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Haute école de gestion  
Genève

# **A comparative analysis of entrepreneurial initiatives and the draft of a financially sustainable business model for CHIP**

**Bachelor Project submitted for the obtention of the  
Bachelor of Science HES in International Business Management**

by

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**Geneva, 31 Mai 2017**

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# Declaration

This Bachelor Project is submitted as part of the final examination requirements of the Haute école de gestion de Genève, for the Bachelor of Science HES-SO in International Business Management.

The student accepts the terms of the confidentiality agreement if one has been signed. The use of any conclusions or recommendations made in the Bachelor Project, with no prejudice to their value, engages neither the responsibility of the author, nor the adviser to the Bachelor Project, nor the jury members nor the HEG.

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Geneva, 31 Mai 2017

Tabea ESTERMANN

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# Executive Summary

CHIC is a pedagogic initiative providing a real interdisciplinary business experience for engineering, business and design students from Lausanne. In 2016, it was expanded as the pilot project – China Hardware Innovation Platform (CHIP) – to different regions in Switzerland. Thanks to the author's participation in the pilot project as a representative of Geneva, extensive research of enterprise education and interviews with various stakeholders, this paper provides a thorough analysis of the pilot project and explores three financially sustainable business models.

The personal engagement of the founder Marc Laperrouza with a wide network and CHIP's focus on the engineering perspective emphasised due to the commitment of EPFL are the initiative's key strengths. On the downside, it also represents weaknesses and inflexibilities, such as the focus on a connected device and the heavy cost structure due to the trip to China.

Taking into consideration the value created by the pilot project for students, institutions, individuals within these institutions and the CHIC community, as well as the different external and internal funding possibilities, three sustainable business models are proposed. Each model prioritises different goals.

The pedagogic model creates a clear separation of responsibilities between the CHIC administration and participating regions. Due to the add-on pricing strategy, the regions provide funding proportional to the service they receive. This model leaves the responsibility for financing with the institutions, which benefit the most from this constellation.

The lean pedagogic model focuses on reducing the variable costs of the project by omitting the costly trip to China. For this fundamental change, the relevant goals are closely reassessed. Simultaneously, it maximises the pedagogic outcome for students and institutions.

The value creation model proposes a profound change in the structure and nature of CHIP. It proposes an overreaching interdisciplinary centre with a focus on problem-solving for external stakeholders. This approach will increase the organisation's complexity, but facilitate funding. It is in line with current research in enterprise education.

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## Abbreviations and Acronyms

BeX	Business Experience major option for students of HES-SO Valais/Wallis
CHIC	China Hardware Camp – initial interdisciplinary initiative
CHIP	China Hardware Platform – pilot initiative out of CHIC
CTI	Commission for Technology and Innovation
ECAL	Ecole Cantonale d'Art de Lausanne – Cantonal Art School Lausanne
ECTS	European Credit Transfer System
EMBA	Executive Master in Business Administration
EPFL	Ecole Polytechnique Fédérale de Lausanne – Swiss Federal Institute of Technology Lausanne
GUESSS	Global University Entrepreneurial Spirit Students' Survey
HEC	Hautes Etudes de Commerce – School of Business in Lausanne University
HEG	Haute Ecole de Gestion – School of Business Administration
HES-SO	Haute Ecole Spécialisé Suisse Occidentale – University of Applied Sciences Western Switzerland
HSG	University of St. Gallen
HSLU	Hochschule Luzern – University of Applied Arts and Sciences Lucerne
ISA	Interdisziplinäre Studienangebote – Interdisciplinary courses in Lucerne
MBA	Master in Business Administration
SME	Small and Medium size Enterprise

# 1. Introduction

In the framework of the China Hardware Innovation Platform (CHIP) project, in which the author is the representative of the Geneva University of Applied Sciences' (HES-SO GE) School of Business Administration (HEG), a team of 5 students are tasked with developing a connected device. Adopting a multidisciplinary approach with participants from engineering, design and business, CHIP is a remarkable model of entrepreneurial education. This paper will analyse CHIP and attempt to quantify the value created by the project, and identify the beneficiaries. Furthermore, it will compare the programme to similar initiatives in entrepreneurial education in order to propose three sustainable business models.

The first chapter will provide an overview of the literature on entrepreneurial education. Then, it will explore CHIP and different initiatives from other universities. Furthermore, it will express the challenges CHIP faces and outline the aim of this report.

## 1.1 Literature review

There is an inconsistency in the literature regarding the definition of certain key concepts. Typically, different authors use entrepreneurship, enterprise and entrepreneurial education interchangeably. In the United Kingdom (QQA 2012) enterprise education is described as the development of mind-set, behaviours and skills to generate ideas and transform them into actions. Meanwhile entrepreneurship is concerned with setting up a business and the knowledge and capabilities required to do so. In the United States entrepreneurship refers to both concepts. For this reason, Erkkilä (2000) proposed a definition of the term entrepreneurial education which comprises both enterprise and entrepreneurship education. This paper will use the definition suggested by QAA and the term entrepreneurial education proposed by Erkkilä.

Infusing entrepreneurial education into school curricula has become popular in recent years (Lackéus 2015). Entrepreneurs earn plaudits for stimulating economic growth, creating jobs, increasing societal resilience and improving equality. Despite evident benefits, implementing entrepreneurial education is challenged by a lack of support, time and resources. Depending on how it's execution, there can be a gap between the stated and desired effects of entrepreneurial education. Research by Urquiza-Fuentes and Paredes-Velasco (2016) confirms what common sense suggests. Students perceive realistic projects to be more useful and important to their studies. It is however unclear to what extent entrepreneurial education impacts the success of graduates'

ventures. On the one hand, a meta-analysis of entrepreneurial education (Martin, McNally and Kay 2013) shows a significant positive relationship between entrepreneurial education and human capital assets, as well as entrepreneurial outcomes. On the other hand, an assessment of a compulsory entrepreneurship course (von Graevenitz, Harhoff and Weber 2010) demonstrates a decline in interests in starting businesses, despite a self-assessed increase in entrepreneurial skills. In a similar study, Ooserbeek, Van Praag and Ijsselstein (2010) find an insignificant increase in self-assessed entrepreneurial skills and a decrease in the likelihood of becoming an entrepreneur.

If universities and governments want to create value for society it is important to choose the right approach in entrepreneurial education. Leckéus (2015) points out that initiatives which follow the idea of value creation using tools such as the Business Model Canvas (Osterwalder, Pigneur 2010) and Lean Start-up (Ries 2011) are promising.

Hitherto, the comparative entrepreneurial spirit of Swiss students on an international scale (Sieger, Fueglistaller 2016) is very weak. The Global University Entrepreneurial Spirit Students' Survey (GUESSS) asks students worldwide about their inclination towards entrepreneurship. It was published for Switzerland in 2016. The results indicated that only 2.3% of Swiss German students intend to start their own business directly after studies, leaving them at the bottom of the list, only above of the risk adverse Japanese, German and Chinese students. In the interest to start a business 5 years after graduation Swiss German students ranks second last at 16.3%, only ahead of the Japanese. Swiss French and Swiss Italian students appear to be slightly more entrepreneurial, with 4.6% interested in starting a business directly after graduation and 26.3% after 5 years. This represents only a minor increase to the Swiss German colleagues when compared, for example, to Ecuador at the top of the list (23.6% and 64.2% respectively). Such statistics must be interpreted cautiously, as for several reasons students from developing countries naturally show a greater interest in starting their own business. Innovation not only happens in new start-ups, it can also occur within existing companies, if the structure allows for it. Nonetheless, for any form of innovation students will need a certain skillset for entrepreneurial and cross-functional thinking.

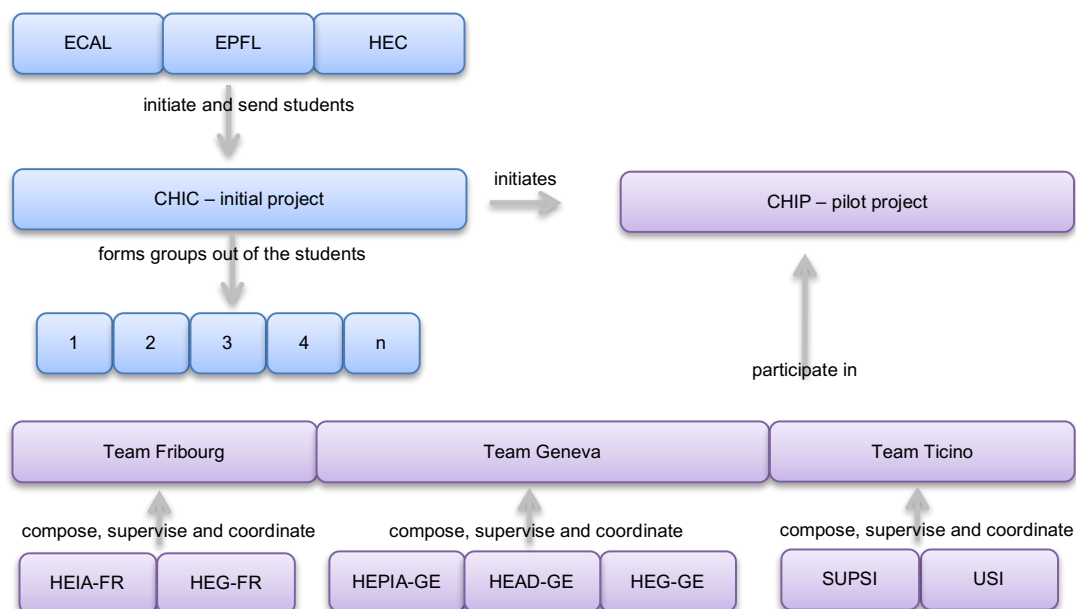
In a study published by the University of Applied Sciences of Lucerne (Wolf 2015b), interdisciplinary teams are formed to increase innovative thinking in 80% of the companies involved. The value added of this approach comes in the form of high

quality imaginative ideas, which can allow interdisciplinary teams to bring products to market 64% faster than ordinary teams. Difficulties in cross-functional teams arise mostly from different styles of communication (43%), different experiences (40%) and jargon (29%).

## 1.2 Introduction to CHIP

First, we need to understand the origin of CHIP and its organisation. Figure 1 illustrates the relationship between the different projects, the teams and the participating institutions. At the time of publication, these names have been changed to harmonize branding (Appendix 9). For reasons of clarity and harmonisation, the initial names of CHIC and CHIP will be used in this paper, as explained below.

**Figure 1 – Structure of CHIC and CHIP**



### 1.2.1 The initial project CHIC in Lausanne

Marc Laperrouza, lecturer and researcher at EPFL, Pascal Marmier, director of swissnex China and Alex Wayenberg, serial entrepreneur engineer and designer, jointly initiated CHIC in 2014 (Laperrouza 2016). The aim was to provide an interdisciplinary and experimental learning opportunity to engineering students of the EPFL, business students of the faculty of Hautes Etudes de Commerce (HEC) of the University of Lausanne and design students from the Ecole Cantonale d'Art Lausanne (ECAL). Interested students choose CHIC as a minor option, equivalent to up to 12

credits, where they develop a functional prototype of a connected device in a multidisciplinary team.

As illustrated in Figure 2, the teams are formed during an ideation weekend, when students meet in different group constellations to brainstorm innovative, out-of-the-box concepts. During this process, students who share similar interests form groups. Until the kick-off day they come up with a specific idea for a product or a customer's problem to be solved. During one semester, the groups work on the project, to produce a functional prototype and reach three milestones. In June at the take-off day the teams receive relevant instructions for the journey to China. Shortly afterwards, the teams and their supervisors board a plane to China to launch the device's production in local factories. This practical approach aims to foster the students' reflexive application of knowledge through complete immersion into the rapid prototyping company Seedstudio in Shenzhen, China. The products are then exhibited on a demo day in September.

**Figure 2 – Schedule for CHIC**



Source: Laperrouza 2016

CHIC is a purely academic project (Appendix 1) and does not aim at commercialising the products developed. For this reason, CHIC can be classified as enterprise education focusing on the development of relevant skills, behaviours and mind-sets to trigger innovative and entrepreneurial behaviour in students.

### **1.2.2 The pilot CHIP**

CHIP is a pilot project that started in 2016, born out of the entrepreneurial education initiative CHIC (Laperrouza 2016). After the developments seen in CHIC, Marc Laperrouza opened the programme up to other Swiss academic institutions, with the branding CHIP, thanks to the financial support of the Gebert Rűf Foundation. The aim was to have a pilot project by 2016/2017, with separate teams representing the regions of Fribourg, Valais, Ticino and Geneva. A further expansion for subsequent years, which would see three to four teams for each region, was envisioned.

The people involved in the regions include the head of faculty, a coordinator and a supervisor for each school sending a student to the team. The head of faculty sponsors the supervisor's and coordinator's hours and provides funding for the student(s) from the faculty. The coordinator will mediate between the different schools in one region, set milestones with the supervisors and generally support the team. Each supervisor coaches a student, possibly in the framework of a semester project.

For the pilot year (2016/2017), CHIC finances one third of the total CHF 2,500 variable costs per student participating in CHIP. The CHIC administration organises the ideation weekend, the kick-off and take-off day, takes part the milestones and organizes the trip to China. CHIC further provides the CHIC community, a tool to communicate within the groups and between the different regions. To help organize group work, CHIC provides a template for the project management tool Trello, which each team member uses to set schedules and tasks. Documents are updated in Trello, as well as on the group's Google Drive, which can be accessed by the CHIC administration and the team's supervisors.

### **1.3 Other entrepreneurial initiatives**

This section will depict different national and international universities and their approach to entrepreneurial education and interdisciplinary teamwork. At the end of each section, there is a short summary of the strong and the weak points of the initiative.

#### **1.3.1 University of Applied Arts and Sciences Lucerne – CreaLab**

The institute CreaLab (Wolf 2015a) of the University of Applied Arts and Sciences in Lucerne (HSLU) researches, creates and promotes conditions in which new innovations can be created. Within the university, it connects the six departments of social work, music, economics, technology and architecture, design and art and computer science, facilitating an interdisciplinary approach on several projects. CreaLab offers various lab facilities to students. Students from Lucerne University, the HSLU and the University of Teacher Education Lucerne can choose from a myriad of interdisciplinary lectures and workshops from the organisation *Interdisziplinäre Studienangebote* (ISA). These courses are equivalent to between one and six European Credit Transfer System Credits (ECTS) (ISA 2016). Depending on which programme the student is enrolled in, three to six ECTS can be validated in the degree's curriculum. The modules with a focus on entrepreneurial education include:

A2X CreaLab Summer School 2017, SocialLAB innovation development, Design Thinking – Creativity and Innovation Bootcamp.

*Strong point: CreaLab is an independent organisation promoting an interdisciplinary approach in teaching and workshops with a distinct mission and budget.*

*Weak point: only a small amount of credits can be validated, thus more complex projects cannot be appropriately rewarded.*

### **1.3.2 University of Applied Sciences Valais/Wallis – Business eXperience**

In 2003, as a part of the University of Applied Sciences of Western Switzerland in Valais/Wallis (HES-SO Valais/Wallis), the Institute for Entrepreneurship and Management launched the programme Business eXperience (BeX) (Business Experience 2017) to stimulate innovation and creativity. Students from the fields of economics, management, computer science, tourism and engineering work in interdisciplinary teams over the course of one year. They receive weekly coaching from their academic supervisor and participate in courses related to the topic. In a dual approach, the teams meet the supervisor from university and a mentor from the industry once every month to discuss their strategy and objectives. The list of possible mentors ranges from representatives of established companies, such as RUAG, to successful founders of start-ups. As the programme is valued at 20 ECTS, which equates to one third of the academic year, students have sufficient time to complete their project. Yet in practice the number of credits a student can validate (Appendix 2) depends on the programme the student is enrolled and in the personal involvement and commitment of the student to BeX. Individual validation is not guided by a strict process, but by the judgement of the supervisors involved. Students majoring in life science receive no credits for their involvement. Business administration students choose BeX as their major orientation and are rewarded with approximately 15 ECTS. For tourism students BeX represents the obligatory internship equivalent to three days of work per week. With a budget of CHF 10,000 (Business Experience 2016) and the lab in the incubator The Ark in TechnoArk Sierre, the teams are well-equipped for success. There are four different stages. In the initial phase from September to October, which commences with the two-day BeX Camp introduction, the business idea is created. During the second stage, strategy and objectives are defined and a business proposal is then developed until December. Next, the market is analysed, the product or service is designed and improved while observing the market and a business plan is finalized until May. Finally, in a debriefing in June, the project is closed

academically and a further continuation by the members is to be discussed. From the 75 teams that have participated in the programme up to 2016 (HES-SO 2016), there have been one to two lasting projects per year.

*Strong point: thanks to many long-term relationships with industries, the local government and between institutions, the programme has strong financial and advisory support.*

*Weak point: the divergent and not fully transparent credit distribution for students enrolled in different programmes.*

### **1.3.3 University of Cambridge – Judge Business School**

The Entrepreneurship Centre (University of Cambridge 2017), founded in 2015 at the Judge Business School, seeks to “spread the spirit of enterprise to both the University of Cambridge community and to wider national and international audiences”. World class research at the university and the Cambridge cluster of start-ups, which is often described as Europe’s Silicon Valley, are an excellent environment for the centre. It offers a myriad of programmes ranging from free evening lectures, practical postgraduate diplomas, a three-month accelerator and workshops for aspiring entrepreneurs, to a programme tailored for PhD and early-career female professional, to the SME Growth Challenge. In the ETECH projects, students from Natural Sciences, Technology and Biological Sciences MBA, EMBA and by request from other departments do a due diligence analysis on emerging technologies within 50 working hours. Researchers from all departments within the University of Cambridge can apply to create an entrepreneurial model with an innovation or novel technology. Students are compensated with credits for their effort, learn to recognize opportunities and can better evaluate emerging innovations and their commercialisation. The interdisciplinary groups, consisting mostly of undergraduate students, answer questions related to the intellectual property position, the viability business model, the market they serve, and the next steps to take.

*Strong point: The exceptional quality of research activities and the extensive connections to entrepreneurs in the region are the perfect breeding ground for entrepreneurial spirit.*

*Weak point: The focus of the ETECH projects is primarily focused on market entry instead of designing a product for a specific need.*



### **1.3.4 University of St.Gallen (HSG) – Startup@HSG**

Startup@HSG, as a part of the Center for Entrepreneurship within the University of St. Gallen (2017) offers five different stages of support to students developing start-ups. It does so with the eventual goal of promoting technology and knowledge-intensive endeavours by university members.

