FROM CREATIVITY TO VALUE CREATION

Mauro Citraro
University of Applied Sciences and Arts of Southern Switzerland Lugano, Switzerland
mauro.citraro@supsi.ch

Cristina Carcano
University of Applied Sciences and Arts of Southern Switzerland Lugano, Switzerland
cristina.carcano@supsi.ch

Emanuele Carpanzano
University of Applied Sciences and Arts of Southern Switzerland Lugano, Switzerland
emanuele.carpanzano@supsi.ch

Alessandro Puiatti
University of Applied Sciences and Arts of Southern Switzerland Lugano, Switzerland
alessandro.puiatti@supsi.ch

Lorenzo Sommaruga
University of Applied Sciences and Arts of Southern Switzerland Lugano, Switzerland
lorenzo.sommaruga@supsi.ch

Sara Vignati
University of Applied Sciences and Arts of Southern Switzerland Lugano, Switzerland
sara.vignati@supsi.ch

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ABSTRACT

In today's world, globally interconnected, volatile, and characterized by a sky-rocketing complexity, significant and unprecedented interdisciplinary is required among various stakeholders to create resilient and innovative value chains. Within this compelling context, we focus on the new role that university-industry collaboration plays on a large scale in bridging the gap between idea generation and value creation to economy and society. A new way to promote attitude towards entrepreneurial leadership at an early stage among students and teachers is experienced by linking curricular and extra-curricular teaching and contents, as well as by supporting voluntary learning "on demand" among students. Intertwined links are indeed possible within a nursery environment, so-called *Entreprenursery*, where students are encouraged to express their creativity, both by raising startup ideas and by solving companies' technical and scientific issues. Entrepreneurial students are thus supported in their innovative ideas

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through collaboration with teachers, experts, entrepreneurs. They are also stimulated to engage other students to be part of an interdisciplinary team. Cooperation in supporting cross-fertilization of creative ideas will be fed by competencies, an open-minded environment, and where diversity integration plays an important role. Only through different thinking is it possible to develop outstanding achievements. Coordination is guaranteed by a collaborative IT platform, which is also open to SMEs to facilitate them in involving entrepreneurial students. Within this new collaborative framework, all stakeholders will profit from reciprocal learning and creativity, increasing the entrepreneurial attitudes of students and teachers and thus accelerating the transfer of academic startup ideas into industrial applications and business opportunities.

1 INTRODUCTION

Since 2017 an experimental way to encourage creativity among students in engineering has been developed. Finally, a method has been put into place to implement entrepreneurship consciousness and attitude. Thanks to continuously ingoing feedback, a set of services has been developed to help entrepreneurial creativity to evolve and to enable innovation.

The main goal is to transfer knowledge gained by students at school and to apply it by working on their own entrepreneurial ideas. It is expected that the chances to set up and develop science-based companies will increase and science-based innovation will be encouraged. In promoting science-based entrepreneurial initiatives, connections between higher education institutions, the private sector, and society will be strengthened and accelerated also through the use of digital tools [1].

Within an innovative work structure, an ideal place was built, the so-called " Startup Garage " (the Garage), for which an associated metaphor of a sailing ship has been chosen. Students are Skippers driven by passion and leadership and are ready to explore new lands ─ ideas and new innovative approach on problems' solving. They will be able to involve the crew ─ mentors, experts, researchers, entrepreneurs ─ and be ready to get back on course by defying winds and bad weather, i.e. mistakes and difficulties. So the Garage is a safe haven to meet, interact, exchange ideas and create effective teams and it has fertile ground, where entrepreneurial creativity and productivity are fostered.

While the need for tangible resources, such as physical meeting spaces, laboratories and materials, is obvious, the essential role potentially played by intangible resources should not be ignored. This approach, aiming to put into practice the quadruple helix model [2], includes an entrepreneurial university culture, an informed and constantly updated sustainability-focused innovation program, access to innovative research projects and ideas produced by the university's academics, as well as involvement of internal and external faculty members and industry practitioners as program mentors [3]. In such a nourishing environment, the mentors are one of the key innovative aspects. There are no teacher-and-students or expert-and-novices binomials, but simply peers working together shoulder to shoulder towards the final entrepreneurial goal. In The Garage, the mentors are called Standby Mentors, since they are requested on demand when the students need to confront with a specialist to overcome an

obstacle. However, they do not offer a solution, but share their knowledge openly. They show to the students how to find the way to the solution, leaving them even to make mistakes if that could be a useful path to the increased knowledge. Within this creative working framework, the 17 ONU Goals are pursued, thus representing a sort of compass for all Skippers. In this way the entrepreneurial creativity is harnessed for value generation.

