qian, C. Miao, J.O. Fiet, The relationship between entrepreneurship education and entrepreneurial intentions: A meta-analytic review, *Entrepreneurship Theory & Practice* 38 (2014) 217–254.
- S.H. Barr, T. Baker, S.K. Markham, A.I. Kingon, Bridging the valley of death: Lessons learned from 14 years of commercialization of technology education, *Academy of Management Learning & Education* 8(3) (2009) 370–388.
- G.S. Becker, *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*, National Bureau of Economic Research, New York, NY, 1964.
- S. Bhagavatula, T. Elfring, A. van Tilburg, G.G. van de Bunt, How social and human capital influence opportunity recognition and resource mobilization in India's handloom industry, *Journal of Business Venturing* 25(3) (2010) 245–260.
- C. Bruyat, P.-A. Julien, Defining the field of research in entrepreneurship, *Journal of Business Venturing* 16(2) (2000) 165–180.
- R. Burt, *Structural Holes: The Social Structure of Competition*, Harvard University Press, Cambridge, MA, 1992.
- R. Burt, The network structure of social capital, in: R.I. Sutton, B.M. Straw (Eds.), *Research in Organizational Behaviour* (Vol. 22), JAI Press, Greenwich, CT, 2000.
- J.S. Coleman, Social capital in the creation of human capital, *American Journal of Sociology* 94 (1988) 95–120.
- P. Davidsson, B. Honig, The role of social and human capital among nascent entrepreneurs, *Journal of Business Venturing* 18 (2003) 301–331.
- M. Dodgson, J. Mathews, T. Kastle, M.C. Hu, The evolving nature of Taiwan's national innovation system: The case of biotechnology innovation networks, *Research Policy* 37 (2008) 430–445.
- K.M. Eisenhardt, Building theories from case study research, *Academy of Management Review* 14(4) (1989) 532–550.
- K.M. Eisenhardt, K.E. Graebner, Theory building from case studies: Opportunities and challenges, *Academy of Management Journal* 50(1) (2014) 25–32.
- R. Emerson, Exchange theory: Part I: A psychological basis for social exchange, in: J. Berger, M. Zelditch, B. Anderson (Eds.), *Sociological Theories in Progress*, Houghton Mifflin, Boston, 1972, pp. 38–57.

- S. Estrin, T. Mickiewicz, U. Stephan, Human capital in social and commercial entrepreneurship, *Journal of Business Venturing* 31 (2016) 449–467.
- A. Fayolle, B. Gailly, N. Lassas-Clerc, Assessing the impact of entrepreneurship education programs: A new methodology, *Journal of European Industrial Training* 30(9) (2006) 701–720.
- A. Fayolle, F. Linan, The future of research on entrepreneurial intentions, *Journal of Business Research* 67 (2014) 663–666.
- A. Fayolle, B. Gailly, N. Lassas-Clerc, Assessing the impact of entrepreneurship education programmes: A new methodology", *Journal of European Industrial Training* 30(9) (2006) 701-720.
- J.O. Fiet, The theoretical side of teaching entrepreneurship, *Journal of Business Venturing* 16(1) (2000) 1–24.
- R. Gibbons, M. Waldman, Task-specific human capital, *American Economic Review* 94 (2004) 203–207.
- M.S. Granovetter, The strength of weak ties, *American Journal of Sociology* 78(6) (1973) 1360-1380.
- M.S. Granovetter, Economic action and social structure: The problem of embeddedness, *American Journal of Sociology* 91(3) (1985) 481–510.
- D. Grichnik, J. Brinckmann, L. Singh, S. Manigart, Beyond environmental scarcity: Human and social capital as driving forces of bootstrapping activities, *Journal of Business Venturing* 29 (2014) 310–326.
- O., Hanseth, K. Lyytinen, Design theory for dynamic complexity in information infrastructures: The case of building internet, *Journal of Information and Technology* 25(1) (2010) 1–19.
- C. Hayter, Constraining entrepreneurial development: A knowledge-based view of social networks among academic entrepreneurs, *Research Policy* 45 (2016) 475–490.
- J. Heinonen, S.A. Poikkijoki, An entrepreneurial-directed approach to entrepreneurship education: Mission impossible? *Journal of Management Development* 25(1) (2006) 80–94.
- K.M. Hmieleski, A.A. Corbetti, Entrepreneur's optimum and new venture performance: A social cognitive perspective, *Academy of Management Journal* 52 (2006) 1973–2488.
- B. Kogut, The network as knowledge: Generative rules and the emergence of structure, *Strategic Management Journal* 21 (2000) 405–425.
- D.F. Kuratko, The emergence of entrepreneurship education: Development, trends, and challenges, *Entrepreneurship Theory and Practice* 29(5) (2005) 577–597.
- S.W. Kwon, P. Arenius, Nations of entrepreneurs: A social capital perspective, *Journal of Business Venturing* 25 (2010) 315–330.
- A. Langley, Strategies for theorizing from process data, *Academy of Management Review* 24(4) (1999) 691–710.
- A. Lauvergeon, et al. Commission “Innovation 2030,” Un principe et sept ambitions pour l'innovation. La documentation française (2013).
- L. Lee, P.K. Wong, M.D. Foo, A. Leung, Entrepreneurial intentions: The influence of organizational and individual factors, *Journal of Business Venturing* 26 (1) (2011) 124–136.
- D.P. Leyden, A.N. Link, D.S. Siegel, A theoretical analysis of the role of social networks in entrepreneurship, *Research Policy* 43 (2016) 1157–1163.
- D. Maresch, R. Harms, N. Kailer, B. Wimmer-Wurm, The impact of entrepreneurship education on the entrepreneurial intention of students in science and engineering versus business studies university programs, *Technological Forecasting & Social Change* 104 (2016) 172–179.
- M.B. Miles, A.M. Huberman, *Qualitative Data Analysis* (2nd ed.), Sage Publications, Thousand Oaks, CA, 1994.