The first and most basic level is for members interested in the entrepreneurial world, seeking to learn more about the potential opportunities. On the second level, there are a myriad of lectures available for undergraduate and postgraduate students, most of which involve group work, but few practical exercises. Due to the nature of the University of St. Gallen, which focuses on Economics, Management, Finance and Law, the teams are comprised of students from the same field of study. For this reason, graduate courses such as *Unternehmensentwicklung* (business development) work together with companies on strategy, business excellence or change management. The HSG Founder Lab, which is part of the next level, offers an incubator. Students can participate, for example, in a three-month programme aimed at accelerating early stage start-ups. Support for questions on interaction design, legal matters or investor relationship management is provided, as well as professional coaching and a work space. Particularly talented students with an early seed stage project can win a scholarship of CHF 4,000, sponsored by the Dr. Werner Jackstädt Foundation. Successful start-ups will gain access to the Swiss start-up monitor, a networking platform for the Swiss start-up scene, which identifies growth potential, successful dynamics of start-ups and the effectiveness of sustenance activities. The most outstanding ideas will compete for the HSG Founder of the Year, which grants a financial contribution of CHF 10,000 to the selected start-up.

*Strong point: the various programmes are targeted to all different levels of commitment to entrepreneurship.*

*Weak point: most students are from economic sciences such as finance, business or management and therefore the programmes lack an interdisciplinary approach.*

### **1.3.5 Karlsruhe Institute of Technology – Summer School**

Master Students with their own business idea and an active interest in China (Karlsruher Institut für Technologie 2016) can participate in a joint programme of Karlsruhe Institute of Technology (KIT) and Jiao Tong University Shanghai. During one week in China and one week in Germany, the seven students from each university get to know budding Chinese entrepreneurs, learn about entrepreneurship, as well as

intercultural communication and its numerous challenges. Under the guidance of EnTechon (institute for entrepreneurship, technology management and innovation of KIT) students research co-evolutionary entrepreneurship. German students must contribute EUR 300 and receive four ECTS for their participation in return.

*Strong point: the financial contribution to the programme will cover some of the costs and increase the stake for the students in the project.*

*Weak point: the students do not really create something tangible, nor do they experience failing and pivoting, since the time is very limited.*

## **1.4 Outlook for CHIP**

As the pilot project CHIP progresses, the question about its continuation is becoming relevant. To set up a repeatable and scalable business model, there are several key challenges to consider.

Currently the institutions participating in CHIP (Laperrouza 2016) are covering two thirds of the variable costs for the participation of their students. One third is offered by CHIC, to incentivize the institutions to participate in the first place. The costs of approximately CHF 2,500 per student do not include the fixed cost required to set up the platform (Appendix 1), the salaries of the people involved in the project or the sunk cost for the tools created.

If CHIP is to be repeated, CHIC's contribution of around CHF 833 per student, which is unrelated to the project's initiators – EPFL, ECAL and HEC – is likely to be questioned. To prevent criticism, the variable costs would need to be fully born by another party.

Concerning the fixed costs, there are no exact records available (Appendix 1) of their size and the specific budgets they are being allocated to. Within scope of this thesis, these costs will not be further estimated.

Collaborations are often established to benefit from synergies, where the outcome produced together exceeds the sum of the effect of separate efforts. Thus in any collaboration it is important to assess the synergies created and to evaluate whether there might be any negative synergies or risks to hinder synergies to develop.

## **1.5 Aim of this report**

Having reviewed various entrepreneurial initiatives and discussed CHIP and its challenges, this report will compare CHIP to the different initiatives and explore options for a sustainable business model.

To achieve this, the next section will review the data collection conducted in order to answer the research question. After a briefly explanation of the data collection methodology, the section will focus on data analysis. In this section, different sources of financing will also be identified.

The final research objective is to present three financially sustainable business model for CHIP within the framework of entrepreneurial education, considering the various stakeholders and identifying the beneficiaries of the platform. The aim is to provide a replicable model of effective entrepreneurial education.

## 2. Analysis

The analysis chapter will examine the data gathered to answer the research question, which partially comprises secondary data from internal documents or public available data, as well as primary data collected for this paper. The latter can be found in the Appendices at the end of the document.

The first part explains the structure of the argument and the methodology used to collect the necessary data.

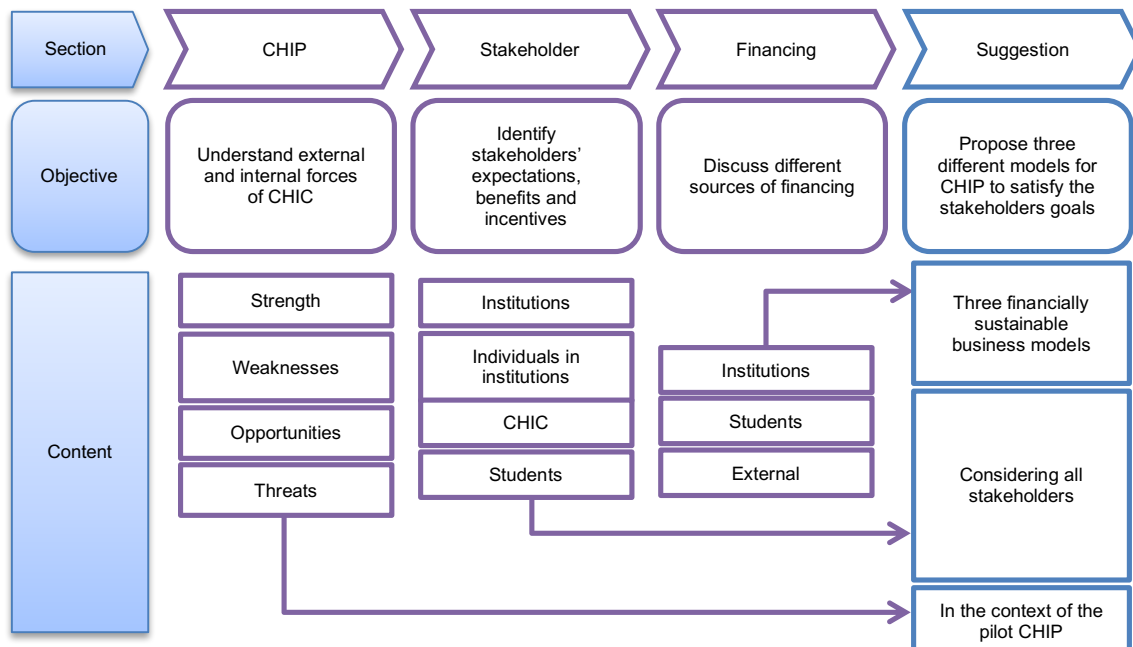
The second part will list the collected data which can be found in the Appendices.

The third and most comprehensive part will be the analysis of the data, in which elements from different sources are combined to construct an argument.

### 2.1 Research methodology

The argument is structured in four parts, as illustrated in Figure 3. The first three sections (in purple) are found in the analysis chapter and the final section (in blue) in the discussion chapter.

**Figure 3 – Argument structure**



The first section takes the pilot CHIP, as described in the introduction, and analyses more profoundly the internal and external environment using a Strength, Weakness, Opportunity and Threat (SWOT) analysis. The necessary information can be taken from the presentation of the pilot project, which was presented to potential supervisors and coordinators in summer 2016 (Laperrouza 2016). Other insights for this section stem from interviews with people involved in the project. Important information is gathered from the author's personal experiences as a project participant and business representative for the Geneva team.

The second section identifies the stakeholders and their incentives, motivations and expected benefits from CHIP. Representative data for the institutions are the interviews conducted with the coordinator and supervisor of the institutions in the regions Valais, Fribourg and Geneva. To gain a comprehensive understanding of the situation, most interviews were conducted face to face. Despite significant efforts to achieve objectivity, the representation of the involved institutions will always be affected by individual subjective bias. This bias can clearly be seen in interviews with different people within one institution, which do not come to the same conclusion. Although the supervisors and coordinators represent the discussion taking place within the institutions, this paper will describe two different stakeholders: a) the institution itself with its own policies and guidelines, and b) the individuals operating within the institution. Another important stakeholder is the student each school sends to the CHIP project, who expects to learn various soft and hard skills. Three different kinds of surveys have been conducted on this interest group, explained in detail below.

The third part of the argument discusses the various possible sources of financing for enterprise education, when taking into account the stakeholders involved. The arguments for this section stem partly from the interviews conducted with supervisors and coordinators, as well as from the analysis of different entrepreneurship initiatives in the introduction. Further information about the funding criteria of external sources is taken from their respective websites and guidelines, as well as the projects already funded by them.

In the chapter's discussion, the last section of the argument is presented. To construct three different business models for the CHIP pilot project, its goals are assessed in terms of relevance, cost and the benefit they bring to the given stakeholders. Following this step, the three models are constructed, each prioritising the different goals to match the funding opportunities available.

## 2.2 Data collection

The data is mostly collected through qualitative interviews, which can be found in the Appendices.

From the CHIC administration, there are interviews with Marc Laperrouza (Appendix 1), the initiator of CHIC, and Pablo Garcia (Appendix 9), the coordinator of CHIP. Both interviews were conducted face-to-face to increase the quality of data.

To gain insights into the different institutions there are interviews with both supervisors and coordinators. These include:

- Alexandre Caboussat, coordinator HEG Geneva (Appendix 4)
- Nicolas Montandon, supervisor HEG Geneva (Appendix 5)
- René Beuchat, supervisor and coordinator HEPIA Geneva (Appendix 6)
- Serge Ayer, supervisor and coordinator HEIA Fribourg (Appendix 7)
- Camille Scherrer, supervisor HEAD Geneva (Appendix 8)

All interviews, except with Ms Scherrer, were conducted face-to-face to allow for follow-up questions.

To gain a more comprehensive understanding of entrepreneurial education in the Swiss educational landscape, three interviews with experts in this field were conducted. These are:

- Blaise Crettol, coordinator BeX Valais (Appendix 3)
- Benedict Stalder, CTI agent for Western Switzerland (Appendix 12)
- Patricia Wolf, head of CreaLab in HSLU (Appendix 13)

To gain insights into student opinion, there is a survey from kick-off day in Lausanne (Appendix 2), carried out using Google survey. Although this tool was used, the interviews were conducted with each student in person, in order to explain the questions and understand individual motivations for the answers. There were 12 participants including the author of this paper, distributed as follows:

- Geneva: 5/5 students – 100% participation – 42% of total weight
- Ticino: 2/4 students – 50% participation – 17% of total weight
- Fribourg: 5/7 students – 71% participation – 42% of total weight

The small sample size and the uneven distribution of respondents make it difficult to draw conclusions from the survey. Yet it can provide some insights, if carefully

evaluated. Critical evaluation of the results is particularly important, since each group and every individual responds very differently to the survey questions.

Another insight into student motivation is the survey (Appendix 10) of all applicants from HEG Geneva. As identified in the interview with Mr Caboussat (Appendix 4), seven people applied to participate as business representative for the Geneva team. All applicants answered to a google survey, except the author of this paper. The responses are qualitative and demonstrate the motivations and incentives which drive students to participate in CHIP.

The students participating in CHIC in the past years have provided feedback at every milestone. This feedback has been consolidated into one table and analysed by certain categories in Appendix 15. We can draw some conclusions from this data about the student's immediate perceived value of the project. However, the data is not adapted to measure value creation objectively to compare it to other initiatives.

## 2.3 Analysis of data

### 2.3.1 CHIP SWOT

SWOT analysis is a complex means of researching economic, technical, sociological, legal and operational activities. It categorises external and internal forces in terms of strengths, weaknesses, opportunities and threats.

**Table 1 – SWOT Analysis**

<b>Strengths</b>	<b>Weaknesses</b>
Interdisciplinary aspect Connections to China Hands-on approach Continuous improvement process Network of entrepreneurs Use of design thinking Culture of failing and pivoting Focus on enterprise education	Focus on connected device Different institutions' timing Credit reward system for students Triangle of institutions, CHIP and students Financing Challenge to measure value created Reliance on key people in participating institutions Reliance on Marc Laperrouza
<b>Opportunities</b>	<b>Threats</b>
Sponsorship from foundations Sponsorship from CTI Create interdisciplinary centres Partnerships with industry	Institutions become independent Reputational risk for EPFL Entrepreneurial education becomes irrelevant

A SWOT analysis defines the position of one entity amongst a reference group in a certain context. In this case, the reference group is the other entrepreneurial initiatives outlined in the introductory chapter. Gibb (2002) published a list of desired outcomes of entrepreneurial education and the mechanisms used to achieve them in a pedagogic environment. These include a sense of responsibility, a feeling of ownership, the ability to cope with uncertainty and the managing of interdependent stakeholders. Appendix 14 lists provides an assessment of CHIP based on all the elements and measures proposed by Gibb.

The SWOT analysis assesses CHIP's positioning and makes recommendations to eliminate or minimize negative aspects and reinforce the positive ones.

### **2.3.1.1 Strength – Interdisciplinary aspect**

Interdisciplinary soft skills are highly relevant in today's innovative environment. Cross-functional teams are not only used in start-ups, but also in well-established corporations to foster innovation (Wolf 2015b). A key strength of CHIP is that it focuses on the interaction between the different disciplines, since this is relevant to all students, regardless of whether they will become entrepreneurs or adopt an entrepreneurial mind-set within a traditional company. As Swiss students are amongst the least likely in the world to start a business (Sieger, Fueglistaller 2016), the latter scenario is more likely to be applicable. It can explain why the absence of a final commercialisation of the product in CHIP does not interfere with the value created for the student, since interdisciplinary cooperation is the more relevant than real market exposure. In their self-assessed learning reports participating students often stress the importance of interaction between different disciplines. Given the importance of recognized interdisciplinary approaches, it is surprising that only a few initiatives are focusing on it. The CreaLab in Lucerne (Wolf 2015a, Appendix 13) shares elements, however interdisciplinary education for undergraduate students comprises mostly theoretic lectures for students from different fields (ISA 2016). The difficulty of validating credits for students from different institutions in Lucerne hinders the formation of truly interdisciplinary teams. This situation is similar in Valais, where some students cannot validate any credits in their programme (Appendix 3).

### **2.3.1.2 Strength – Connections to China**

China has in recent history established its role as the factory of the world. There are few companies who are not connected to China and its way of production. The relationship which CHIP has with China presents a unique opportunity for students to explore the way these suppliers work. Not only does it provide an incentive for students



to participate, it also allows participants to gain real-life experience. Immersion into this foreign environment can teach students more about intercultural communication and global supply chains than any presentation can. There are several summer schools which recognize this value, for such as the Karlsruhe Institute of Technology, which was discussed in the introduction. This feature gives CHIP a competitive advantage, since it raises the barrier to entry for other potential competitors.

### **2.3.1.3 Strength – Hands-on approach**

Despite being a pedagogic initiative, the applied approach of teaching and learning is a key strength of the programme. According to Marc Laperrouza (Appendix 1) universities are educating students in a very theoretic way. Most courses prepare students for a future in academia and research. However, 97% of students in EPFL (Appendix 1) will never work in research, but will be employed by a company or self-employed. Consequently, the amount of skills and knowledge focusing on academic pursuits is disproportionately high. It is therefore more than reasonable to target some of the pedagogic effort to the majority of students who will encounter more practical, non-academic projects in their future career.

### **2.3.1.4 Strength – Continuous improvement process**

The identity of CHIP is entrepreneurial and so is the programme itself. Through a continuous improvement process, tools and relevant materials are reviewed and updated. The project is an experiment in how to teach relevant skills to students and new insights can change the approach used to do so.

### **2.3.1.5 Strength – Network of entrepreneurs**

Like the University of Cambridge, the EPFL, HEC and ECAL triangle in Lausanne, as initiators of CHIC, can benefit from a cluster of top researchers and entrepreneurs. Thanks to alumni connections and the network of professors involved, CHIP participants can obtain a glance into the world of product development.

### **2.3.1.6 Strength – Use of design thinking**

Rather than bringing a previously developed technology to the market, CHIC promotes the process of design thinking and the tool value proposition canvas (Osterwalder, Pigneur 2010). These tools teach participants to search for customer jobs, and their pains and gains involved in proceeding with this job. They then proceed to design a solution that matches jobs, gains and pains. This customer focus is in line with the best practises in businesses and fosters skills such as creativity and problem solving.

### **2.3.1.7 Strength – Culture of failing and pivoting**

Following the lean start-up methodology (Ries 2011), CHIP encourages students to try many options, fail rapidly and pivot. This is the process proposed in most literature today, but it is far from the reality in classrooms. CHIP's comparatively long time-frame is a significant advantage, as there is enough time to make assumptions, question customers, test designs and adapt strategies where needed. Students learn to accept failure and go on to generate new ideas. In terms of soft skills, it is extremely fruitful to talk about incorrect assumptions and how the team corrected them. This process is closer to real working life than an exam, where students only have one chance to answer to a question and where a wrong answer ultimately constitutes a failure. Immediately finding the correct answer to a problem is often impossible in our complex world, so the process proposing a solution and probing its validity until the final solution is designed can be far more valuable.

### **2.3.1.8 Strength – Focus on enterprise education**

In his interview, Pablo Garcia stressed (Appendix 9) the importance of enterprise education, which teaches an individual to generate ideas and skills and translate them into action, rather than simply writing a business plan and fundraising. The latter style of learning is already offered by several institutions and associations in Switzerland, and is more suitable for people with a particular idea in mind. A focus on the former educational style suits curious students who do not yet have a specific idea but want to explore the entrepreneurial way of thinking. The skills acquired in the programme will be useful in all walks of life, not only in starting up a company. Therefore, money invested into enterprise education is more likely to generate wider aggregate societal benefits, be it economic, social or political.

### **2.3.1.9 Weakness – Focus on connected device**

The CHIP initiative has very few constraints for students. The teams are free to solve any issue they desire, if the solution demands a connected device. During the ideation process, the use of design thinking encourages creativity and thinking outside the box. The focus on a connected device can be explained by the structure of CHIP, which has partnerships with Seedstudio and teams consisting of engineers, designers and business students. In terms of business and design, there are also few constraints for students. However, one of the initiative's weaknesses is that it constrains engineers in their creative ability to solve an issue. It also hinders the entire process of design thinking. The idea starting with an existing issue and then designing an appropriate is complicated by the necessity for the solution to come in the form of a connected device.

Several groups struggled to come up with a combination of the two in the ideation weekend. Either a relevant issue was identified, but no connected device could be found to solve it, or a connected device was imagined, but it did not adequately solve a relevant existing issue. This challenge produces a business-related conflict, where the problem being solved for the customer does not justify the cost of a connected device.

#### **2.3.1.10 Weakness – Different institutions' timing**

The downside of having different disciplines participating in the project is the coordination of different schedules. Every institution integrates CHIP differently into their course; therefore the time allocated to students to work on the project differs. In the Geneva team, CHIP represents the both the primary project of a semester and bachelor's programme for engineering students. Each of these projects has its own timing, requirements and deadlines, which are not necessarily synchronised with the schedule of CHIP and its milestones. The interaction designer in Geneva can skip a workshop to compensate for the time spent on CHIP. This means the extra time is not distributed evenly through the semester and if there are other projects to hand in, making enough time for CHIP can be difficult. This point illustrates that the time a student has available to work for CHIP and internal deadlines are not synchronised with the deadlines and the workload given by CHIP through the internal schedule provided by the CHIC administration.