Intangible resources are also made of a non-formal learning process providing three evolving steps to develop further startup ideas in their scientific and technological feasibility [2], as well as in searching for business opportunities. Once students have received a bachelor's or master's degree, they can stay in the Garage for a further six months, thus having more time to choose whatever they want to do with their startup ideas already developed along three previous steps. Actually, step validation makes startup ideas much closer to real feasibility.

Thereafter, the step out of the Garage is compulsory, but nonetheless favours either entrance into academic startup incubators or a professional career as entrepreneurial employee.

2 CREATIVITY

2.1 Students' creativity on the road

By collecting data during the five years of the testing approach to creativity, some interesting consolidated results develop. They will be used to drive creativity to the next implementations.

First of all, we can say that engineering students are ready to put entrepreneurial ideas into a processing and developing system, especially when they are enrolled in the Department of Innovative Technologies (DTI) as first-year students.

Table 1 shows the retained ideas ─ the startup ideas to be worked in the Garage after selection ─ and the number of members forming up teams of skippers around the ideas development. In the last 5 years, more than 10% of all students of the Garage's project have shown an entrepreneurial attitude (Tab. 2).

In order to scout creativity, students are informed and encouraged to submit ideas at the beginning of the academic year through a digital platform, called Pingel@p [4]. This application helps to facilitate both competence and need/issue sharing at all levels of the 4 quadruple helix model [2].

The collection of ideas takes place in this online platform and facilitates the homogeneous description of ideas according to a predefined structure, which is also captured and frozen out in smart contracts based on Blockchain technologies in order to guarantee intellectual property (IP) protection [2].

Every student enrolled in Bachelor and Master programs can submit her/his innovative idea which is then collected through a „Call for Ideas" event managed by an ICT system. The internally developed system enables the student's ideas to be matched with the best fitting Standby Mentor by automatically picking teachers, researchers, experts, company managers based on their expertise.