- M. Milosevic, Skills or networks? Success and fundraising determinants in a low-performing venture capital market, *Research Policy* 47 (2018) 49–60.
- F. J. Mirandaa, A. Chamorro-Meraa, S. Rubio, Academic entrepreneurship in Spanish universities: An analysis of the determinants of entrepreneurial intention, *European Research on Management and Business Economics* 23 (2017) 113–122.
- K. Moberg, Two approaches to entrepreneurship education: The different effects of education for and through entrepreneurship at the lower secondary level, *The International Journal of Management Education* 12 (2014) 512–528.
- R. Mudambi, Location, control and innovation in knowledge-intensive industries. *Journal of Economic Geography* (2008), 8(5) p. 699-725.
- P. Mustar, Entrepreneurship at MINES ParisTech, a leading French engineering school, *Academy of Management Learning & Education* 8(3) (2009) 418–425.
- S. Nambisan, Digital entrepreneurship: Toward a digital technology perspective of entrepreneurship. *Entrepreneurship Theory Practice* 41(6) (2017) 1029–1055.
- B.E. Nwankwo, G.C. Kanu, M.I. Marire, S.K. Balogun, C. Uhiara, Gender-role orientation and self-efficacy as correlates of entrepreneurial intention, *European Journal of Business and Social Sciences* 1(6) (2012), 09–26. <http://www.ejbss.com/recent.aspx>
- S.C. Parker, *The Economics of Entrepreneurship*, Cambridge University Press, Cambridge, UK, 2009.
- S.C. Parker, Intrapreneurship or entrepreneurship? *Journal of Business Venturing* 26 (2011) 19–34.
- W. Penuel, M. Riel, A. Krause, K. Frank, Analyzing teachers' professional interactions in a school as social capital: A social network approach, *Teachers College Record* 111(1) (2009) 124–163.
- P.H. Phan, D.S. Siegel, M. Wright, New developments in technology management education: Background issues, program initiatives, and a research agenda, *Academy of Management Learning & Education* 8(3) (2009) 324–336.
- P. Rippha, G. Secundo, Digital academic entrepreneurship: The potential of digital technologies on academic entrepreneurship, *Technological Forecasting & Social Change* 146(C) (2019).
- A. Seghers, T. Vanacker, S. Manigart, The impact of human and social capital on entrepreneurs' knowledge of finance alternatives, *Journal of Small Business Management* 50(1) (2012) 63–86.
- S. Shane, T. Stuart, Organizational endowments and the performance of university start-ups, *Management Sciences* 48 (2002) 154–170.
- D.A. Shepherd, Educating entrepreneurship students about emotion and learning from failure. *Academy of Management Learning & Education* 3(3) (2004) 274–287.
- A.V. Shipilov, S.X. Li, Can you have your cake and eat it too? Structural holes' influence on status accumulation and market performance in collaborative networks, *Administrative Science Quarterly* 53(1) (2008) 73–108.
- C.L. Shook, R.L. Priem, J.E. McGee, Venture creation and the enterprising individual: A review and synthesis, *Journal of Management* 23(3) (2003) 379–399.
- G.T. Solomon, S. Duffy, A. Tarabishy, The state of entrepreneurship education in the United States: A nationwide survey and analysis, *International Journal of Entrepreneurship Education* 1(1) (2002) 65–86.
- E.M. Uslaner, *The Moral Foundations of Trust*, Cambridge University Press, New York, NY, 2002.
- B. Uzzi, The sources and consequences of embeddedness for the economic performance of organizations: The network effect, *American Sociological Review* 61 (1996) 674–698.
- C. Verzat, J. Byrne, A. Fayolle, Tangling with spaghetti: Pedagogical lessons from games, *Academy of Management Learning & Education* 8(3) (2009) 356–369.