#### **2.3.1.11 Weakness – Credit reward system for students**

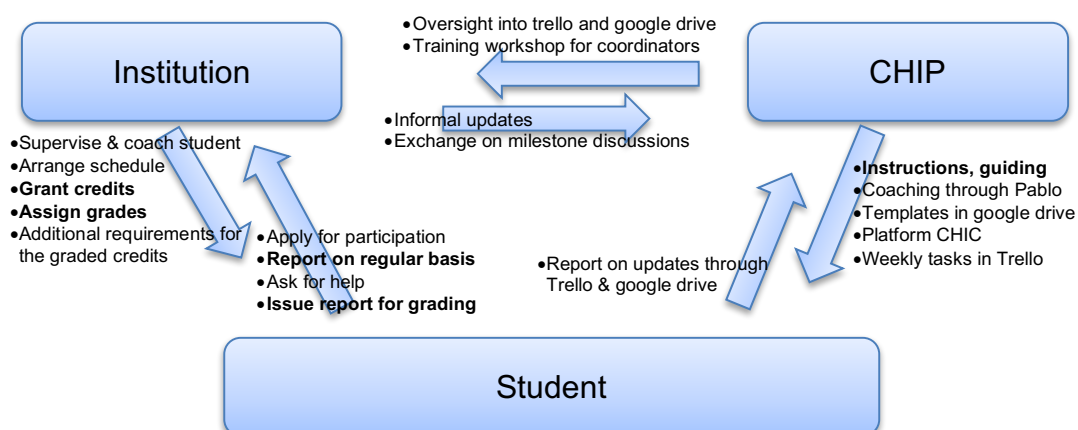
To reward students for their participation in CHIP, they can validate credits in their degree programme. Since most programmes are very tightly structured and each module and course is selected to create an overall fit, freeing up credits can be difficult for some institutions. An approach aimed at teaching a lot of content and measuring it precisely with exams is completely opposite to the dynamic and bottom-up learning approach promoted by CHIP. As discussed in this paper, there is undoubtedly a high pedagogic value created by CHIP, but it is hard to measure and quantify. Universities tend to prefer giving students three credits for following a class-based course on project management, for which the student will write an exam and may not absorb the information permanently (Appendix 7), as they can show evidence of what the student has learned. In the case of CHIP, regardless of whether the student learns something tangible about project management or in the worst case learns nothing, the value of the endeavour it is difficult to quantify. Since institutions must prove precisely what they are teaching and what merits credits, assigning credits to CHIP is more difficult. In addition, CHIP did not exist when the original plans for credit distribution were envisaged, and

changing something within institutions is often challenging. For this reason, most institutions participating in CHIP recognize it as a project similar to a bachelor's thesis or semester project.

### 2.3.1.12 Weakness – Triangle of institutions, CHIP and students

As discussed in the stakeholder analysis below, adding more stakeholders to a project makes it harder to manage varying interests. In this context of CHIP, which has a triangle of institutions, communication between students and CHIP representatives and the managing of interests is complicated. As illustrated in Figure 4, there are different relationships between the three groups; the particularly important aspects are in bold. Students receive most information on how CHIP works and what is expected of them regarding the project through the ideation and kick-off events, as well as through the platforms CHIC, Trello and Google Drive. The same information is communicated to the institutions, where the person receiving the information does not consistently or entirely distribute the information to the students' supervisors. Since students are graded and receive credits from their supervisors, they are more inclined to work harder for them than for the CHIC administration. If there is a lag in communication, a supervisor might establish additional requirements for a grade or a different schedule, as discussed above, then the one set by CHIP. If grades are the primary incentive, students will first and foremost comply with the expectations of their supervisors. It is therefore very important to ensure clear communication throughout the triangle and within the institutions.

**Figure 4 – Relation between CHIP, institutions and students**



Source: author's observation

### **2.3.1.13 Weakness – Financing**

The pilot project CHIP is supporting the participating institutions with one third of the variable costs, which equates to CHF 833 per student. The additional costs covered by CHIC are the overhead costs of coordination, the tools provided and the event coaches. With this current model, each region has asked for internal funding from their institutions. If the project is to be repeated, a different financing model needs to be drawn up.

### **2.3.1.14 Weakness – Challenge to measure value created**

The pedagogic and comprehensive nature of the project makes it difficult to measure the value created for different stakeholder. This issue is reinforced by the absence of a final exam and the fact that students are not expected to develop a product for market commercialisation, as the process of developing the product is more important than the outcome. To affirm the relevance of the program, some evidence needs to be presented to satisfy stakeholders. Up to now, students were given a different feedback report detailing what they had learned at each milestone and at the end of the project, as shown by the example of the Geneva team in Table 2. The quality of this data and the insights gained from this information leave a lot to be desired. It is difficult to draw conclusions from the data or satisfy donors.

**Table 2 – Self-reported learning at milestone 1 Geneva team**

Name	Your discipline	Other disciplines	Group work	Project management	Yourself
Adrien	Protocol Bluetooth	Designers and Managers need to rethink all the time the product for improvement	To explain simply our work	Having our own calendar	Speak more
Axel	RFID		Communicate more simply	Respect my deadline	Better documentation
Julia	Do more versions, test and combine them	Physical prototyping is HARD	We all need encouragement from each other	Listen more	Share more
Loïc	Do more sketches	Difficult for engineers to know the final size of the components	Each person should explain clearly his work to have teamwork	Respect the deadline	Don't be shy to show drawings
Tabea	Interview effectively in talking less and listening more	Interconnectedness of all different disciplines	Everybody needs to speak up and tell his opinion	Keep on track with deadlines	Be relaxed and cope with high expectations

### **2.3.1.15 Weakness – Reliance on key people in participating institutions**

CHIP came to life through the personal connections which Marc Laperrouza had with different people of other institutions. These key people then motivated other institutions in their region to join and drew up a plan for financing, student recruitment and credit compensation. These schemes are temporary and set up to work for one year within the CHIP pilot project. The success or failure of CHIP in one region relies heavily on the ability of these key people to obtain time and resources for the project. As long as CHIP remains a non-permanent project within these institutions, there will be a strong reliance on the time and effort these people invest into promoting it.

### **2.3.1.16 Weakness – Reliance on Marc Laperrouza**

As the major driving force behind the initiation of CHIC and the pilot project CHIP, Marc Laperrouza is a key figure within the initiative. He manages the funding for the programme as well as public relations, communication and marketing. He is involved in the programme's continuous improvement process and also coaches the teams in CHIC. His ability to conduct these tasks depends on the willingness of his employer – EPFL – to continue with the project and his own motivation to keep working for the initiative. If he were to shift his focus to another project and another challenge, CHIC and CHIP might not continue in the way they have under his influence. To mitigate this risk, Pablo Garcia, who is employed by EPFL, has also been integrated into the project and is currently coordinating the teams from the pilot project CHIP. Nevertheless, the dependency on Marc Laperrouza remains vital.

### **2.3.1.17 Opportunity – Sponsorship from foundations**

Currently the Gebert Rűf Foundation is financing the CHIP pilot project. There are also other foundations which are financing entrepreneurship and enterprise education. One example is the Dr. Werner Jackstädt Foundation, which is also funding Startup@HSG (University of St.Gallen 2017). These foundations might be interested in funding an innovative interdisciplinary enterprise education initiative, which is rather unique when compared to the myriad of existing entrepreneurial programmes. If the value created can be captured in a reliable way, it will be easier to attract funding from such institutions.

### **2.3.1.18 Opportunity – Sponsorship from CTI (Innosuisse)**

The Commission for Technology and Innovation (CTI) is currently funding several entrepreneurship initiatives including BeX (Appendix 3) and CreaLab (Appendix 13), which were discussed in the introduction. Its goals are to promote research and

development projects between universities and corporations, support entrepreneurs and start-ups through courses and coaching and connect participants of the industry and science through different activities in knowledge and technology transfers (Schweizerische Eidgenossenschaft 2016). To create a clearer structure and an independent entity, it will be transformed into a new institute called Innosuisse, starting in January 2018. Some activities will be added, such as scholarships and interest free loans for future entrepreneurs. Given the fact that CHIP is a pure pedagogic programme, which also promotes innovation and entrepreneurial spirit, the possible funding opportunity provided by Innosuisse must be examined in detail. In partnership with players from the industry, comparable to Bex or CreaLab, CHIP could potentially access funds from the newly created entity Innosuisse.

#### ***2.3.1.19 Opportunity – Create interdisciplinary centres***

The CHIP pilot project reinforces communication between different institutions in one region, and to a lesser extent across regions. All interviews conducted with institutional representatives confirm this effect and point out opportunities for further cooperation. This collaboration is similar to the concept of ISA (Wolf 2015a) in Lucerne, discussed in the introduction, where an interdisciplinary centre has been established to offer courses and projects to students from different institutions and disciplines. Similar centres could be established in the regions participating in CHIP. These interdisciplinary centres could manage and promote CHIP in the future and develop other programmes. In Geneva, for example, there has been some bilateral collaboration in the past in which the author of this paper participated, but the result was not truly interdisciplinary.

#### ***2.3.1.20 Opportunity – Partnerships with industry***

Teaming up with players from the industry can bring both opportunities and risks. For example, contextualising the purely pedagogic initiative through partnerships in industry would qualify it for support by Innosuisse. Another opportunity is the funding which companies could bring to the project. The sponsor can gain publicity by displaying its logo in communications, news releases and the name of the group, such as in BeX (Appendix 3). Another opportunity is the ability of an SME to present the group with real market scenarios. Companies could apply with a problem they have observed, for which they have not yet found an adequate solution. Out of the companies presented, the teams could pick one to work with. Such a scenario would accelerate the ideation process, which proved difficult for some groups. On the other hand, this plan could also be risky. Pablo Garcia (Appendix 10) believes students will not have the same feeling of ownership over the project, since they did not propose the

problem they will solve (Gibb 2002). This factor might decrease participant engagement, but at the same time it could serve as a motivation, since milestones would be conducted in partnership with representatives of the respective industries. Students could be incentivised by the possibility of making connections within the involved companies, which might be a future employer for them. Another risk is the addition of a new stakeholder to the project, which could complicate communication and create additional conflicts of interests. For example, the company might push for a product to commercialise, while the universities will push for maximum learning.

#### **2.3.1.21 Threat – Institutions become independent**

Marc Laperrouza mentions (Appendix 1) the possibility that participating institutions will aim to reproduce the CHIP pilot project on their own, if they deem it a success. Yet there is little evidence in the interviews conducted with the supervisors and coordinators to suggest that they would be willing to autonomously set up the entire platform and necessary project management tools, as well as the connections to China. Most supervisors believe CHIP is an excellent project, because they do not need to set it up from zero. The threat is therefore not relevant in short term, but in long term institutions might gain experience and the confidence required to run such a programme on their own. Sustaining value will therefore be extremely important for CHIP in the long term. That said, the initial idea behind the pilot project was to replicate CHIC in different regions (Appendix 9). Therefore, having a certain degree of independence is desirable, as long as CHIC can be the umbrella providing relevant teaching material, tools and the network. With a complete separation of the different regions, the effect of shared overhead costs, the critical mass for improvement of the project and understanding of the innovation process cannot be attained.

#### **2.3.1.22 Threat – Reputational risk for EPFL**

In the branding and the presentation of the pilot project CHIP aimed at the potential participating institutions (Laperrouza 2016), EPFL is often named next to CHIP. Even though CHIC is officially an initiative of EPFL, HEC and ECAL, supervisors, coordinators and students involved in CHIP mostly associate the former with the project. This could be because engineering is an important part of the project, as engineering students receive the most credits in CHIC and CHIP. Another reason could be the fact that the offices of Marc Laperrouza and Pablo Garcia are at EPFL. The relationship between EPFL, CHIC and CHIP will be analysed more closely below. There is the notion of reputational risk for EPFL being associated with other institutions like HES-SO, which are historically not considered comparable. The risk depends on



the degree to which EPFL is associated with CHIP and the extent to which the quality of CHIP is perceived as below the level of EPFL.

### **2.3.1.23 Threat – Enterprise education becomes irrelevant**

CHIP is only relevant for institutions if the content and concept it promotes are in line with what they are looking for. Alexandre Caboussat (Appendix 3) believes the identity of CHIP matches the identity of HES-SO HEG and especially the department of International Business Management. As stressed by Marc Laperrouza (Appendix 1) and Pablo Garcia (Appendix 9), CHIC does not aim at teaching entrepreneurship, which involves setting up a start-up and writing a business plan, but it is rather a part of enterprise education. Students will become more creative, learn how to develop products and be able to communicate across disciplines. In a paper to be presented at the ECSB Entrepreneurship Education Conference in Cork in May 2017, Lackéus finds very weak impact of enterprise education on the skills it claims to foster. It explains the difficulty of measuring the impact of enterprise education, due to the blurry line between entrepreneurship and traditional progressive education which focuses on projects and problem-solving. There is a risk that enterprise education will lose relevance within the myriad of other projects which share the goal of improving problem-solving skills and creativity. According to Lackéus, enterprise education may therefore become irrelevant. To avoid this situation, the option of value creation education is introduced. Through the application of capabilities, students “create something preferably novel of value to at least one external stakeholder outside their group, class or school”. This approach is found to increase motivation and the development of entrepreneurial competencies more than pure enterprise education.

## **2.3.2 Stakeholders – value creation**

There are several interest groups involved in CHIP and it is important to understand their structure and goals, as they create internal dynamics and incentives. This dynamic can explain the motivation and reasons for taking or to abandoning certain actions. Therefore, this section will outline the value created for each of the stakeholders.

### **2.3.2.1 Students**

The students participating in CHIP is the most obvious group for which the project creates value, as they receive comprehensive education. However, the actual value created for the participants is difficult to measure. We could run a test on all students prior to and following the project to examine aptness for innovation, interdisciplinary

teamwork and levelheadedness. The School of Applied Psychology of the University of Applied Science North-Western Switzerland has developed several tests (Fachhochschule Nordwestschweiz 2016) within the context of the Strategic Entrepreneurship initiative. It measures the extent to which a participant's personality enhances entrepreneurial success and maintains health and productiveness. An example of the results of two different tests taken by the author can be found in Appendix 11. A well-designed test could accurately measure aptness to entrepreneurial activity, however it was not possible to carry out the test in this year's CHIP pilot project, as the time frame of this paper is shorter than that of the CHIP project and the test is only available in German. In the future, it would be useful to collaborate in order to improve the test and make it relevant to a wider audience.

René Beuchat highlights (Appendix 6) a further important value for students. For most students, it is very difficult to imagine how things work in China. Today, however, companies typically design and research in Europe before sourcing their products in China. For this reason, it is important for students to understand how commercial operations in China and what challenges outsourcing can bring.

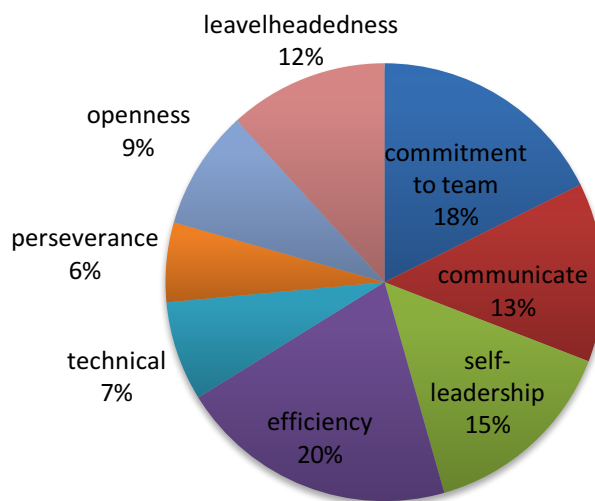
Another way to measure value creation is through student feedback. As illustrated in Table 2 on page 21, students report what they are learning in five different categories: learning experience in their own discipline; in the disciplines of other team members; in group work; in project management; and what they learn about themselves. This feedback is then used to demonstrate the value created for students. The challenge of this data collection method is the analysis and the quality of data. The conclusion about the student learning experience reported by the students is analysed in depth in Appendix 15.

Technical skills such as designing, using a certain protocol or creating a business model were mentioned most often in the student learning experience. 64% of students responded to have learned such skills in their own discipline and 52% of students have learned technical skills from other disciplines. Interdisciplinary group work, including communication with other disciplines and insights into how other students think, can also be found within all different fields of learning. This makes up 10% of learning experience in one's own discipline and 32% in other disciplines (14% interdisciplinary + 18% insights). Another important field of learning is the focus on customers and what they really want, which accounts for 11% of learning experience in one's own discipline and in other disciplines. In terms of group work, students report gaining knowledge in communication (35%), coherence to unite as a team and work on a common goal

(28%). This trend is confirmed with 44% of learning in project management about collaboration as to how to work as a team together and compromise. The tools gained in terms of project organisation are perceived as relevant in the context of group work (23%) and in the context of project management (24%).

The answers documented for the students from the HEG Geneva who applied to be the business representative for the Geneva Team (Appendix 10) are in line with the answers recorded above.

**Figure 5 – Student feedback on what they have learnt about themselves**



Source: Appendix 15

The response to questions about what students have learnt about themselves are very diverse, as shown in Figure 5. They range from finding ways to get to the desired outcome in an easier/faster way (20%), self-leadership (15%) and levelheadedness (12%), to team commitment (18%) and expressing ideas and expectations effectively (13%).

The findings show that the value created for students in terms of experience and learning is relevant. Marc Laperrouza claims (Appendix 1) that mentioning the participation in CHIC on job interviews has helped students to differentiate themselves from their peers and demonstrate innovative capabilities. Blaise Crettol (Appendix 3) of BeX also agrees with statement, in relation to their programme. As a participant of CHIP, the author of this paper can confirm this effect. Having talked to people in recruiting agencies, private equity, the academic world and the Big Four in audit, the reactions to CHIP participation have been reassuringly positive.

### **2.3.2.2 CHIC**

CHIC is strongly driven by Marc Laperrouza's personal engagement in exposing students to the reality of Chinese production (Appendix 6) and making the different involved institutions work closely together (Appendix 1). The existing initiative in Lausanne is working well and this has triggered the idea to further expand the project (Appendix 9). As the bulk of the overheads have already been invested and are considered a sunk cost, rolling the project out to other schools can be done at a marginal cost. Adding more participants will decrease the average cost per student and justify the investment. Marc Laperrouza points out (Appendix 1) that CHIP is a form of creative commons, where knowledge and creativity is shared to create greater value for society in general. Thanks to the critical mass generated by the additional teams, branding can be reinforced and experiences shared.

Furthermore, CHIC is an experiment which can help gain insights into human behaviour, group work and interdisciplinary approaches to innovation (Appendix 5). It is possible to research these complex concepts in CHIC and to publish papers about it. In this manner, CHIC can integrate the bachelors and masters teaching experience into research and learn about teaching techniques.