Table 1 — Garage's Data

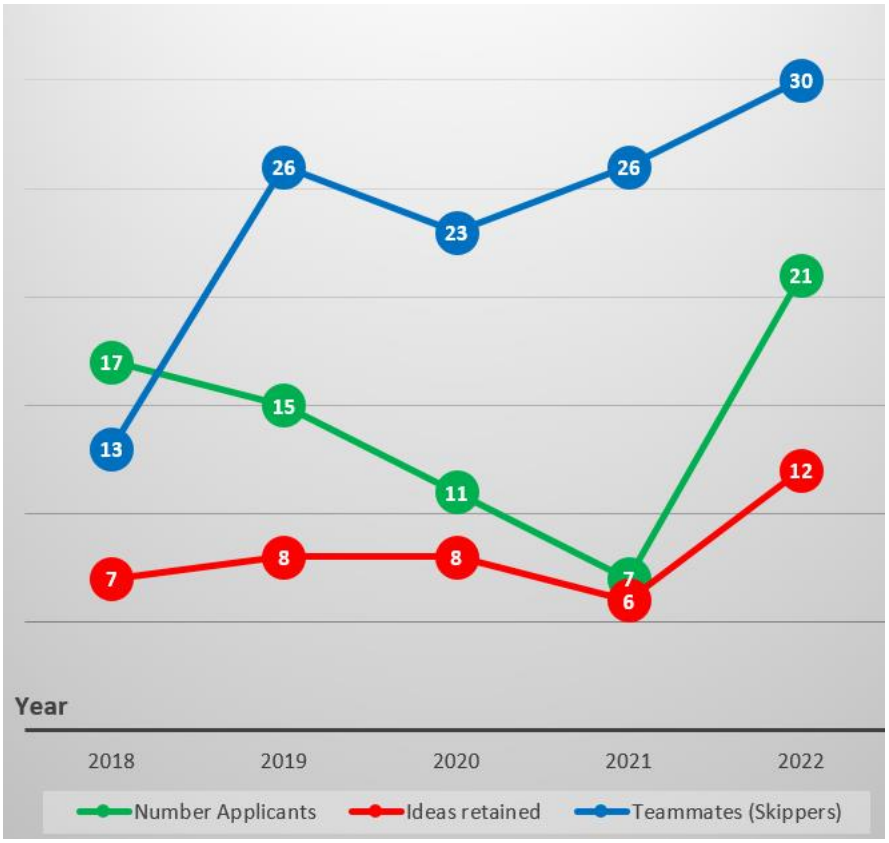
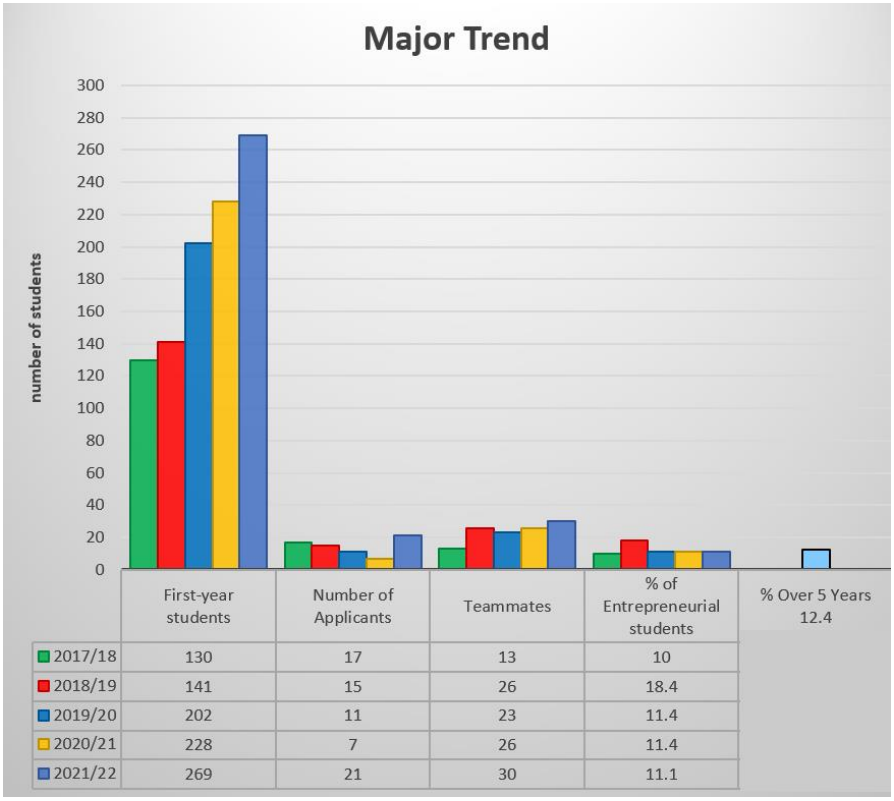


Table 2 — Garage's Major Trend



	First-year students	Number of Applicants	Teammates	% of Entrepreneurial students	% Over 5 Years 12.4
2017/18	130	17	13	10	
2018/19	141	15	26	18.4	
2019/20	202	11	23	11.4	
2020/21	228	7	26	11.4	
2021/22	269	21	30	11.1	

After the submission of an idea, applicants are recognized as Idea Owners. Then, after a digital assessment process involving Standby Mentors, some of the brightest ideas are retained to be developed later according to the Startup Garage methodology.

In addition, a new tool for accelerating a potentially more valuable idea, has been integrated into the Pingel@p platform: the call-for-needs resolution. This tool aims to have a more open innovation cross-fertilization approach, where companies can describe some specific actual needs and share them in a nurtured way with other platform actors. In order to support the call-for-needs resolution process, regular "creActivity" events are organized by the Garage on a monthly base. These meetings with companies which concretely describe their needs or current impelling issues, take place in the Garage space and enable a first person contact and a live discussion between the different actors.

So cross-fertilization of fresh-minded Skippers with entrepreneurial spirit/attitude can accelerate the investigation of new solutions towards faster prototype development and market adoption, supported by a digital platform and nurtured in the Garage environment.

2.2 Creativity Spotlight

Pingel@p fulfils some essential requirements such as collection and evaluation of idea proposals, matching of students with suitable mentors, call-for-needs resolution from industry partners, as well as call–for-expertise to promote team-building among entrepreneurial students. In particular, the last two are in line with the theoretical model proposed in [3], where the Garage should comprise a number of fundamental components, including one to create positive collaboration and creative synergies, and another to generate productive interaction between entrepreneurial students and industry.

While today Pingel@p is a one-to-one match between a student's idea and a mentor, we aim to build this connection multilaterally, enabling companies to promote young talents and creativity.