- J. Viedma, M. Enache, Managing personal human capital for professional excellence: An attempt to design a practical methodology, *Knowledge Management Research & Practice* 6 (2008) 52–61.
- R.K. Yin, *Case Study Research, Design and Methods*, Sage Publications, Thousand Oaks, CA, 2003.
- H. Yoon, S. Yun, J. Lee, F. Phillips, Entrepreneurship in East Asian regional innovation systems: Role of social capital, *Technological Forecasting & Social Change* 100 (2015) 83–95.
- C.P. Zeithaml, G.H. Rice, Entrepreneurship/small business education in American universities, *Journal of Small Business Management* 25(1) (1987) 44–50.

Appendix 1: MI principles and operationalization

Principle	Operationalization
<p>Combine the concept of “school” and “company” to co-build the talents of tomorrow.</p>	<p>The school and the company build together a training program that combines field experiences, internal and external training, and face-to-face and distance learning in a time continuum in which the diploma is no longer the end point of the training. The idea is to learn in a work environment when it is needed in order to anchor the simultaneous academic education, therefore becoming better equipped for the future.</p> <p>We will support missions/projects developed by the company to groups of four to five students, alternating their presence at the company and school at a flexible pace.</p> <p>Success is achieved through a triple tutoring:</p> <ul style="list-style-type: none"> – Professional (company tutor) to explain the operational context and transmit know-how based on communities of practice – Personal (school tutor-coach) to develop the managerial posture and know-how – Academic (tutor-professor school) to take a step back, help in asking the right questions, then bringing the structuring responses (concepts, tools, and methods) and the know-how
<p>Abolish the boundaries between traditional management disciplines.</p>	<p>By dealing with the issues in a transversal way, highlighting the interactions among the various functions of the company, which is seen as a living organism</p> <p>By innovating in educational matters with the aim of developing operational and managerial added value for the individual and for the company</p> <p>By making fluid the movements among reflection, analysis, and action with reiteration</p> <p>By operating internationally with cosmopolitanism (management in context)</p> <p>By using collaborative work and networks to think, produce, and act</p>
<p>Make the recruitment of your future managers reliable and profitable.</p>	<p>By participating upstream in the selection of 24 students (in the pilot phase) to take part in the alternative teaching path and are motivated by its innovative pedagogy and the image of the partner companies</p> <p>By testing the participants in your environment by entrusting them with a concrete project, supporting them, contributing to their talents, and identifying the most promising of them</p> <p>By optimizing your recruitments while reducing their costs</p>
<p>Make these new future collaborators loyal.</p>	<p>By contributing to the financing of their studies via the Euomed Foundation (tax-free funds)</p> <p>By acculturating them to your universe (via the projects and your tutors), by interesting them in your challenges, by preparing them for a common future</p> <p>By giving them development perspectives via this alternate program that becomes an innovative training system through a logic of lifelong learning</p> <p>By stimulating your collective innovation abilities</p> <p>By bringing the school into the company with a spirit of cross-fertilization that is structured and offers mutual added value</p> <p>By having access to the latest developments in management knowledge through research, invitations to conferences, and other events</p>

	<p>By benefiting from our know-how in pedagogy/training in engineering for your internal programs</p> <p>By receiving regular information on new skills to acquire in order to anticipate and stay at the cutting edge in your field</p>
Explore new levers to motivate and develop your executives	<p>By benefiting from preferential access to our education programs for your executives/high potentials</p> <p>By promoting your managers (especially senior) by offering them the opportunity to become tutors</p> <p>By allowing these tutors to participate in their training sessions as participants and/or stakeholders</p>
Have a management research center that can keep you one step ahead.	<p>By allowing you to adjust and test new concepts and potential innovations for your business</p>
Consolidate your CSR policy and enhance your internal and external image in this area.	<p>By contributing to the diversity of our students and your recruitments through our foundation and our Phoenix setting (student association "Egalité des chances" / Equal opportunities)</p> <p>By participating in our responsible managers' network</p>