### **2.3.2.3 Institutions participating in CHIP**

The interviews conducted with supervisors and coordinators from different institutions (Appendices 4-9) present some insights into the benefits they receive as an institution and on a personal level from participation in CHIP. We can identify the key values, outlined below.

Working on the same project with teams from EPFL, ECAL and HEC in Lausanne is a significant benchmark for the involved institutions, which hope their students can live up to standards maintained by the above-mentioned prestigious institutions. This collaboration also reinforces general institutional quality, as they can gain insights into how other universities create value for students, which helps strengthen Switzerland's overall higher education landscape.

Another important insight is the practical feedback supervisors receive from students about their ability to draw on content learned in previous modules for the project. Serge Ayer was astounded to discover how rapidly students forget tools learned in the previous semesters (Appendix 7), something which individuals within the participating institutions can use as feedback to further improve the methodology used or content taught in the relevant modules. CHIP can therefore serve as a feedback mechanism for

the coherence of the whole programme, as students need to combine their knowledge from different modules into one project. This information is easily available to supervisors and relevant to the project coordinators, who are often heads of department and responsible for student courses. A mechanism to report on this finding and consider future improvements can be established within the institutions to maximize the benefit for them.

An interdisciplinary and intercultural approach is a good criterion for funding programmes (Appendix 4). CHIP could serve as showpiece for collecting funds and explaining why the institution's activities are relevant. It also increases the visibility of the participating department within the school and the overall institution it is connected to.

A focus on Asia is an important orientation for some departments, such as the International Business Management faculty of HES-SO HEG Geneva. Participating in CHIP can help strengthen this alignment.

#### **2.3.2.4 *Individuals within institutions – coordinators and supervisors***

Maintaining contact with other schools in the region and the proactive people within these schools is mentioned throughout the interviews. As lecturers and researchers, supervisors are constantly required to think of new initiatives and projects. Having access to other schools through personal connections is an asset for this task. To illustrate this point, we can use the example of CHIP, which has been cultivated through Marc Laperrouza's network. Knowing the right people who can come up with original ideas outside of traditional education is helpful for other innovative projects.

A further important notion is the personal satisfaction which supervisors derive from being part of student development. Supervising CHIP is not a regular task and can make a supervisor's work more interesting (Appendix 5). Most supervisors agree that participating in the project and travelling to China with the students is an enjoyable experience.

Institutions can assign the task of supervising the CHIP report as a reward for the most diligent and hardworking staff, and as an interesting diversification of their tasks.

### **2.3.3 Financing**

To finance the initiative, there should be a sustainable stream of revenues. This section will talk about different origins of financing, rather than pricing strategies.

### **2.3.3.1 Institutions**

Alexandre Caboussat notes (Appendix 4) that when EPFL stops paying one third of variable costs, it is likely that a request for the complete funding of the project by HES-SO Geneva would be successful. Serge Ayer (Appendix 7) from Fribourg is also confident about obtaining funding or sponsoring. They propose that the schools cover the cost of journey to China for the students, as an incentive for participation, and supply the wage for the supervisors and coordinators. HEG Geneva allocates 10 hours for a coordinator and 40 hours for the supervisor out of the 1847 hours allocated annually for the management of CHIP. In the engineering schools HEPIA (Appendix 6) and HEIA (Appendix 7), coaching student projects is already an important part of the professors' responsibilities. Therefore, from a coaching perspective, CHIP is seen in the same light as one of the regular semester projects. For this reason, no extra hours need to be allocated to the project.

### **2.3.3.2 Students**

The idea of student financing came up in the very first discussion (Appendix 1) with Marc Laperrouza. Talking about the difficulties the initiative has in obtaining funding, he mentioned the Anglo-Saxon system, where students need to contribute financially for their education. This logic is in contrast with the idea that education is to be state funded, which prevails in mainland Europe.

The notion of student financial contribution came up in several instances during research. Blaise Crettol (Appendix 3) from BeX argued that a financial contribution would raise the stake students hold in their project. Despite the generous budget of CHF 10,000 per project, he is in favour of the student financial commitment. In his experienced opinion, financial ownership will increase the likelihood of success for a project and improve a student's learning curve. The Karlsruhe Institute of Technology adopts a similar idea; students need to contribute EUR 300 for their journey to the partner school in China.

When asked about a possible financial contribution for travel expenses (Appendix 2), the willingness of CHIP participants to fund their participation varies significantly. Out of the twelve participants, responses range from CHF 0 to CHF 1,000, with an average of CHF 266. A similar pattern emerges from the responses of HEG-GE students applying for CHIP, which range from CHF 0 to CHF 2,000, resulting in an average of CHF 270 when excluding the outlier of CHF 2000.

For schools (Appendix 6) with low student interest in the project, assigning a price tag is not appropriate. Serge Ayer (Appendix 7) believes that if students are obliged to contribute financially to the project, it may discourage talented students with limited financial support from applying.

Student financing must therefore be approached carefully. Students would be willing to contribute between CHF 200 and CHF 300 of the total CHF 2500. The purpose of this contribution, such as the goal of increasing engagement, would have to be researched in more detail. When it comes financing the project, we would need to weigh the benefit of covering 10% of variable costs against the effect of preselecting students. Searching for 100% or 90% of the financing for such a project effectively represents the same amount of work for the coordinators as writing proposals and requests. For this reason, the effect of increased engagement is more important than the financing of the project, unless the amount contributed would cover a substantial part of the variable cost per student. However this option, in turn, would strongly increase the preselection process.

### **2.3.3.3 External sources**

Alexandre Caboussat notes (Appendix 3) that external private funding for projects in universities is a very efficient way to proceed with little red tape. Since budgets must be approved and justified, obtaining and sustaining them within the environment of an educational institution can bear risks for an initiative. If there is external sponsorship, universities will readily engage in projects as they can increase the institution's visibility and provide tangible projects to be showcased. However, when there is no external financing, issues of effectiveness are raised and can slow down the process. From this statement, I deduce that external funding is the most convenient means for an institution to finance a project like CHIP.

Nevertheless, in the same way as institutions, private external donors also have requests for the project. As Blaise Crettol (Appendix 3) notes, the support of external sponsors relies heavily on networking from individuals within the university. Different kinds of external donors can be identified. First there are special government funds, such as the Federal Commission for Innovation and Technology (CTI) or the cantonal equivalent. Then there are private foundations with certain objectives. Another external funding source could come from corporations.

#### **2.3.3.3.1 Government funds**

Governments create policies to channel money into fields of special interest and one of these fields is technology and innovation. CTI promotes innovation and

entrepreneurship in three different ways. First, it promotes knowledge and technology transfer, second it funds research and development (R&D) in situations of joint investment between industry and university partners, and third it supports start-ups and entrepreneurs. The latter is mostly about coaching upcoming entrepreneurs and start-ups. Almost three quarters of the budget is attributed to the R&D section (Schweizerische Eidgenossenschaft 2016), which requires universities to research and develop projects jointly with industry players. As a purely academic project, CHIP will not be able to access these funds without altering its underlying concept.

#### *2.3.3.3.2 Private foundations*

Various foundations promote and support innovation initiatives where government funds do not stretch. These foundations cover areas in which universities are innovating or fund projects when they identify potential benefits. Obtaining funding from these organisations is dependent on the defined criteria given by the foundation's mission. Some only grant support for Universities of Applied Sciences (Ernst Göhner Stiftung 2017), if traditional universities do not run similar projects. Support is foreseen for initiatives which enable the transfer of innovation and technology from educational institutions to the industry. Other foundations such as the Dr. Werner Jackstädt Foundation, which currently supports Startup@HSG have less specific criteria (Dr. Werner Jackstädt-Stiftung 2017).

As mentioned in the introduction, the Gebert Rüt foundation currently supports the CHIP pilot project. Normally this support is granted for a short period of time until a project is established, and thus cannot be a solution for long term.

#### *2.3.3.3.3 Corporations*

Opinions on corporate financing for educational projects vary significantly. Mr Ayer is confident (Appendix 7) that industry partners can be found to support a continuation of CHIP. The involvement of corporation in financing will inevitably change the nature of the initiative. This trend can be seen in BeX (Appendix 3), where companies not only engage financially but also through coaching. Indeed, there will be conditions attached to commercial financial support. Visibility is one of the benefits companies receive from this initiative. Evidently, corporations follow their own schedule and defend their own interests, which are ultimately based on maximising profits. It is feasible that companies would attempt to influence the nature of student projects (Appendix 9) by asking the students to work on practicable solutions to certain problems encountered in daily business operations. CreaLab (Appendix 13) has successfully worked in this way for many years. Companies and students benefit from experiencing the other entity's



viewpoints. Another comparable initiative is PostVenture (Appendix 12), in which the University of Applied Sciences Zürich collaborates with Swiss Post. These initiatives are examples of value creation education outlined by Lackéus (2017), where new ideas, concepts or products are created in a cooperation with external stakeholders. Despite possessing some evidence that this approach can increase motivation and engagement, some fear (Appendix 9) that this could decrease participant motivation due to an increase in constraints introduced by the external donor. As is mentioned by Gibb (2002) in his work on teaching innovation (Gibb 2002), providing problems to solve can decrease a sense of responsibility and ownership.

### **3. Discussion**

After introducing CHIP and analysing the data collected within the perspective of value creation for stakeholders and possible financing mechanisms, this paper will now discuss the research question.

To propose a possible solution for the future of CHIP, we should first discuss its stated goals. Since the proposals will aim at maximising the result for these goals, we must analyse them in detail. Following this analysis, the paper will propose three different models for the future of CHIP which differ from the current system.

#### **3.1 Discuss and redefine goals**

Throughout the research conducted for this paper, many questions concerning the goals of CHIP were raised. Understanding a project's goals is crucial; vaguely defined goals often fail to generate the energy and resources needed to attain a particular ambition. For this reason, I will first discuss CHIP's goals for students and institutions.

##### **3.1.1 Students gain interdisciplinary experience**

The first pedagogical approach mentioned by Laperrouza (2016) in his presentation about CHIP is the use of interdisciplinary teams. The whole project has strong focus on dual interdisciplinary working, where students learn between different professions and between different specialisations in their own field (Appendix 1). CHIP teaches students how to interact with people from other fields and demonstrates the complexity and interconnectedness of different disciplines, as well as the different personalities they have (Appendix 6). To make students better professionals in the future, they must learn to think horizontally rather than in silos. Unfortunately, the latter is closer to the academic reality than the former (Appendix 13) and efforts to change this situation are challenging. The complexity of involving different schools with their professors, divergent working methods, credit systems and coaching slows down the process and complicates communication. Nevertheless, working in interdisciplinary teams remains highly important in the business world (Wolf 2015b) and students tend to perceive such experience as valuable (Appendix 15).

As identified in the SWOT analysis, adopting an interdisciplinary approach is a major strength of CHIP. Therefore, this focus should remain one of the project's main goals, despite the obstacles it poses to the organisation of the programme.

### **3.1.2 Develop a connected device**

As discussed in the SWOT analysis, the necessity of developing a connected device is one of the only constraints faced by teams in their projects. Since the products are not designed for commercialisation, the high costs associated with developing and producing such a device are not relevant. The project is not about the commercial value of the product, but rather focuses on how student learn when working within the group. This is the view held by most people involved (Appendix 1, Appendix 3, Appendix 6). However, this notion contradicts the goal of obtaining real business exposure and developing an entrepreneurial mind-set.

As engineers work on a connected device solution, they must ultimately collaborate with other disciplines to make the device work. Consequently, CHIP represents real business exposure for engineers. This is different, however, for the business representative. Since there is such a strong focus on the physical functioning of the connected device, the business-related aspects of the project – including services, customer relations, channel management, competitors and partners – is more of a theoretical exercise than concrete exposure to business. The aspects of CHIP relevant to real business experience are more pronounced in tasks pertaining to team management and communication. A similar conflict arises for designers, who are working on a customer journey and a user experience. The notion of design thinking, introduced in the ideation weekend, is complicated by the necessity for the solution to be a connected device. As observed in the ideation weekend, this situation requires teams to search for a problem which could only be solved by such a device, rather than a solution for the problem identified. When later analysing the problem based on interview data, deviations from the initial assumptions can interfere with the predefined solution, which is a connected device.

The goal of developing a connected device is important for CHIP, since it is guarantees the involvement of the three disciplines engineering, design and business. It is however one major obstacle for the learning experience and the coherence of other goals.

### **3.1.3 Students develop an entrepreneurial mind-set**

CHIP positions itself as part of enterprise education (Appendix 1, Appendix 9), which is defined (QQA 2012) as the development of mind-set, behaviours and skills to generate ideas and to translate them into action. CHIP does not aim to create ventures, but to teach students how to create ideas and execute them. However, there are a few obstacles on the way to reaching this goal. Developing a product is just of numerous

ways to teach students to seize opportunities and progress economically and socially. In its current form, CHIP is neither a complete enterprise education initiative – since there would be many ways to teach an entrepreneurial mind-set more effectively without solely focusing on product development – nor is it entrepreneurship education. Lackéus (2017) concludes that the impact of enterprise education is weak, due to the difficulty of measuring its effect and the challenge of differentiating between programmes focused on traditional projects concerning problem solving and creativity. A possible solution proposed in this case would be value creation education, where students create new value for an external entity.

Developing an entrepreneurial mind-set is a desirable goal for CHIP. Yet achieving this target in a pedagogic environment is very challenging, as Gibb (2002) notes, since entrepreneurs learn primarily from relationships with stakeholders of intermediary organisations, banks, accountants, governments, regulators, and more. These stakeholders are not included in CHIP. The stakeholder environment in the pedagogic project consists of peers, family, supervisors and partners in China.

### **3.1.4 Exposure to the real business world**

One of the approaches outlined in CHIP (Laperrouza 2016) is that of experimental learning using “real projects with commercial potential”. HEG students applying for the project (Appendix 10) also state this as desired outcome.

The goal of imitating a real business scenario is naturally desirable, but it cannot be fully achieved within the current project format, as discussed above. Serge Ayer (Appendix 7) recognises that CHIP is closer to real life than a purely academic exercise, but is still not exactly like working in industry. Marc Laperrouza (Appendix 1) and Pablo Garcia (Appendix 9) also stress the pedagogic value of the initiative rather than the commercial one. It is true that CHIP comprises experimental learning, but the commercial potential has thus far been fairly weak, as Benedict Stalder (Appendix 12) notes. The absence of pressure to commercialise the product makes the project feel much less like the real business world and rather like an improved version of teaching. There are many advantages associated with a low-pressure environment and students are free to pursue their own project and ideas. CreaLab (Appendix 13) and PostVenture (Appendix 12) are partnering up with companies from the industry to create a real business experience. In these projects, groups of students are proposing innovative and commercially feasible solutions to practical issues faced by companies. This approach can reduce ownership and a participant’s sense of responsibility (Gibb

2002). However, if the goal is to increase student exposure to a real business environment, partnerships with industry players can be a vital solution. There is some evidence (Lackéus 2017) to suggest that solving a problem for external stakeholder increases a student's motivation and learning experience. Given that very few Swiss students plan to start their own business directly after their studies (Sieger, Fueglistaller 2016), partnering with companies which are potential future employers can provide a strong incentive for students working professionally and delivering quality work. Currently, students participating in CHIP need to convince their supervisors about their idea and progress during the project. If they needed to prove themselves to coaches from a partner company, the stakes would possibly be higher for them.

The goal of exposing students to a real business environment is desirable and could be further enhanced through changes in the structure of CHIP.

### **3.1.5 Immersion into production in China**

One of the central elements of CHIP is the product production experience gained in China and the immersion into fast prototyping and the promotion of Swiss engineering. This focus has been a founding element of CHIC and its initiators – Swissnex China and Marc Laperrouza – who have extensive relations with China (EPFL 2017). It is difficult for Swiss students (Appendix 6) to imagine how things work in China. Many companies design products in Europe and source in China. For this reason, an important goal of CHIP is to demonstrate how things are done in China and the challenges presented by outsourcing. Patricia Wolf (Appendix 13) opposes this view. She acknowledges that traveling to China represents an enticing adventure, but questions the utility of physically going there. Outsourcing to China does not follow the current trend of nearshoring and producing locally. In the future, she believes, students should learn how things can be made locally in a more environmentally friendly and sustainable way. This view is provocative, as it questions the very nature of the project. Indeed, the initial C in CHIC stands for China. Nonetheless, the focus on China represents a challenge for CHIP. The costs of travelling to China are the biggest part of the variable expenditures. René Beuchat mentioned (Appendix 6) that if there were to be several teams in Geneva, only the best performers would be sent to China to produce their product. It is very difficult to assess whether the added value of the trip justifies the expenses for the flights, the hotel, the visa and the time taken to organise the trip.

Of course, immersion into the Chinese production environment is a very interesting prospect. Yet the question of whether this goal is relevant to students is more challenging. Although supply chains are global and it is important to learn about them, a physical trip to China is not the only way to achieve this goal. For example, in CreLab (Appendix 13) intercultural projects are carried out via Skype. Nevertheless, the opportunity to travel to China is a powerful incentive for students to participate in the project (Appendix 10).

### **3.1.6 Cooperation between schools**

All supervisors and coordinators (Appendices 4-9) state the importance of cooperation between schools. The general view is that CHIP helps schools to get closer to each other and that it enables professors to meet key people who are motivated to carry out projects in other institutions. This situation could be valuable for future cooperation. Cooperation between schools was one of Marc Laperrouza's aims when setting up CHIP (Appendix 1). Such cooperation is crucial for creating the horizontal thinking required for innovation (Appendix 13) and for a more competitive Swiss university landscape (Appendix 5). Working in an interdisciplinary manner is not only challenging for students, but also for professors dealing with their peers from other institutions and fields.

Pursuing this goal is important and valuable, but at the same time it creates challenges which need to be solved.

### **3.1.7 Research innovation and entrepreneurship**

Nicolas Montandon (Appendix 5) and Marc Laperrouza (Appendix 1) state the goal of scaling up through the expansion of CHIC to CHIP. Having more teams allows resources to be used more economically. Furthermore, it would allow for research on innovative behaviour, both on the part of students and interdisciplinary groups. In the same way that the CreaLab (Appendix 13) promotes interdisciplinary and innovative projects and conducts related research, CHIC could also serve as a laboratory for innovation. Insights about innovation and creativity can be gained by observing the participating teams.

This goal is currently not formally pursued, but given the importance of publishing for researchers, it could offer perfect synergies.

## **3.2 Options and recommendations**

After discussing the goals of CHIP, this section will examine three different potential models for the entrepreneurial initiative. To answer the research question, the models need to be financially sustainable for the initiating body CHIC. Each of the proposed models has a focus on different goals, which will attract different funding sources.

### **3.2.1 Pedagogic model – operational changes**

The first model proposes few modifications to the existing CHIP concept and focuses mostly on operational changes.