A virtual environment has also been thought to combine social and professional features in existing networking applications, such as Facebook, Instagram, LinkedIn. The goal is to create a virtual space for the Skippers to exchange opinions and resources, to encourage team building through cross-fertilization and gender inclusion. Moreover, we will create events in main city squares with activities managed by Skippers. They will promote interaction with the local community, stimulate general public thinking, and promote the university brand.

Actually, the lonely situation of the creative student, such as the need for help, can be overcome by exploiting the Pingel@p Webapp call-for-expertise [2] to look for students willing to help a single Skipper. This is a main goal, which will be pursued systematically very soon, because innovation for a sustainable future is a complex endeavour that cannot be accomplished by the solo-sailing of even the most talented and eager home garage-based entrepreneur [3].

2.3 Ongoing generation of creativity

An academic community of students interested in entrepreneurship has to build and connect to enable the visibility of startup ideas being processed in the Garage. Most active actors of this community will be referred to as Skippers hereafter, a new terminology for entrepreneurial students engaged in building up tight-knit teams working on startup ideas. All teammates should regard themselves as chief officers operating jointly in tune with their interests and competences to put sail to startup ideas by forming a cohesive and qualified crew. Actually, all people with good ideas can be Skippers, who are at one time at the helm or another time go onto the ideas' deck: a symbolically furnished corner built within the Garage.

Hereafter, an interconnected system — recalling quadruple helix model [2] — has been realized to support creativity aiming to transfer its value to the industry, as shown in Fig. 1 below.

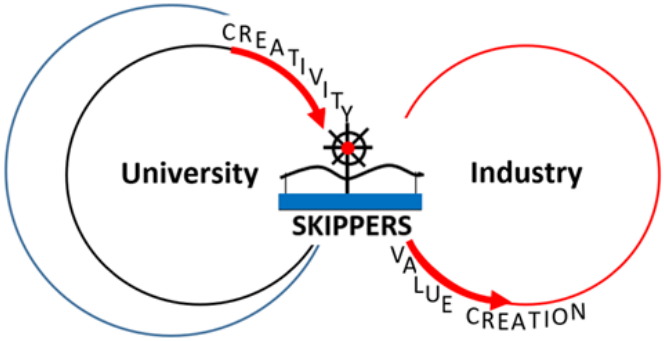


Fig. 1 — Creativity Interconnections

3 VALUE CREATION

3.1 Entreprenursery

Recently, an entreprenursery has been born focusing on entrepreneurial students and implementing the Garage's Concept&Method within a framework of a sharing creativity involving different stakeholders. Actually, the Garage should be seen as a nursery taking care of students' creativity and development in an entrepreneurial value dimension without being pressured by monetary constraints.

Relative to the general population, university students have an overall higher risk tolerance, as they are frequently unconstrained by overwhelming financial or family obligations that dampen risk-seeking behaviour [4]. It is essential to positively harness the risk-taking inclination through a structured process of "learning-to-fail" while limiting the scale and fallout of such failure.

As Charles Camarda, a NASA astronaut and Senior Advisor for Engineering Development stated, "You have to fail in order to be successful and there are smart ways to fail. So, I try to teach students how to fail smart, fast, small, cheap, early, and often" [5]. A cleverly designed entreprenursery would be the ideal environment for aspiring entrepreneurs to learn to fail with limited fallout.

Within a challenging, safely upgrading dimension, the entreprenursery project aims to expose entrepreneurial students to actual issues proposed by local companies: similar processes have to be formalized to support students in tackling such challenges and

to create feasible and marketable solutions. Local companies have the opportunity to provide a call-for-needs-resolution (a business idea in need of development), through a predefined institutional gateway designed to give industry participants access to the Pingel@p platform. Skippers can adopt and investigate this idea, potentially proposing a solution and developing a prototype. Alternatively, firms can 'tap' the pool of existing ideas at various stages of development available on the Pingel@p platform, potentially offering funding or bringing them in-house (creative ideas transfer) for further business development. Likewise, companies can source entrepreneurial talent from among the students working on their startup idea in the Garage and offer them internships or employment opportunities alongside or upon completion of the university degrees. In this manner connections between company-student do not remain only in the classroom but they can go further in establishing entrepreneurial relationship. Indeed, companies will propagate opportunities for summer internships, creating strong cooperation between the academic world and local businesses [3]. Such early-stage interaction and team building contribute to the formation of extensive and heterogeneous professional networks, which, according to successful entrepreneurs themselves, are a fundamental prerequisite for entrepreneurial success [6].