Appendix 2: MI educational setting

Educational contents	Description
Experience in the company	<p>The student has 18 months of internship over 2 years:</p> <ul style="list-style-type: none"> - 6 months internship in M1 - 6 months internship in M2 (ideally abroad) - 6 months of internship after a 2-month summer postponement of study in strict compliance with the Cherpion law of July 28, 2011. <p>The flexibility of the rhythm and the mode of teaching make it possible to consider simultaneously the priorities of the student and those of the company.</p>
Theoretical content	<p>Six courses in seminar format are offered:</p> <ul style="list-style-type: none"> - Methodologies and market approaches - Intrapreneurial alternatives - Diversification of the company through innovation/entrepreneurship - Globalize activities - Develop the company through external growth, alliances, and partnerships - Consolidate activities and increase profitability
Digital education	<p>In order to augment the dynamic movement between the school and the company, we have reinforced the use of new pedagogical approaches, greatly integrating media and digital technologies.</p> <p>The school already had to its credit a pedagogical strategy that aimed at digital application since its September 2009 opening of the six core courses of the program (marketing, finance, human resources, strategy, complexity, innovation and entrepreneurship), which are found exclusively on a virtual platform.</p> <p>Navigation systems and linguistic algorithms were encouraged by participants to ensure the requirements of the Management Internship: the development of distance learning, the mobilization of social networks on the internet, the different forms of knowledge building available (forums, wikis, virtual libraries, etc.).</p>
Pedagogical supervising	<p>Supervising is conducted by a team of specialists with complementary roles aimed at providing global and multifaceted support of the learner.</p>

	<ul style="list-style-type: none"> - The pedagogical tutor is one of the professors assigned to teach one of the six specific courses of the program. He/she ensures the cohesion between the field mission given to the group of students and the learning of theoretical concepts essential to the smooth running of the mission. He/she also recommends complementary elective courses (in-depth concepts) to be followed to complete the student's training according to the skills needed to achieve the goal set by the company. - The personal development coach's mission is to help students to get to know themselves better and to assess their strengths and weaknesses in order to better understand their professional relationships with their collaborators. He/she recommends the tools necessary for the future manager in his/her professional life (e.g., public speaking, stress management, emotional intelligence, meeting management, etc.) and helps to increase the student's motivation to continue with the Management Internship. For 3 years following the graduate's integration into the company, the graduate may call on the coach to ask for advice when making strategic and personal choices. - The company tutor: after selecting among the students' profiles in line with the HR needs of the company, he/she guides the future employee on the operational dimensions and on the knowledge of the company culture. During the 18 months of internship this tutor will also help the future collaborator in the success of his/her mission. - The pedagogical coordinator of the MI is a confirmed professor with strong experience in business. He/she is in charge of the analysis and synthesis of the evaluations made at the end of each course, the evaluations in the company, and diagnoses in personal development. He/she creates the individual assessment of the qualities and skills of the students engaged in the Management Internship, which will allow the company to identify adequate matches for its needs. For the student, this assessment will serve as a roadmap in pursuit of his/her training to develop and acquire the skills of the profession and to learn about his/her future work environment.
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Appendix 3: OIC educational setting

Educational contents	Description
Teaching	<p>The first pillar addresses theoretical content and concepts across various themes:</p> <ul style="list-style-type: none"> - Open innovation - Valorizing innovation/entrepreneurship - Agile management - Financing innovation - Intellectual property - Pitch
Experience	<p>The second pillar focuses on empirical dimensions:</p> <ul style="list-style-type: none"> - Project of a company/intrapreneurship - Innovation and entrepreneurship from the public domain - Inductive pedagogy
Conferences of experts	<p>The third pillar offers conferences of innovation actors:</p> <p>For example, Gemalto NFC and connected objects, Micro Vitae (Global Winner of Innovation), Human Up, Médecin Quantique, etc.</p>