#### **3.2.1.1 Goals**

CHIP will stay a purely pedagogic model with an emphasis on interdisciplinary teamwork and the acquisition of soft skills, such as communication and insights into other disciplines. Likewise, the schools will become more interconnected through this common project. The team will still develop a connected device within the same constellation of engineering, design and business. There will still be a conflict between the task of design thinking and the predetermined necessity of producing a connected device. Therefore, more time should be spent on brainstorming and ideation phases, in order to come up with a relevant problem that could be solved with a connected device.

Since the initiative in this constellation primarily concentrate on enterprise education rather than entrepreneurship education, exposure to a real business environment will take place when the groups are traveling to China to visit the factories. Immersion into the Chinese way of building devices and prototyping will be the primary focus. The trip to China will be an incentive for supervisors and students to participate in the project.

The increased number of teams will enable the CHIC administration to investigate team performance. Collaboration with the University of Applied Sciences North-Western Switzerland, which has developed several entrepreneurship tests (Appendix 11), could enhance the academic value of the initiative.

#### **3.2.1.2 Financing and operation**

The main challenge in this version of the project is the financing of the initiative. To reduce the financial burden on the CHIC administration, an add-on pricing strategy can be adapted. In this system, regions who want to participate pay a base price to access the CHIC material and in return receive access to the base documentation on Google Drive, the Trello template cards and the CHIC community online. This base price will be quite low, since even a small contribution to the sunk cost would benefit the central

CHIC organisation. With basic access, no coaching or teaching is included. There will be one short presentation of the concept and the data provided. Participating regions can then purchase the add-on principle and further services, as explained below.

Each region can decide how many teams will receive the add-on for the trip to China. This option could include all teams, or simply the one able to come up with the best functioning prototype at the time of the take-off event (Appendix 6). This add-on includes the flight and hotel reservation, visa acquisition and the organisation of a programme of activities during the stay in China. This add-on should be purchased as early as possible during the entire process as possible, as the price of flight tickets increases over time.

Purchasing the basic CHIC package grants a participant complete freedom to proceed with ideation, kick-off, milestones and take-off as desired. All material used by CHIC is at the region's disposition and they can use it or modify it according to their schedule and curriculum. In this manner, a particular part of the project such as ideation or design thinking can be integrated into the general curriculum of a school. Through this model, the content of the events will be better adapted to the general curriculum of the students and it can be spread over an entire year or one semester, contingent on regional preference. Communication will be significantly simplified, as the central CHIC administration will no longer be a part of the project. If a region does not have the capacity to organise and guide these events, CHIC offers an add-on to participate in the ideation weekend, the kick-off day and the take off day, which is also organised for the students participating in the initial CHIC programme. Specific coaching for the milestones can also be purchased. If an element is added onto the package, the staff of CHIC will organise and supervise the event. Additional supervision from the regional supervisors is not needed in this case. The price for these add-ons is to be determined by the amount of hours which CHIC administration staff spend on the particular add-on. This option allows for greater operational simplicity. The question of how to reward students with credits remains an issue to be resolved by the sending institutions, which will find an individual solution for each student.

Whether the add-on is purchased or not, it is in the interest of the sending institutions to align the requirements for the student between the CHIP project and the module the project represents. Grades or credits should be attributed based on the work performed throughout the CHIC curriculum. The aim of this strategy is to avoid a conflict of interest, in which a student is more inclined to fulfil grade requirements than the



objectives of the project itself. The central CHIC administration can issue guidelines for add-on purchasers on how to reward and grade students effectively.

In this way, the financial burden is transferred from CHIP to the participating institutions and is thus not completely resolved. The institutions can themselves request internal funding (Appendix 4), sponsoring from corporations (Appendix 7) or private foundations. Depending on the number of students interested they could price the participation for students between CHF 100-600. Requiring each student pay a small amount could increase commitment to the project (Appendix 3).

### **3.2.2 Lean pedagogic model – value for price**

The lean pedagogic model is based on the pedagogic model but does not include the trip to China. Since the trip to China is hardest part to finance, taking it out of the equation will reduce the financial burden of the project.

#### **3.2.2.1 Goals**

As discussed above, the question of whether immersion into the Chinese way of production is relevant for today's students (Appendix 6), or if nearshoring and environmentalism will soon to dominate the market (Appendix 13), is a subject requiring a separate analysis. Nobody can reliably predict the future and thus there is currently no correct or incorrect answer to this discussion.

In the lean pedagogic model, the trip to China is replaced by a partnership with a local factory, which can be contacted via Skype, phone or email. As the primary interest of engineering students is to learn about production and local prices, contact in the early stages of product development can be stimulating and add pedagogic value to the project. Prototypes can be shown on video calls or sent by mail. This process is similar to real-life scenarios, for example when a small start-up does not have the financial means to travel to factories and instead communicates online. Consequently, students can learn how to communicate effectively across cultures and time zones with the modern communication tools.

The operational set-up and thus the goals will be the same as in the pedagogic model, in which each region has students from different disciplines with a supervisor assigned to each student.

### **3.2.2.2 Financing and operation**

Removing the bulk of expenses – previously allocated for the journey to China – will reduce the financial burden of the project. The remaining costs would be the hourly salaries supervisors and coordinators, and the costs required for accessing CHIC material.

Like the pedagogic model, there will be add-on pricing, through which regions can access CHIC teaching materials for a low base price, together with access to the platforms Trello, CHIC community and Google Drive. The organisation of ideation activities, kick-off day, milestones and take-off can be separately purchased as add-ons.

### **3.2.3 Value creation model – change focus**

The value creation model proposes fundamental changes to the current model, based on the Escape Theory by Lackéus (2017). It redefines the goals the initiative prioritises and the approach it adopts to attain them.

#### **3.2.3.1 Goals**

As discussed in the pedagogic model, fostering interdisciplinary work is a key success of CHIP and will therefore remain one of the main goals of the initiative. The same is true for cooperation between different schools.

Exposing students to a realistic business environment is a fundamental goal of the project. In a purely academic environment it is difficult to attain a concrete business experience, as the problems students try to solve have little market relevance (Appendix 4). As many groups struggle to find an important issue to resolve, they often end up with projects which bringing little societal value. Benedict Stalder from EPFL Innovation Park (Appendix 12) thus questions whether students are motivated and enjoying the project. According to the value creation theory (Lackéus 2017), students will work on real projects from external stakeholders, where they create something preferably novel for these stakeholders. This approach has been shown to increase motivation and commitment, leading to the development of entrepreneurial spirit. With this approach, the two goals are self-reinforcing. Several schools are adopting this approach and launching initiatives, such as PostVenture (Appendix 12), where students solve business-related issues faced by companies. Using disruptive and innovative concepts to solve practical issues is proving successful in CreaLab (Appendix 13), where stakeholders have expressed their appreciation for the projects. For these reasons, the value creation model will prioritise real business experiences

with real problems from partners from the industry. These partners can be small entities or big corporations, start-ups, associations, non-governmental organisations or the state.

The fundamental change to the project will be the solution which students work on. To circumvent the restrictive nature of the design thinking process, there will no longer be a focus on a connected device or on production in China. The network in China could still be used in some cases, and the solution could be a connected device, but there will be no obligation to pursue either of these two goals. In the value creation model, these two goals will be transformed into possible solutions to the problem.

Another important goal will be to conduct research on innovation. Innovative student behaviour is a relevant field to study and the design thinking process, in which students search for solutions to real problems, can be analysed by observing the students during the process. Like CreaLab (Wolf 2015a), the community can consist of active problem solving and the research of problem solving techniques.

### **3.2.3.2 *Financing and operation***

As the project would no longer be necessarily linked to China, the community would need a new name which expresses a focus on interdisciplinary value creation. CHIC can serve as an interdisciplinary centre connecting universities across Western Switzerland or as a local interdisciplinary centre.

Maintaining partnerships with external stakeholders will allow the community to access various funds. Industry partners, who provide problems to solve, will contribute financially to the community and thus also provide coaching for groups such as BeX (Appendix 3). Depending on the project, funds from CTI can be requested to remunerate the hours worked by the academic staff involved in the project (Appendix 13). High transparency is need to successfully demonstrate economic and societal value to external stakeholders, as Patricia Wolf (Appendix 13) notes.

This approach would allow the community to include not only engineering, design and business students, but also several of other specialisations such as social work, health, architecture and music.

The interdisciplinary centre manages the stakeholders and the projects. Requests for problems from external stakeholders are approved by the centre. The centre will write funding requests to the relevant fund providers. These include private foundations focusing on subjects such as art, music or social welfare and government agencies

such as specific research funds or CTI. The different schools participating in the centre will finance their staff's working hours; the staff will be responsible for supervising students and assessing their grades, as is the case in the current CHIP project format.

Yet in contrast to the current CHIP project, in which all groups develop a similar solution for different problems, the new community will develop a wide variety of solutions to existing problems. The initiatives will remain pedagogic in the sense that they do not directly encourage students to start their own business, but instead to cooperate with existing entities. Using this approach, entrepreneurial spirit is developed and students can engage with companies and the process of innovation.

### **3.3 Synthesis**

As discussed in the introduction, CHIP has been launched as a pilot project to expand the concept of CHIC to different regions. The initiative has an innovative approach, stemming from its focus on interdisciplinary working groups and the use of design thinking. Some elements of the initiative's structure and the goals which it pursues could be optimized. In this paper, three different models have been proposed to modify the current goals and obtain a financially sustainable model for pedagogic enterprise education.

## 4. Conclusion

CHIP is an initiative which aims at providing a real interdisciplinary business experience, within a pedagogic framework, to students from the fields of engineering, design and business. The societal and economic value created for different stakeholders is difficult to measure, but the bigger challenge is obtaining funding from relevant stakeholders. It is difficult to justify the heavy cost structure with the current purely academic framework of the project.

This paper analyses the pilot project's strengths, weaknesses, opportunities and threats, relevant stakeholders and possible financing mechanisms. Through this analysis, the goals of the initiative are assessed. Each stakeholder involved in the pilot project possesses different interests and goals.

The three alternative models proposed for the project recommended an adaptation to the current model. Each proposed model outlines a set of advantages and disadvantages for different stakeholders.

The pedagogic model primarily focuses on operational changes. This option would create a clearer line between the CHIC administration and the participating regions. This process will oblige participating regions to cover relevant costs, including overheads and the variable costs of the CHIC administration. These numbers are currently incomplete (Appendix 1) and should be measured more precisely to create a profit and loss statement for the CHIC project. This model assigns the responsibility of financing to the involved institutions, which are the main beneficiaries of the project.

The lean pedagogic model focuses on reducing the variable costs of the project by omitting the costly trip to China. At the same time, it maximises the pedagogic outcome for students and institutions.

The value creation model proposes a radical change in the structure and nature of CHIP. It proposes an overreaching interdisciplinary centre with a focus on problem-solving for external stakeholders. This approach will add complexity to the execution, but facilitate funding. It increases the experience of real business for students and the visibility of the involved institutions.

Each model would have different consequences and the scope of this thesis is not wide enough to explore the different scenarios in their entirety. Nonetheless, the research has shown that there are many different ways of adapting enterprise education so that

it increases entrepreneurial spirit and finally value for society. The ability of innovation to drive economic and societal value still needs to be further researched, for example through interdisciplinary centres.

## 5. Epilogue – authors experience in CHIP

The epilogue reflects the participation of the author in CHIP and has been requested by Alexandre Caboussat, head of International Business Management. It is a purely subjective comment and not part of the argument discussed in this paper.

Since the introduction of CHIP at the bachelor project presentation in HEG Geneva, I was fascinated by the novelty and the adventure of the initiative. After having spent extensive time participating in, thinking about and researching on CHIP, I still believe it to be a good opportunity. However, I believe that certain goals should be reassessed and that the organisational structure should be changed. HEG should participate in a changed format of CHIP in the future.

I did not learn many things about my own field of business, since the business part of the project does not reflect a real business environment. The set-up of CHIP is not different to a pure marketing or entrepreneurship group work, where a pedagogic supervisor will judge my application of the learned tools such as business model canvas or value proposition canvas. In the spectrum of soft skills meanwhile, I have learned a myriad of things. I personally dislike classes such as “Leading Yourself”, “Leading the Organisation” or “Intercultural Communication”, because I believe these skills, unlike mathematics, accounting or economics, cannot be taught and understood as a theory. Successfully leading people and negotiating in a multi-stakeholder environment must be approached in a different way by everybody and should therefore be experienced and built on one’s personality. I believe that the theories in these fields are only the beginning to mastering the skills. Through my participation, I have trained and acquired these skills. Dealing with the different supervisors and institutions, I experienced the results of ineffective communication, conflict of interests and misaligned incentives. This is a reality not only in institutions, but also in companies.

My own incentives were stronger to write this paper, since it will count for 12 ECTS in my diploma, than to work on the project CHIP itself. I therefore spent more time interviewing the relevant people for this analysis, than designing a fictional solution interview to test the connected device solution we have already decided on. Keeping the team together, despite frustrations and confusing feedback was a real-life challenge. I cannot comment on the trip to China yet and its utility, since we will leave one month after the submission of this paper. Surely it will be a great adventure and I will comment on the usefulness afterwards.

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# Appendix 1: Interview with Marc Laperrouza, 7.2.17

## *Environment of CHIC*

### 5 Values

- create Value: set up CHIC
- distribute Value: set up the pilot with HES-SO
- capture Value: get feedback and make the system better
- defend Value: create a competitive advantage (porters 5 forces)
- sustain Value: create a scalable, repeatable business model

### What CHIP tries to do:

- make Institutions work together (HEPIA, HEG, HEAD)
- dual interdisciplinary approach for students (within profession, between different specialisation)

## *Target*

Find a solution for the time/credit issue in the institutions (minor?)

Provide evidence that value is created.

Find a way to pay for it. Currently the variable cost (without overhead) is CHF2500/Student

Possibly provide tools in case of misunderstanding or issues in teams to resolve them. Teach teams how to create a psychological safety. There was a project to do so with extensive surveys providing Feedback Map, where each team member had to rate different points as having resources to go on (time, money), understanding what to do next, understanding the target, share the view in the team ect.

- **Provide different options how CHIP could be proceeded**
- **Demonstrate the value created for the various stakeholders through the value proposition canvas.**

## *General Comments/ open Questions*

If compare, compare it to other initiatives that will actually create a product and not a service. (what is the wider difference of creating an app or a tangible product?? – engineer? Complexity?)

97% of EPFL students will work in industry but receive a lot of tools to become academics. **CHIC is in this case a difference**, since it actually offers **real life experience**

Possible outcomes after this pilot

- Best case: The institutions love it and want to continue it.
- Worst case: The institution think it was wasted time, nothing gained.
- Uncertain case: The institutions like it and want to do it themselves, they think they can do it better, it's less complicated.

Fribourg has no designers – what to do about it?

Should the platform CHIC itself stay within EPFL or not? If it doesn't stay, how to outsource it. Could it become like an umbrella brand that is replicated in other places (there is interest from Tsinghua, Korea and different other places) If so, how does the business model and the value proposition looks like? Form of creative commons, big platform/CLUB to subscribe, pay hours..., the general aim is to reach a critical mass to enforce the branding, share knowledge and experience, decrease marginal costs.

→ from the beginning, they were really careful to brand it with EPFL. They do not contribute with their Mandate from Rûf Foundation to the normal (20%-60%) overhead costs

### *Steps to take*

Marc Laperrouza will send me the surveys already conducted with the students that have done CHIC. I will absorb the relevant information for my project

Another further questioning of the students will be done in cooperation with Marc not to bother the students.

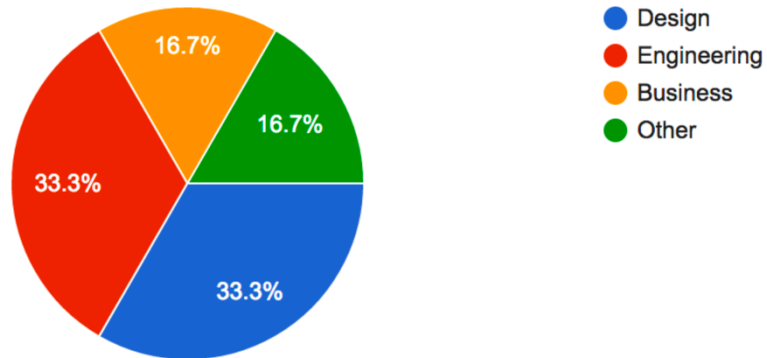
Contact Valais HES-SO BEX (Business Experience Initiative) to understand their initiative, with a different approach where they put 10'000CHF on the table and expect something working in the end.

Interview the current participating institutions to check for the real reasons and interests they are participating in CHIP.

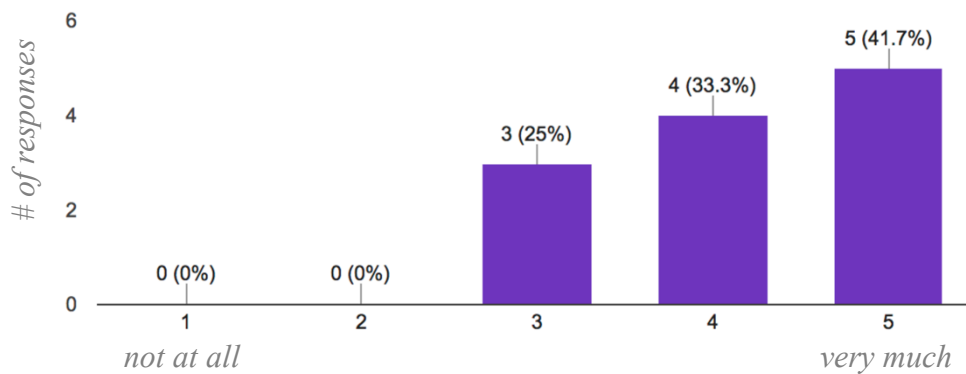
## Appendix 2: Survey with CHIP participants, 18.02.2017

The following interview was performed during the kick-off day in Lausanne with 12 participants from the regions Geneva, Fribourg and Ticino.