A high priority is to ensure that no one is left behind. In building inter-multidisiplinary team, Startup Garage Management is highly aware of untapped potential of the gender diversity for entrepreneurship, but gender inequality, or the underrepresentation of women in top positions of business and industry as well as universities, remains an unresolved issue across Europe. Giving priority to diversity, equity, and inclusion in universities is often a strategic choice. This environment helps to build synergies, develop new ideas and investigate new fields. Often equality, equity, diversity and inclusion are used interchangeably, despite the fact that they may mean different things.

3.2 Entrepreneurial education

The continuous and fast evolution of new technologies and their adoption to innovate industrial processes, products, services and business models, requires an increasingly comprehensive vision of society's expectations and people's roles in managing market-reactive and human-oriented companies. As a consequence, education is a key factor to deal with the ongoing challenges for manufacturing companies from both the consumer-oriented and the worker-oriented perspectives. To deal with such a challenge new education and competence development methods [7] and instruments have gradually been introduced in the last decade within university education paths.

Nowadays, as a consequence of the disruptive, ongoing digitalization and industrial transformation processes, moving from the industry 4.0 to the industry 5.0 paradigms [8], a further relevant innovation in the overall education framework is of even increasing importance with specific reference to the complex "creativity to value" process chain management. According to the discussed novel open education framework, enterprises must share their practical and professional experience with students, so as to enable them to put their startup ideas and entrepreneurial skills into practice. In particular, companies should also involve students in facing production and product innovation problems, and ask them to suggest implementation proposals. Similarly, professionals and representatives from the society should inspire students

to identify future needs and to propose potential solutions, based on their knowledge, skills, creativity and interdisciplinary teamwork. Such a virtuous and heterogeneously integrated approach sets the basis for a co-operative process and innovative transdisciplinary co-creation approach [9].

The proposed education paths and experiences will de facto enhance the student's entrepreneurial attitudes in facing real world challenges and increase their risk of failure acceptance and management capacities that constitute skills highly demanded today by industries, that have to compete within a more and more challenging and innovation-driven economy and society [10]. The aim is indeed to offer the academic system a synergistic framework that stimulates and transforms talented students into entrepreneurial employees, or to support them in turning business ideas into entrepreneurial projects. A system of intertwined connections is going to be put in place, in which the Startup Garage Management is much more extensiverly involved and engaged as is shown in Fig. 2 below.

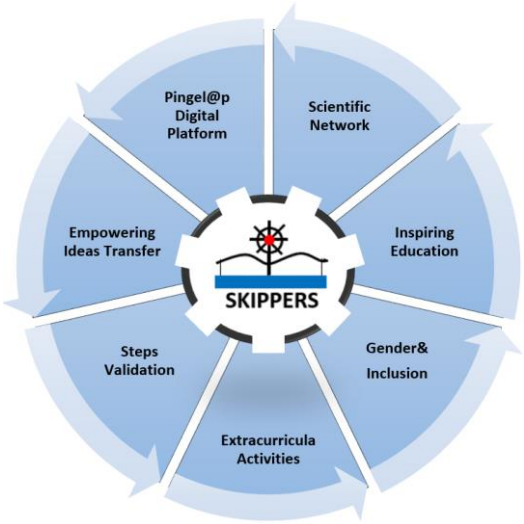


Fig. 2 — Garage's System

4. CONCLUSIONS AND FUTURE WORKS

The growing new centrality of humans within sustainable society, economy, and industry requires more and more to valorize soft and distinguishing skills like creativity, problem-solving and teamwork in strict correlation with entrepreneurial attitudes like business orientation, leadership, gender and cultural inclusivity, learning-to-fail, and resilience. The priority objective of the Garage is to let students express easily entrepreneurial ideas trying to optimize their skills without interfering or inhibiting their creativity. In this respect, it is however paramount to leverage the osmosis among industries, universities, and entrepreneurial students by means of the ICT applications, such as the Pingel@p, which acts as the driver to scale up the Entreprenursery concept. In this context, universities must embrace and face plainly the challenge and play their crucial role in sustain creativity as core value of the entrepreneurship. An impactful communication has to be put in place, making real such an important educational turnaround. The implementation of a new tool for accelerating potentially more valuable ideas, i.e. the call-for-needs-resolution, is underway to helps fresh minded skippers with entrepreneurial attitude to nurse their creativity towards new value creation.

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