Appendix 4: SMIH educational setting

Educational contents	Description				
Theoretical content	<p>Theoretical modules follow the following premise:</p> <ul style="list-style-type: none"> - Presentation of the health ecosystem and innovation and entrepreneurship issues - Business strategies and possible diversifications in health - Management and organizational dimension - The deployment of innovations and their financing in the health sector - Prevention of risks related to health innovation initiatives <p>The program offers a common core (fundamentals) and a specialization in which the student chooses between two 90-hour options: “Health Industries and Technologies” or “Support and Care.”</p> <table border="1" data-bbox="416 745 1407 1305"> <thead> <tr> <th data-bbox="416 745 911 790">The fundamentals:</th> <th data-bbox="916 745 1407 790">Specialization:</th> </tr> </thead> <tbody> <tr> <td data-bbox="416 797 911 1305"> <ul style="list-style-type: none"> - Public policies in health - Innovative organization - Products and services innovation - Open innovation - Management of the innovative organization - Innovation and strategy - Innovation and entrepreneurship - Risk, safety at work, QWL - Design thinking in health - Intellectual property - Crisis management in health - Financing innovation - Investment decision </td> <td data-bbox="916 797 1407 1305"> <ul style="list-style-type: none"> - Regulatory issues - Evolution of health technologies - e-Health - Marketing and commercialization of health products - Legal aspects and health </td> </tr> </tbody> </table>	The fundamentals:	Specialization:	<ul style="list-style-type: none"> - Public policies in health - Innovative organization - Products and services innovation - Open innovation - Management of the innovative organization - Innovation and strategy - Innovation and entrepreneurship - Risk, safety at work, QWL - Design thinking in health - Intellectual property - Crisis management in health - Financing innovation - Investment decision 	<ul style="list-style-type: none"> - Regulatory issues - Evolution of health technologies - e-Health - Marketing and commercialization of health products - Legal aspects and health
The fundamentals:	Specialization:				
<ul style="list-style-type: none"> - Public policies in health - Innovative organization - Products and services innovation - Open innovation - Management of the innovative organization - Innovation and strategy - Innovation and entrepreneurship - Risk, safety at work, QWL - Design thinking in health - Intellectual property - Crisis management in health - Financing innovation - Investment decision 	<ul style="list-style-type: none"> - Regulatory issues - Evolution of health technologies - e-Health - Marketing and commercialization of health products - Legal aspects and health 				
Expert conferences	<p>The aim of this teaching component is to give students an insight into the real functions they are destined for in companies and to broaden their horizons in relation to the topics explored.</p> <p>Example of conferences: Eurobiomed, ProvePharm, Genepred, Innate Pharma</p>				
Soft skills	<p>In order to contribute to their personal development, this training has been strengthened by learning a range of tools that enable students to reinforce life skills to better address their future functions.</p> <ul style="list-style-type: none"> - Personality profiles - Appreciative inquiry - Management of stress - Methodology and mission approach - Valorizing the student’s digital image 				
Experience in the company	<p>The student has the opportunity to implement the learning outcomes of an experience within the company, choosing from the following three methods.</p> <p>Mission in the Company Collective</p> <ul style="list-style-type: none"> - Mission carried out in groups of four to five people - Duration: 6 to 10 months - 3 days/week: Monday, Tuesday, Wednesday - Supervision: 1 KBS coach and 1 business coach 				

	<ul style="list-style-type: none"> - Deliverables: defense + report - Mandatory individual internship: 6 months - Period: July–December <p>Alternate Internship Individual</p> <ul style="list-style-type: none"> - 3 days/week: Monday, Tuesday, Wednesday in Company A - Duration: 132 days, 11 months continuously possible - Period: Sept–July - Possibility of a second optional internship in Company B - Duration: 6 months - Period: August–January <p>Fixed-term contracts/permanent contracts in the company</p> <ul style="list-style-type: none"> - 3 days/week: Monday, Tuesday, Wednesday in Company A - Fixed-term or permanent contract - Training financed by the company or the learner - Possibility of a second optional internship in Company B - Duration: 6 months - Period: July–December
Events	<p>In order to enable students to discover the latest innovations in the health sector and become familiar with the key players in their field, the training course requires mandatory visits of all students at major exhibitions dedicated to health.</p> <ul style="list-style-type: none"> – Innov’in MED: European event dedicated 100% to the promotion of research and disruptive innovations – The Health Future Show: the essential meeting of health innovation in the PACA region⁸
Professional thesis	<p>A personal work prepared as part of a corporate mission and leading to a defense is required of all students. The professional thesis represents both a means to acquire knowledge and an opportunity to prepare an effective entry into working life by developing a professional project.</p>
Digital pedagogy	<p>Students benefit from Kedge BS’s digital environment in terms of infrastructure and teaching approaches.</p>

⁸ PACA: Provence, Alpes, Côte d’Azur