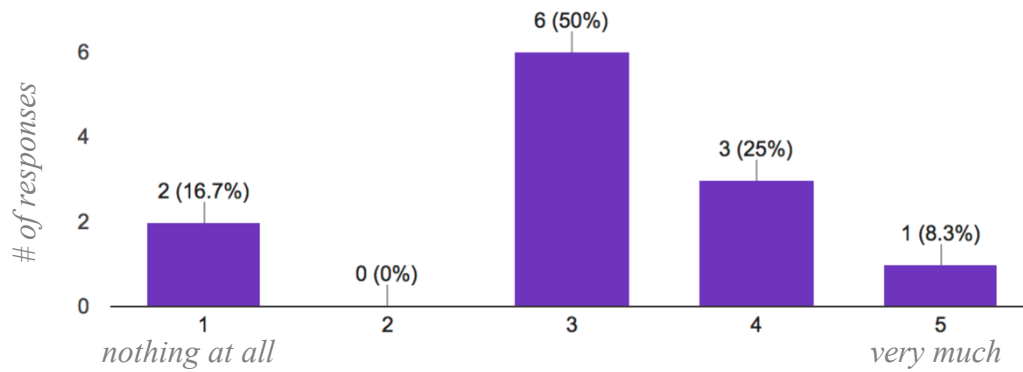
I represent... (12 responses)



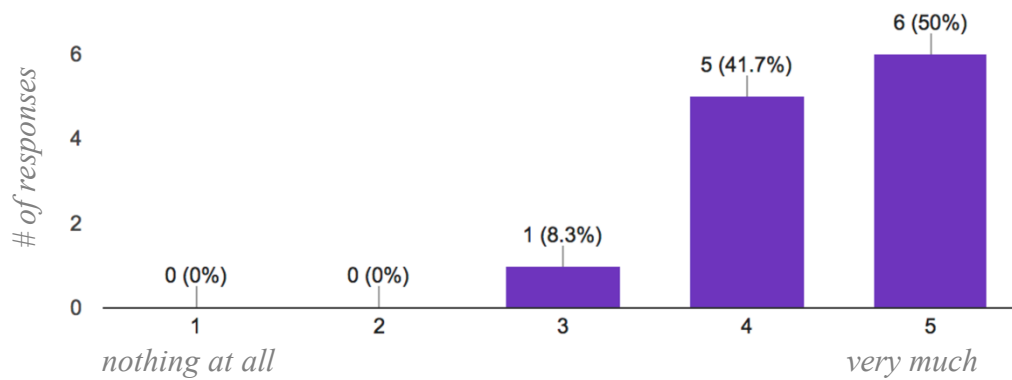
I enjoy CHIC (12 responses)



### I have learnt from CHIC (12 responses)

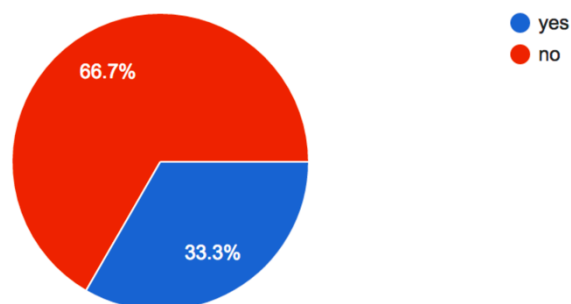


### I think I will learn from CHIC (12 responses)



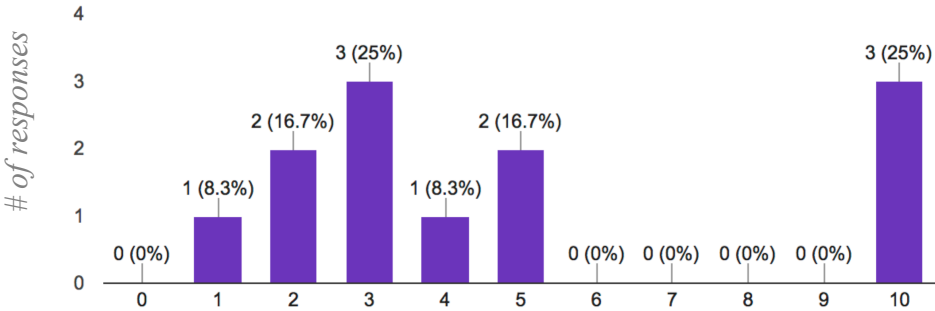
### So far, my participation in CHIC has caused an increase in my likelihood of starting up my own business

(12 responses)



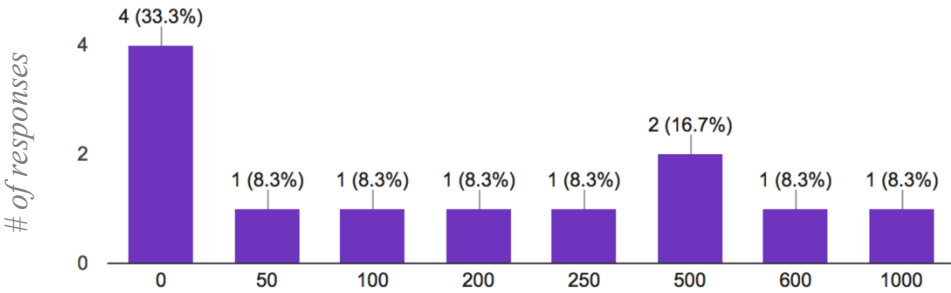
**In my institution, there are .... people who would be able and motivated to join a CHIC team**

(12 responses)



**If I had to contribute to the costs of CHIC to participate I would be willing to pay CHF.....**

(12 responses)



## Appendix 3: Interview with Blaise Crettol, 6.03.17

Mr. Crettol joined BeX in September 2005.

### *How did BeX start? Who was the driving force behind it?*

Business eXperience started out of the wish to make entrepreneurial education more tangible for business students. In a project in 2003, the business administration students were given the task to sell ties online. The Idea was to practise some business experience for the students.

The responsible realized that the project was providing a good experience to the students. To improve the programme, they split up the class in groups of 3 to 4 people. In this way, every student was to participate.

In 2006, the tourism and the business information technology department, who were like the business administration department part of the school of management and tourism (HEG), joined the project and the interdisciplinary spirit of the programme was created.

Five years after the beginning of the programme the school of engineering, with systems engineering, energy and environmental engineering and the life technologies joined the initiative.

In the future there will be discussions with the school of social work to join BeX.

### *What do you believe to be the strong and the weak point of your initiative?*

Positive: interdisciplinary of the programme.

Negative: Students could possibly be more implied into the project. Students receive generous financial support for the project. The aim of the initiative is to put them into a real life situation of a start-up. In order to increase their stake in the project, a contribution in financing would surely be very effective.

### *Regarding your website, each group has a budget of 10'000 CHF. How do you finance and manage this sum?*

Since the school is not allowed to hand out money to students, the Institute for Entrepreneurship and Management created the Association Business eXperience. As any association, there is a general assembly, which is validating the work done and taking decisions about the programme and the financing. The board consists of the founder of the association.



- President of the local political district
- Representative of technopôle
- Representative of HES-SO (Mr. Crettol himself)

There are several interest groups donating in form of money or time of professors to the association. These are

- The canton of Valais
- CTI (commission pour la technologie et l'innovation) from the swiss government
- Raiffeisen (which is terminating it's support)
- A private foundation with the aim to promote entrepreneurship
- Technopark Sierre
- HES-SO
- The different departments (business, engineering, tourism...)
- FIDAG Fiduciare (which is offering their services for free to the association)

The association in turn is managing the option programme in which students can choose to participate. Depending on their field of study the ECTS can be validated for their degree. The number of credits to be transferred depends on the field of study, and the individual case of the student and the involvement into the programme. This is also subject to constant change, as the different departments are changing their curriculum. Currently the life technology section isn't getting any credits for their involvement. Nevertheless they participate, as it represents a unique opportunity for them. For the business administration department, which was the initiator of the programme, students receive around 15 ECTS. For the tourism section it represents the obligatory internship, they have to absolve and is equivalent to 3 days work per week.

*How do you account to your donors for the investment they have made?  
How do you quantify the value created to the different stakeholders?*

There is no clear and easy return on investment for BeX, due to the fact, that it is primarily a pedagogic initiative and learning is hard to quantify and value.

For the academic stakeholder, the students will receive grades that will be validated in their semester. The students are working in groups on a Business Case and later on a Business Plan. There is a group grade and in the end a personal assessment in an oral interview.

For the external stakeholder, it is fairly difficult to demonstrate value created. There is a report in which all BeX businesses can be found with the description of their outcome. In one year, there are normally 6-8 projects that are started, out of which 2-3 will

continue to exist during the programme. Out of these, 1-2 will be converted into a company (sarl) after the project. This represents value to society. In a second step, there is a list of participants to the project, who are active in their BeX start-up (direct) or in another start-up (indirect). There is no further assessment of value created. Since the project is rather about an experience and about a learning process, capturing the value creation is highly complex and risks being irrelevant if quantified in pure numbers.

For private donors, BeX offers visibility with the logo displayed in communication, in news releases and on the name of the prize for the best group. Also there can be a Web TV with the name of the sponsor and the sponsor can benefit from advantageous prices for certain educational offers by the HES-SO.

Since the Raiffeisen Bank has left the group of sponsors, there is currently an active search for new contributors, with which there will be a 3-years contract. This is a difficult exercise, exactly for the fact, that the value created is difficult to quantify.

#### *Which other schools than the HES-SO Valais participate in BeX?*

For the business representatives of the teams, there are other HES-SO HEG's that offer BeX as an option. The number of credits might vary in these cases.

#### *You are this year participating in CHIP, what is your impression so far of the program? It's weaknesses and it's strengths?*

CHIP and BeX are working in the same direction but do not share exactly the same objective. Whereas BeX has the intention of launching a company and encourages the students to do so, CHIP does not foresee this mechanism.

BeX tries to find two things:

- if the student has the entrepreneurial spirit or not and
- if the idea they had for a business is viable or not.

If students get a positive confirmation for both of these questions, they are allowed the benefit from an intellectual property (IP) transfer in the 6 months after the project to start up their own company (sarl). CHIP in contrary has no intention to produce any start-ups. It is purely an experience in interdisciplinary work.

Another difference is CHIP's focus on engineering and a tangible product/device. BeX produces more often services and applications than tangible mechanic devices.

One of the main risks of CHIP could be the intellectual property. Students from BeX participating in CHIP were reluctant to produce in China in fear of IP theft.

*As representative of the successful BeX association, do you have any recommendations for the young CHIP program?*

There is a financial question in the CHIP version with the HES-SO. There is a risk that the partners, especially EPFL do not continue to pay for the participation of HES-SO students.

In order to find good financing, the right institution or company has to be identified. In a second step, the right person should be found and then an appointment can be made. Having long-term contracts with sponsors makes the operations more steady and smooth.

There is some evidence from BeX that the experience helps students to find jobs, since they can present a practical and interdisciplinary word. All students are receiving a certificate of participation in the project. Some students will ask for it when they are looking for a job.

In order to make interdisciplinary projects work you need a lot of flexibility to– you have to accept the special and strange things.

## Appendix 4: Interview with Alexandre Caboussat, 7.03.17

Mr. Caboussat is Coordinator for HES-SO HEG Geneva

*What are the benefits for your department International Business Management (IBM) in participating in CHIP? Which needs are you covering with this programme?*

Despite being very sceptical in the beginning, IBM joined this initiative for different reasons.

There is a fit between CHIP and IBM in numerous ways:

- Strategic direction towards emerging markets (major in Business in Asia)
- International approach, like the name of the programme IBM states
- Spirit of entrepreneurship and creation (course in entrepreneurship)
- Incentive from HES-SO and Swiss Confederation to do interdisciplinary projects
- Both are young programmes and have a similar way of functioning and communicating.

Collaboration between the IBM Entrepreneurship class in HEG and HEPIA brought the topic on the agenda. It was through HEPIA that the department of IBM was informed about the CHIP initiative.

Collaboration with CHIP can benefit IBM in various ways:

- Make the Global Business and Asian Markets major option more mature
- Get closer to EPFL, and their wide knowledge and contacts
- Offer an opportunity to students, connected to China
- Develop the social and technical competence of the student participating
- Have a smaller scale alternative to the HES-SO Innokick Master within IBM without offering it as a major within the IBM degree
- It is fun

Another factor is visibility of IBM within HEG and HES-SO, the visibility of the three to the outside world and the people deciding over funding them. Interdisciplinary and Internationality is a criterion for funding. This could be a showpiece to collect funds and explain why the things we do is very relevant.

*Do you have a balance sheet of your participation in the initiative? If yes, can I see it?*

The variable costs for CHIP are approximately CHF 2500 per student. Currently EPFL is financing 1/3 of the sum and in Geneva, the HES-SO Genève or, alternatively, the schools HEG, HEAD, HEPIA themselves agreed to pay remaining 2/3, since it is interdisciplinary.

Additional costs are the supervisor and coordinator hours, which are provided by the schools (HEPIA, HEG, HEAD). For Mr. Caboussat as coordinator for the HEG, this represents 10 hours out of the 1847 yearly total. For the supervisor of HEG, this amounts to 40 hours. However, every school is different in this matter.

*How much would you be willing/able to pay for such participation?*

In case EPFL would stop paying their third of the variable costs, it is possible that a request for the complete funding by HES-SO Genève would be successful. Currently the request was done for CHF 11'000 and requesting CHF 15'000 would be not too different. It is important to talk to the right person and using the right arguments.

However, taking the lead and coordinating the whole project (Initiation, Kick-off, journey to China, connections to factories) and the overhead would not be within the scope possible for the HES-SO Genève. There is no resource to pay for the coaching of the whole programme CHIP.

For all of this to be true, there should not be more than two teams in Geneva. If there are to be four teams, the whole question of centralizing and planning will be more complicated.

*Where do you believe value is created in this project and for whom?*

For the student: real life business experience, interdisciplinary and social skills

For the institution: collaborate with other schools, find the right people within the other institutions that are keen on starting new initiatives

Concerning the product itself: it can be some of value, or not. This is not the main focus.

*Entrepreneurial education's effect is difficult to measure as we can see in the literature. How would you as a mathematician go about proving the viability of such a vague pedagogic venture?*

To measure effectively you need the right KPI's.

Possible options:

- Number of failures along the way: in a given project
- The time to recover after a failure
- The number of successful restarts
- If you would do it again to prove that you still can do it

→ For this topic: Ask Mr. Montandon what are benchmarks for entrepreneurs, like an entrepreneurial spirit test.

*In the EPFL-ECAL-HEC triangle, CHIP represents a minor option. Do you consider this for IBM, if the project is to be continued?*

Having CHIP as a minor option poses several issues:

- Minors are only equivalent to 6 ECTS and only during one semester. 12 ECTS as the bachelor project represents is the right price for a student to be motivated in the project and allows asking for a decent amount of work.
- Having a sequence of minors (taking a autumn and spring minor for the project) reduces the flexibility that is at the core of minors to explore very different fields. It would be like putting all eggs in one basket.

*You know EPFL and CHIC fairly well, what is in your opinion the strong and weak point of this initiative?*

Weak: The programme is not mature yet and hence relies too much on key people.

Strong:

- It is very ambitious in what it tries to achieve.
- It has a compact content in actually going to China and really producing the device. This is a major difference to the Innokick Master offered by HES-SO. It's a good thing for it to be this way.
- Furthermore it puts people together that wouldn't work together otherwise.
- There is high visibility with the powerful EPFL branding. Everyone wants to work with the best.
- Not completely new. Participation in the 1<sup>st</sup> round would be questionable.

*How do you estimate the reputational risk for EPFL, when collaborating with the HES-SO?*

This programme is only pilot and therefore no long-term commitment. In the course of the collaboration, the people in charge of CHIP noticed, that working with HES-SO Genève is no risk to them. Possibly not everybody within EPFL would agree with this.

*Do you have any recommendations for CHIP or for my bachelor thesis?*

CHIP: The label CHIC and CHIP are highly confusing. It would be an easier branding to use CHIC only. This would help the branding of the programme.

Thesis:

The key point in sustainability is the question how to get the money to pay for it.

An example to illustrate this is the Euler Course for kids with high potential in Maths at EPFL. These kids represent a minority and sponsorship is necessary. When the programme has the sponsorships, nobody within EPFL will complain about it or doubt about its usefulness. On the contrary the people like the initiative. If there is no sponsorship there will be a big question whether it is a worthwhile to spend all this effort. The same is true for CHIP. If you are on the margins, there will be a lot of questioning. For this reason it would be easier to be self-sustainable with sponsors.

Another big question is how to make it repeatable without the involvement of Marc Laperrouza. If he abandons CHIP it will be difficult to sustain on itself as a programme. Therefore, a solution to this weakness should be searched. A possible successor is Pablo Garcia del Valle. There is a positive correlation however between reliance on people and their commitment in initiatives such as CHIP.

Currently, EPFL is going on the wave of outreach. Despite no evidence for it to start soon, we should think about the possibility of a consolidation stage later on.

## Appendix 5: Interview with Supervisor Nicolas Montandon, 10.03.17

Institution: HES-SO HEG Geneva

### *How did you become involved into the CHIP project?*

Marc Laperrouza contacted our head of department Mr Caboussat. At the occasion on our regular informal meetings, he entrusted me with the project since it was something new and interesting for the department. We both went to the first session at HEPIA with no expectations.

We later decided to make it part of the bachelor project, since we needed a way to reward the student with sufficient credits. We could have also invented another option like a minor.

### *What do you perceive to be the objectives of CHIP?*

From the institutional point of view it's an experiment to develop creativity and sandboxing tools, through interdisciplinary student participation. We hope to improve the teaching abilities for the course entrepreneurship. Furthermore it reinforces cooperation between the different institutions/faculties within Geneva and in other regions.

Objectives on student's side are to identify and encourage an entrepreneurial capabilities and mind-set and to help developing the skillset to increase the likelihood of success. This approach includes the multidisciplinary aspect of it, compared to a course with only business students.

CHIP's mission is also to serve as vector for the main stakeholders to fund research – it's comparable to a laboratory to experiment with human behaviours, group work and the interdisciplinary approach to innovation. The initiators also might have the need to publish papers. In this way they can integrate bachelor and master teaching experience into research and learn about teaching techniques.

### *What personal benefits do you expecting from your participation as supervisor? What are your personal objectives?*

From a sober point of view, the investment in terms of time and effort with respect to the personal reward is not particularly lucrative. However, there are many reasons why this is a good deal for me. There is the opportunity to meet new people, to go to China, building something new, all of which is motivating for work. Moreover it is also fun to



test this new initiative, which makes the days more interesting and I never get bored at work. Also we can team up with prestigious institutions – that’s highly interesting.

It does bring another perspective on how projects can be run and the tools to do so, which is something I can transfer to my work. In a reciprocal way I can also help develop the initiative with the experiences I already have. This effect would only diminish after several years.

Finally it is also personal satisfaction to be part of growing stage of the students.

*Have these expectations been confirmed so far? What have you learned from your participation in CHIP?*

Yes, the expectations have been confirmed.

I am surprised how structured the process is and curious in the same time, whether constant guidance through Trello, in a very organic environment such as product development, will actually lead to acceleration of the process.

*What is the value for your institution in participating in CHIP? With respect to which aspects is CHIP in line with the educational objectives you pursue?*

Through this participation, we open up our school to other higher education institutions, which is ultimately important, since we have the same funding.

There is a feeling of constructive co-competition, as there is always some kind of competitive behaviour between different participating institutions. We help each other and compete in the same time.

Since students and supervisors cooperate with the prestigious institutions on this very applied interactional initiative, relations that reinforce the general quality of school are building up. This makes Switzerland’s higher education landscape overall stronger.

The programme is in line with our focus on international business, global supply chains and the trend to use capabilities wherever they are found. Following this idea, we have the engineering and the designing here and the production in China. In another element it also focuses on intercultural skills in the dimension of different countries (Switzerland-China), different institutions (University – HES) and different domains (designer, engineer, business).

*Why do you think EPFL is interested in opening CHIC to other schools (HES-SO)*

In this way they can run an experiment, gain insights and evolve faster through having more iterations. The final aim would be to achieve economics of scale and cost sharing.

Concerning the scientific side, it is beneficial to have 3<sup>rd</sup> parties to improve the process

*What do you see is their risk?*

There might be a perceived downgrading of their reputation, since we are outside of the top names working in that region. There is the possibility of dilution and the risk that the new participants don't want to share the costs.

*What do you think can your student learn from CHIP in terms of skillsets (soft, interdisciplinary, hard)?*

The student learned how to work with other traits/professions (professional cultures) and has to deal with different constraints and the complexity. Furthermore it is an opportunity to go to another place.

*Would you like to participate in CHIP again? Why?*

Yes of course, for all the reasons stated above.

*How many students from your department would be capable and interested in participating in CHIP each year?*

From the International Business Management department there would be 2-3 students. Possibly there could also be interest from the department of Economie d'Entreprise.

*If students had to contribute financially, what do you believe to be a reasonable price to encourage engagement without discouraging participation?*

The full cost of plane and hotel are around CHF 1500. I think students can be asked to contribute around CHF 1000.

## Appendix 6: Interview with Supervisor René Beuchat, 22.03.17

Institution: HES-SO HEPIA Geneva

*How did you become involved into the CHIP project? What do you perceive to be the objectives of CHIP?*

Last year students from EPFL requested me to be their supervisor in CHIC. I haven't heard from this project before and I didn't know Marc, since we are not working in the same department in EPFL. The students' initial explanation wasn't very detailed, but during the process of supervision I got to know the concept of CHIC.

There were two ways I heard of CHIP. One is through my connection to Marc that I had through the supervision experience and the other way was through HEAD, which had also been contacted by Marc if they would be interested to join CHIP. In summer 2016 we organized some sessions to talk about the option to participate in CHIP and the implication this would have with a team from Geneva. Potential coordinators and supervisors participated in order to inform all potential stakeholders accurately.

In HEPIA, I am the only person supervising and coordinating CHIP. Thanks to this lean structure, the costs are low and the work can be done very efficiently without any extra layer that complicates communication.

To understand the objectives of CHIP, we have to go to its creation. There is Swissnex China, which promotes, connects and facilitates business between Switzerland and China and there is Marc with extensive connections to China. For Swiss students it is difficult to imagine how things work in China. It is a reality today that companies design/market in Europe and source in China. Therefore it is important for students to understand how things are done there and what challenges outsourcing brings. That is why Marc within Unil, located in EPFL offices, initiated CHIC as an interdisciplinary project for ECAL, EPFL and HEC.

The objective therefore is mostly pedagogic and not yet commercial. It teaches students how to interact with people from other fields and demonstrates the complexity and interconnectedness of different disciplines as well as the different spirits they have. Interdisciplinary is reality in today's workplace and we shouldn't teach students to think in silos, but horizontal. In this way we create better students and better future professionals.

*What personal benefits do you expect from your participation as supervisor? What are your personal objectives?*

I enjoy working with students on projects and giving them this real world opportunity. Furthermore I get in touch with the other schools and the people in these schools. Beside CHIP there will be opportunities to collaborate. It is a pity that the Geneva University doesn't participate finally.

It is my objective that our Geneva team comes up with a good result – a working product. This will be a satisfaction and a justification for the effort spent on the project. We can use it as a showcase and it could prove our decent coaching and the learning effect from the project. If the return is positive in this sense, the project could be repeated in the future. Having teams from the Lausanne triangle working on similar projects is a benchmark. We can measure our students and us with an institution as EPFL.

*Have these expectations been confirmed so far? What have you learned from your participation in CHIP?*

Up to now the students work well and there is good team spirit. The students enjoy the participation, learn technical skills and communicate better, since they have to simplify their explanations for non-engineers. Compared to projects that don't participate in CHIP, they are slower in their process. So far they have developed some elements and done various feasibility analysis. The part of realisation will come now, where they will start to build the product.

The aspect of communication between the schools with different domains and among the students is working well. It is interesting to see how the students are working and so far, this has been a good experience.

*What is the value for your institution in participating in CHIP? With respect to which aspects is CHIP in line with the educational objectives you pursue?*

There is a good fit between the two. We have a course about project management, since we believe this to be important. However our students don't appreciate this knowledge, nor do they see the value of such skills. Through a project like CHIP, students experience first hand why project management is relevant and how it should be done. Engineers need to leave the technical field sometimes to see the other aspects. So far they experience it very positive to work together.

*Why do you think EPFL is interested in opening CHIC to other schools (HES-SO)*

In my opinion it is first and foremost Marc who wants to open up the CHIC project to other schools. He believes in the concept of designing/engineering here and producing in China. Since CHIC is working well within the Lausanne triangle, why shouldn't it be expanded to other schools? Through connections he got to the HES-SO Fribourg and later also considered Geneva, Ticino and Valais. Many things happen thanks to personal connections in other institutions.

The idea is to make the institutions pay for their variable costs. His mission is to establish this interdisciplinary camp in Lausanne, but nothing stops him to expand it. The budget for setting it up has already been allocated and invested accordingly. Other professors like me are simply paid to supervise students in projects. It is essentially no difference for us to supervise a project like CHIP or any other project.

It will be interesting if all students from the different regions can meet to exchange their ideas and experience before we all take off to China.

*What do you think can your student learn from CHIP in terms of skillsets (soft, interdisciplinary, hard)?*

As mentioned above, the interdisciplinary skills and the horizontal thinking compared to the silo thinking are important points.

Furthermore there are project management tools such as trello and the CHIC community platform with a tight project schedule that needs to be managed. This is a good training for the workplace. It also simplifies supervision.

*Would you like to participate in CHIP again? Why?*

I would participate again and I will learn every time different things because the people, the product and the environment are changing. I can see how we get better in what we are doing.

*How many students from your department would be capable and interested in participating in CHIP each year?*

Our department of information technology has 30-40 students each year, of which approx. 15 specialize in software and complex systems, 10 in communication, multimedia and networks and 10 in hardware technology. The two students participating are from the latter specialisation.

When confronted with the opportunity for CHIP, four students initially showed interest, but only two applied. We can only speculate about the reasons. It could be a lack of open-mindedness, a disinterest in traveling to China or the fear of working in a group with people from other disciplines.

From the possibility of supervision, we could have 2 to 3 groups in Geneva.

*If students had to contribute financially, what do you believe to be a reasonable price to encourage engagement without discouraging participation?*

Since we don't have enough students interested in the project in the first place, putting a price tag on it is not appropriate. In general, I don't think we should charge students for their participation. If the budget is too tight, we could start with different groups and only send the ones to China that come up with a good functional prototype.

I think every school should be able to provide the funding of approx. CHF 6'000 for the journey if there are motivated students. The other costs of supervision are already within our responsibility of teaching. If the financing is getting too complicated and has to come from too high up in the hierarchy, there will be more stakeholders involved that question the project. If HES-SO Genève pays for it, the music and social work department won't have any benefits and therefore be likely to oppose it.

## Appendix 7: Interview with supervisor Serge Ayer, 27.03.17

Institution: HES-SO HEIA Fribourg

*How did you become involved into the CHIP project? What do you perceive to be the objectives of CHIP?*

Marc Laperrouza had a connection to the HEG in Fribourg, which then contacted me. I was interested in the project and now I have the role of coordinator in Fribourg and supervisor for two students. There are six engineer students and one student from business. Each student has a supervisor he/she sees each week and there is one weekly meeting for the whole group with me as coordinator.

The engineer students participate in CHIP as part of their semester project 6 and their bachelor project. In the first weeks they have one day every week to work on the project and in the second part of the semester they will work full time on the bachelor project. In so far, it is not an enormous change to the normal course, except that they are working for both projects on the same topic.

The objectives of CHIP are the immersion into an interdisciplinary group, where working with different students from different fields is closer to real life than a pure academic exercise. Nevertheless it is still pedagogic and not exactly like working in the industry. The project covers all aspects of studies and combines technical skills and soft skills like project management and leadership. It is an overreaching approach.

*What personal benefits do you expecting from your participation as supervisor? What are your personal objectives?*

As it is true for the students, we professors also have to work together with other professors from other fields. We need to think out of the box and this collaboration might lead to other opportunities in the future.

Furthermore I can see how the students are working and organizing themselves in a group. It is insightful to see the group interaction, because apart one project in pairs, students normally work alone on projects. The challenges and obstacles of group work in this interdisciplinary context appear and students learn to combine the soft skills and the hard skills. Despite having project management and methodology classes, most of the tools are already forgotten.

*Have these expectations been confirmed so far? What have you learned from your participation in CHIP?*

We are slightly behind the schedule since we have only started some weeks ago. I will better be able to answer to this question at the end of the project when returning from China. So far, all has been as expected. The students however still don't have the sense of urgency to work and collaborate in the group.

*What is the value for your institution in participating in CHIP? With respect to which aspects is CHIP in line with the educational objectives you pursue?*

CHIP is not the only interdisciplinary project we are involved in. Our school is focussed on practical work and we favour this kind of projects. Similar involvements are the following.

The HydroContest is a competition in Lausanne every year, where students participate in a boat race. Through the effort of different engineering disciplines, they will aim to speed up the boat.

Solar decathlon is a big biennially project, where various fields of engineering and architecture design a self-sufficient house with solar technologies. This autumn, they will take it apart piece by piece, bring it to the place of competition (this year the USA) and reassemble it. There it will compete on different KPI's against other projects from all over the world. The budget for this project amounts to a six-figure sum.

For the cadre of CHIP, it is reasonable not to be in the form of a competition. Finding suitable KPI's to compare these widely different projects will be a challenge. The budget for CHIP is acceptable and we advertised it with the journey to China. Students like this kind of projects and it is much more applied than some of our courses. If the project is to be repeated, we might try to find a sponsor for our team.

*Why do you think EPFL is interested in opening CHIC to other schools (HES-SO)*

In my opinion, it can reinforce the project, if other groups from other schools participate. For CHIC there is a base investment, which has already been done. More volume, more groups can be a justification for the investment done. How the investment into students from competing institutions is justified, is an EPFL internal political question.

*What do you think can your student learn from CHIP in terms of skillsets (soft, interdisciplinary, hard)?*



Apart from the obvious technical skills, students learn soft skills like project management and leadership. The decision-making process poses serious challenges and we have installed a structure which will improve this. Another part is the understanding of constraints of each discipline and the impact it has on the other disciplines. Students have to make the effort to understand the others obstacles and difficulties and develop respect for the others' field.

*Would you like to participate in CHIP again? Why?*

If this year is a good experience, I believe it should be done again. We can find a way to handle the budget. I favour the prospect to giving our students this opportunity.

*How many students from your department would be capable and interested in participating in CHIP each year?*

This year we made the promotion for the project and selected all the students interested in the project. There have not been more applicants. At the presentation of the bachelor thesis in autumn, we will present the result. This and the word of mouth advertisement from the students will possibly increase the application for another year. Currently two students represent each discipline of engineering. Since we don't have a design school in our area, and didn't want to complicate the administrative process for the pilot, we don't have designers. There is one professor with experience in design, which is supporting the group. If there were another student to be found from a school such as ECAL, which could easily take part in the weekly meetings in Fribourg, this would be a good solution for another group.

Given the size of the school, we wouldn't include more than ten students. If there would be this number of interested students, we could form two groups of five. I favour one group of max. seven people or possibly two smaller groups for Fribourg.

*If students had to contribute financially, what do you believe to be a reasonable price to encourage engagement without discouraging participation?*

Asking for a financial contribution would automatically pre-select the students interested for the project. I am not sure whether the ones willing to pay will be the ones, which would perform best.

*Do you have any other comments?*

As far as I can judge now, the students are motivated even though they should work more on the projects. They seem not to have the sense of urgency for the milestones.

Also, the Trello cards are not always in line with our timing, which poses a challenge to the planning. The cards are progressing too quickly sometimes. In one case the specs were asked before the requirements. In our planning there are normally first the requirements, then the risk analysis and then the specs. This is to say, that the cards are not adapted to our specific case.

## Appendix 8: Interview with Supervisor Camille Scherrer, 28.03.17

Institution: HES-SO HEAD Geneva

*How did you become involved into the CHIP project? What do you perceive to be the objectives of CHIP?*

As teacher in the Media design Master, Lysianne thought I would be a good supervisor and asked me.

*What personal benefits do you expecting from your participation as supervisor? What are your personal objectives?*

I will learn from other fields teaching workflows, production timings and team working solutions (trello etc..). I'll surely benefit personally from this experience.

*Have these expectations been confirmed so far? What have you learned from your participation in CHIP?*

Yes!

*What is the value for your institution in participating in CHIP? With respect to which aspects is CHIP in line with the educational objectives you pursue?*

It will be a vitrine for our design skills and "savoir-faires", educationally speaking it will bring super skills to our students that a "normal" course wouldn't bring.

*Why do you think EPFL is interested in opening CHIC to other schools (HES-SO)*

They surely want some competition!

*What do you think can your student learn from CHIP in terms of skillsets (soft, interdisciplinary, hard)?*

Timings between the business part and engineering part. They have to find their position and be strong about their ideas, which is not simple as they create ideas and not solutionate.

*Would you like to participate in CHIP again? Why?*

I'll tell you after the trip to China :) (but yes, as it's a really different teaching approach and we meet new teachers from other schools that may lead to other great collaborations..)

*How many students from your department would be capable and interested in participating in CHIP each year?*

They do not all have enough design skills and autonomy, so maybe around 5 (among ~15)

*If students had to contribute financially, what do you believe to be a reasonable price to encourage engagement without discouraging participation?*

250.- would be reasonable.

## Appendix 9: Interview with Pablo Garcia - Coordinator of CHIP, 28.03.17

*How did you get involved in CHIC? What is your role?*

I am an entrepreneur myself, I like to put together different disciplines and develop products. There are many things to manage at the same time. There are the students, the supervisors, the institutions with their own calendars and the campuses, which are sometimes in different locations. I am happy to be involved.

*How much time do you spend on managing CHIC?*

There are a lot of things to do, follow up the teams, organize the events properly and update the documents. All of this should normally take me 2-2,5 days per week. However it turned out that it is a challenging to manage so many teams and different requirements, coming myself from a technical background. In reality, the time spent is closer to 4-5 days a week. This is also due to the dynamic way in which we operate. Every year we are evolving the project and update the documents. We are trying some new project management tools and processes. But still, we don't want to micromanage and it's hard to implement some ideas, since we are in Lausanne far away from the teams.

*How is the relationship between the local supervisors and you as a CHIC coordinator?*

Every supervisor is handling it different. Some want to see the students once a week, some three times a week and some other they leave the students really free. Normally we will communicate to the supervisor and he will implement the process accordingly to their specific calendar and characteristics. The idea is to be able to deploy CHIC everywhere in other schools. If a school likes the concept of CHIC, they should be able to receive a complete set material (Trello, platform, tools, calendar, events) and they can follow the methodology. We therefore have to select the processes that are useful to develop this system.

*The names CHIC and CHIP are confusing, do you plan to change this to something like CHIC and CHIC x?*

We decided to drop the name CHIP. In all documents and on the google drive, we just use the branding CHIC Geneva, CHIC Ticino and so on. On the one hand we don't want to make an explicit separation with CHIC and CHIC x, since it might imply the difference in quality. On the other hand there is a question internally at EPFL, whether

we should differentiate the product we have in Lausanne and the product we offer to other Universities. It's easier to go on like this for the moment. We might be to pivot in the future if there are complaints about this.

*Now, the branding is the same, but the financing is still different between the Lausanne triangle and the pilot teams?*

When we presented the programme, people wanted to migrate it to their universities. After this initial idea to scale up the project, Marc Laperrouza wrote financing propositions and contacted the Gebert Rüt Foundation, which agreed to finance the scaling up of the initiative.

*If the pilot CHIC is to be repeated, there was an initial idea of scaling up to 2-4 teams per region. What can you tell me about the current state of this?*

The final idea is to replicate exactly what we have in Lausanne. We have three institutions, which we call the triangle of engineering, business and design, providing students for the teams. We have to wait till the end of the pilot to see if all the stakeholders are satisfied and want to repeat the program. If this would be the case we need to discuss the work/funding required to do it.

*In this case, the events would be organized in the regions by the local institutions and instructors?*

Instead of bringing the teams to Lausanne, there will be a milestone in each region. All will be independent. However, we were considering some collaboration if there are people with certain skills (programming, industrial design) missing in a team. This process though is difficult to implement and it is to be investigated how to go about it.

Events will be local, but there will be somebody from the CHIC team that will help orchestrate the whole process and probably give a few workshops on teamwork, brainstorming, etc.

*Currently the price to institutions amounts to CHF 2500 per student. How would the financing look like if the project were to be rolled out next year?*

The current budget of CHF 2500 is solely to cover the out of the pocket costs to scale up the project. But in the future the foundation wouldn't pay the salaries and so on anymore. The idea would be to go to the local institutions that participate in CHIC, show the results and ask for funding or a professor to take charge of this project. If the pilot proves to provide some value to the institutions, they would want to continue this project. For this to happen, the stakeholder controlling the education system and

providing funds to improve pedagogy, should compensate the teachers accordingly. This can be done through either validating teaching credits, or by paying the extra hours.

*What are the next steps you are taking before starting the new edition?*

We are constantly collecting feedback about operational changes. Also we see the things, which didn't work well and with this we are building the new programme. Some elements of timing are not optimal. Also, we should publish the new edition now, to attract people and make the professors arrange the question of credits.

*How can I assist you in your work to help you in the process of improving CHIC?*

You can identify in which way CHIC is different to other entrepreneurial education initiatives. We claim provide a real hands-on approach, but still students are protected from the market. Since we cannot teach all the skills in one year, at least the learning curve should be as steep as possible. In this case we are focussing on the product development and the interdisciplinary of the groups. These are things you cannot teach in a course, the students cannot see the value of the theoretic skills in this field. They will forget it straight away. Teaching it through CHIC makes it stick and relevant to the student. If a student works for a start-up afterwards, there will be many things he/she already knows and other things he/she doesn't. We intentionally don't teach entrepreneurship in the sense of business knowledge to finance it, to be profitable and to acquire customers. There are many opportunities in Switzerland like the CTI to learn these sets of skills. They will coach you, give you contacts, and connect you to potential fund providers.

*Do you have any other comments?*

Launching a start-up from a safe lab with a fixed salary from a university is not the same thing as investing your own money and take the risk whether the business model is working or not. To do this transition you need to change your mind-set from a researcher to the one of an entrepreneur. The part of engineering where it's about the technology will only be about 20% of the project, and the rest is about business, to make the start-up survive.

The level of the Swiss students is really good and, thanks to this, we have come back from China with pretty nice prototypes. Having said this, being a pedagogic initiative, it doesn't matter if you come back from China without having a working product. We care

most, that students learn a lot of things. If the funding from companies are pure sponsoring, this wouldn't be an issue. However having private investment will often come with a contract containing certain criteria to fulfil. We could also organize a mini CHIC for a company. Currently students come up with a project and there is not a real customer behind. This process is a bit "artificial" from the business point of view, but has the benefit that students are super-motivated and work very well together, around a cause that unites them. If companies are involved we will be solving certain problems like developing a toaster, for instance, that won't be appealing at all for many students.

I believe students shouldn't care too much for the product, there are many things around they can learn in any project in my opinion, but students possibly wouldn't see this the same way. We should experiment. CHIC is about experimenting.



## Appendix 10: Survey with HEG students applying for CHIP, 30.03.17

*What was your primary motivation in applying to CHIP?*

- Experience
- Getting some project management experience
- Getting an experience overseas as an HEG student
- I want to work in Asia and this project could open doors for me
- The challenge
- Not to do bachelor project

*What were any secondary reasons you had in applying to CHIP?*

- Contact
- None
- Test myself in a real-life context and apply my entrepreneurial knowledge
- Gaining experience
- Work on a real project
- Trip to china

*Which element of the project did you consider to be a negative point?*

- Only 1 student is chosen
- To be restricted to a connected device only
- None, honestly
- The fact that you have to write a paper apart from the project
- Amount of work
- None

*What things did you expect to be exposed to, which you would not have experience otherwise?*

- Manage a project across geographical and cultural boundaries.
- Dealing with Chinese marketing, developing a real product from A to Z
- Kind of work with a multicultural team in a totally unknown environment in a predefined (none extensible) time frame.
- Project management
- Dysfunction of the team, contact with real investors
- Product development

*Which new abilities did you hope to develop?*

- My understanding of what it needs to launch a product in the market under real conditions

- Leadership, stress management and problem solving
- I don't know the unknown, but I wanted mostly to enhanced and confirm the skill I acquired in the HEG and to learn about how to apply it with attitude.
- Project management and communication
- Team spirit, autonomy, entrepreneurship
- Interdisciplinary work

*If the initiative were to ask for a financial contribution to cover the flight ticket and the hotel in China, how much would you be willing to contribute?*

- CHF 0 – 2x
- CHF 100 – 1x
- CHF 500 – 1x
- CHF 750 – 1x
- CHF 2000 – 1x

Average including all answers CHF 558.

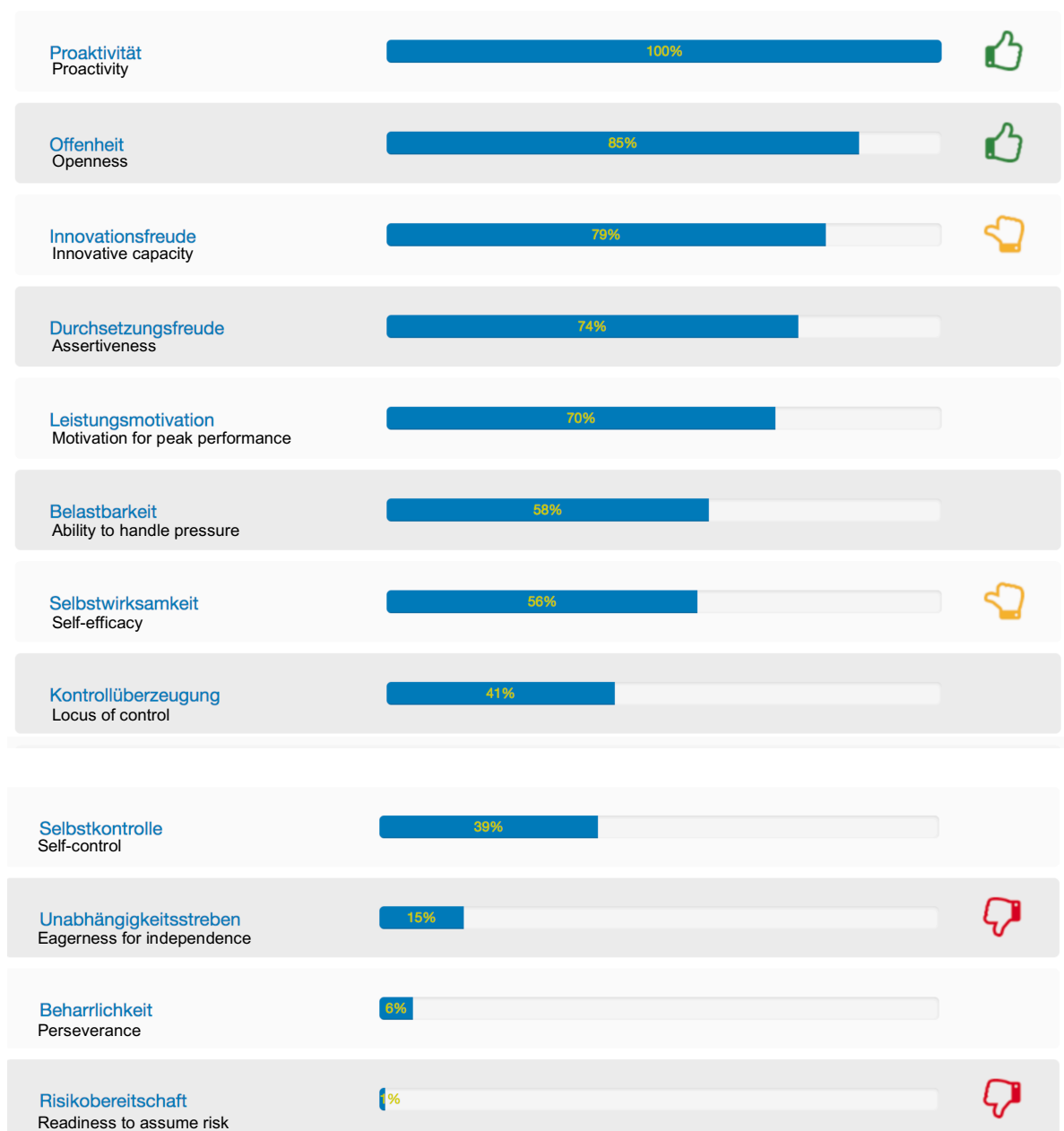
Average excluding CHF 2000 outlier CHF 270.

## Appendix 11: entrepreneurship test results

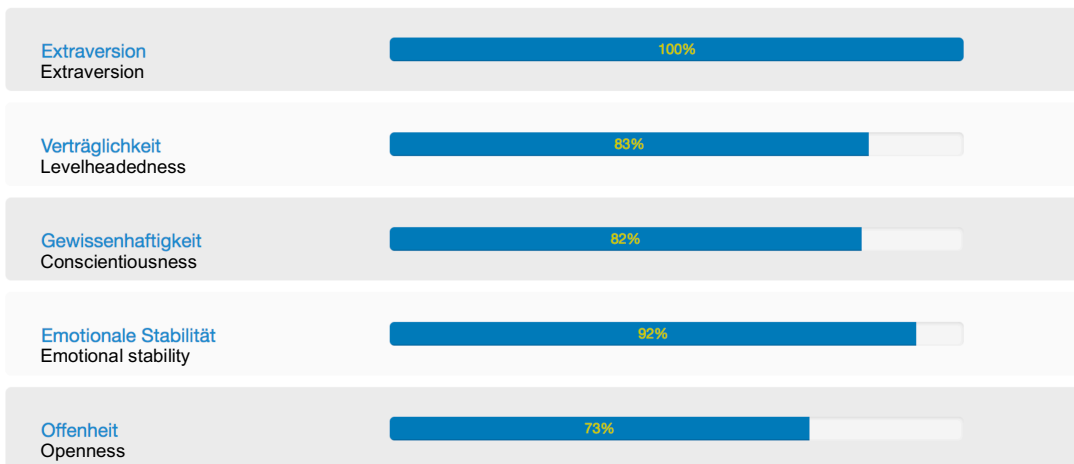
The following test has been performed by the author on the website <http://www.entrepreneur-check.ch/>, which was developed by the School of Applied Psychology of the University of Applied Science North-Western Switzerland. The translation of the terms can be found in black below the German characteristic.

The bar indicates how many people in your control group have a lower distinctness than you.

### *Module personality*



## Module big five



## Appendix 12: Interview with Benedict Stalder, EPFL Innovation Park, 12.04.17

*The CTI, a commission to promote innovation and technology, is currently funding several entrepreneurship initiatives including BeX and CreaLab. Its goals are to promote research and development projects between universities and corporates, support entrepreneurs and start-ups through courses and coaching and connect participants of the industry and science through different activities in knowledge and technology transfer.*

*How is the relationship between EPFL Innovation Park and CTI?*

CTI has different activities. There is coaching of knowledge and technology transfer, funding of R&D where they invest jointly with industry and university partners, and the section start-up and entrepreneurship. We are part of CTI Entrepreneurship and our mandate is limited to Western Switzerland. There are of course other service providers in other regions. Therefore, we represent the CTI, but we are not CTI (!). We recruit participants for the programme and follow selection criteria where projects need to be innovative either in the sense of the business model or the technology.

We offer different modules. We start with module 2, which is intended for students from Universities and Universities of Applied Sciences who are following classes and consider becoming entrepreneurs in the future.

I myself handle the module 3 Business Creation and module 4 Business Growth, where founders already are advanced in their start-up and on the way to build their business or are entering the growth phase. Most of the people think about young entrepreneurs, but all ages from 25 to 65 years are represented among our participants and all have different backgrounds and cultural backgrounds. To teach optimally we have 3 trainers in each class (!), the trainers typically present a new topic immediately followed by the participants trying to apply the learning to their own project. Since applying theory to reality is always more difficult than it appears the 3 trainers then coach and help the participants for about 50% of the class time before moving to teaching the next topic. Our objective is to ensure our participants can apply the learned concepts and not just understand the theory.

*CTI as well as private foundations are focusing more on entrepreneurship education than enterprise education. Do you know the reason for this focus?*

We are doing both. All our trainers are entrepreneurs. I myself started a business at 21 when I obtained my degree in Engineering. For this reason, everywhere in the course

in from the finance course to the negotiation or product development course etc... you will find the notion of how to handle innovation. It is about collaboration and co-founding.

We can take the metaphor of having children. Innovating is like making children, it's not very difficult (!), the difficult part is how to raise them. In entrepreneurship, we teach people how to be good parents to their innovation, how to handle collaboration, clients and investors. Entrepreneurship is the way to carry the innovation. The two are symbiotic.

*In EPFL Innovation Park you have a lot of insights into how innovation drives the competitiveness of Switzerland. Which importance from the technology transfer and value creation do you attribute to start-ups? Which to partnerships from universities and existing companies? Which to in-house innovation of established corporates?*

First, innovation is the base of the existence of an entrepreneur. Contrary to what most people believe, financing is only a very small part of the entrepreneurial work. For us, innovation and the entrepreneurial spirit is more important and finance is just a tool.

Now in terms of value creation, you can find innovation in universities/academia, which is taken by an entrepreneur to transform it into a business. We make them realize they are no longer only researchers but business people with business accountability. You find innovation fostering initiatives in companies like Nestlé and institutions like the Swiss Post. The idea is to take people and startups with innovative ideas from inside and outside the company and to help their innovation find its place in the company and as a result in the real economy. The outcome can be commercial agreements, partnership agreements, license agreements or the startup is bought by the company. There are many people who see entrepreneurship as simply putting together an idea, an investment and a business plan and sell-off after 3 years to make a lot of money. But this opinion is the view of the investor and the (often amateur) speculator. This is what the media is talking about but this is only the tip of the iceberg of entrepreneurship, the part we can see. The bigger part is under the water where you find people who innovate because that is what they like doing and they acquire new clients and integrate their business into the industry as a mean of making their business and dream simply sustainable.

Now it is difficult to attribute an exact share of innovation creation to one of the three you mention. Start-ups tend to bring more disruptive innovation whereas existing companies might innovate by modifying and incrementally improving their concepts

and products. If you look at startups you will again see two types of innovation, typically disruptive innovation could spin off from research at Universities and incremental innovation could come from people who are leaving established companies to start their own business with that innovation. I am not sure what innovation part is more needed, I think you need all known and new form of innovation and to make this you need to make innovation ubiquitous and an absolutely normal thing to do.

*CHIC is a purely pedagogic initiative. What do you think about this?*

I understand CHIC to be academic, focussed on the learning process and therefore less under business constraints. One group for example built connected drumsticks, the academic setting allowed the team to focus only on the innovation process, from collaboration to the working prototype, this is great from a learning perspective but if this could be quickly followed by a stage where they are confronted to a real market and real client related constraints you will obtain a greater satisfaction and sense of purpose from the participants. What do the participants of CHIC really want? Are they satisfied with what they have built? even if it is not usable in the real market? Can we extend this experience by showing to them the next step - Customer validation? This is where CHIC needs to build a clear path to our CTI Entrepreneurship Business Concept course where we take them to the “business part” of their project.

*CTI is also funding the CreaLab in Lucerne, a centre for researching, creating and promoting conditions, processes and methods for encouraging new developments, innovations and changes.*

*What do you think about this concept? How would you see a similar centre for western Switzerland?*

I strongly believe in the dual education. We exclusively use trainers in our programme that have own entrepreneurship and business experience. Our participants want real experience and we give it to them. Honestly researching about entrepreneurship is not the same as experiencing it. However people with own entrepreneurship experience themselves know what to teach but not necessarily how to teach it. This is where academia and research helps us by teaching us how to teach. To answer your question more precisely: yes I think anything that can help foster innovation is a good idea as long as it is directly and strongly connected to real world experience.

*What do you think is the best way to empower students to innovate?*

You certainly should not talk to them about the big exit strategy and the glamorous stories. People should know that everyone can be innovator and entrepreneur. We

should normalize innovation, make it accessible and a normal thing to do. Even students should be able to bring innovation to companies in addition to doing (hopefully smarter) internships. Universities must take the lead with initiatives of bringing value to the companies and they in turn will offer real opportunities to students. There is one initiative from the Swiss Post called PostVenture. This initiative is supported and executed by the Center for Innovation & Entrepreneurship of the School of Management and Law (ZHAW) and the EPFL Innovation Park contributes for the Western Switzerland part. Universities need to be innovative in their way of collaborating with companies. This kind of collaboration makes more sense to students, it will create some real value and satisfaction. Everybody will get something in return.



## Appendix 13: Interview with Patricia Wolf from HSLU, 12.04.17

*You are head of the interdisciplinary programme "Creative Living Lab" and head of research at IBR (Institut für Betriebs- und Regionalökonomie). In your opinion, what are the highlights and downsides of the Swiss interdisciplinary education landscape?*

The highlight is that there is more and more interdisciplinary thinking. Connected to this is also the downside, which is that in fact the actions and structures are not set up do encourage such. Especially at Universities there is a strong silo thinking in disciplines, and to a lesser extend at Universities of Applied Sciences. There is a strong pressure to publish in journals. This is much easier, if the fields are highly specialized, with small research questions, rather than interdisciplinary.

*The CreaLab is in this case an alternative initiative. How do you experience working with different schools in your programme ISA? I saw that in some departments only few ECTS can be validated by students.*

This is an advantage of the University of Applied Sciences in Lucerne, where the interdisciplinary modules are a fix part of the curriculum. Students have to choose 2-3 modules for which they receive ECTS. Finally the modules being offered depend on how the different schools who participate construct them. They are not forced to offer something. Obviously, for the CreaLab all the modules offered are a field of experiment, we can research on. Otherwise it is very difficult to enter the standard education.

*How do you experience the collaboration of the different schools?*

Since it is an overreaching programme of the University, it is working rather well. Students cannot participate in all modules, depending on their head of departments. Also there are restrictions whether they can participate in the Summer and Winter school we offer.

*Concerning interdisciplinary courses/projects for students, (for ECTS credits): What are the best strategies to get buy-in from the relevant people within institutions and government in your experience?*

There was no difficulty at all. Everybody can offer modules and the once the students subscribe to will be carried out. The school of music and the school of design and art are not participating very actively in the programmes.

*CreaLab is a successful centre for researching, creating and promoting conditions, processes and methods for encouraging new developments, innovations and changes. How is the CreaLab structured and financed?*

The CreaLab has been created as the interdisciplinary major in five different departments until 2010. We noticed then that they were doing the same thing but not together. The discussion was opened and one proposal was to create the CreaLab. Afterwards there was funding for three years for the project. Then, due to some internal political difficulties, the funding was stopped. The directors of the schools of information systems, business, social work, technic and architecture jointly decided that it was still worthwhile and it is them to currently directly finance the group. It is now an interdepartmental project, but has been very tightly financed in the last three years. We then developed our own currency, the bee's notebook, where we received stamps when we were working diligently, but did not received any hours paid. For the next period 2018-2020, the funding was increased by 66%, as this could not continue this way.

Our clients are all kind of companies from big to small, but there are also government agencies or NGO's.

*How does CTI finances your initiative?*

There is a core team discussing in which directions we want to develop the CreaLab. Our hours are paid for by the schools. Then there are certain projects and initiatives for which we will request the funding by CTI.

*Can you give one example, where you receive CTI funding?*

There is one pillar called next economy, in which we think about communities and how we can involve them into business models. Currently we have a bee project, where a apiculture approached us with the concern, that they cannot produce enough honey. We proposed them to try out a model with deputy apiarists, where people who have some time and interest in the field. There could possibly be a business model, where the apicultures provide the beehive to them and the deputy produce honey for them to pick up. We are still working on this project which is financed by CTI.

Another question was whether we can use the fallow land in cities to create space for creative and artistic work. We considered then to place containers as long as they are not used. The reconstruction of these are normally quite expensive. Therefore we developed with our architecture students a cheap solution. There is currently a spin off, where they are constructed.

*Are there students involved in this project?*

Normally there is always a project leader and a project team. Then there are students who are working on projects who support us. They are researching on the question whether there is a need for this and how can we set up this project.

*What is your strategy to keep overhead costs in CreaLab low, while managing so many different projects?*

It is all well-structured. We know who is responsible for which part. The only overhead are the meetings where we (the core team) exchange what we are up to and my work as a leader. Furthermore, there are two students working with me as assistants. We don't have any locations, we are organized as a flexible network that can meet anywhere.

*What are your key obstacles and key successes in CreaLab?*

Financing is a constant difficulty, as already mentioned. Another difficulty is the fact, that we are normally 3-5 years ahead of the market. It makes project proposals difficult. Some ideas, we are discussing since a long time and we proposed it eight times. It happened, that we proposed something and people told us this was not relevant, but it would in fact become relevant in the years to come. One example of this is virtual work. In Switzerland there should be a solution, since these people do not pay any taxes, they have no connection to a team or a boss. Four years ago, we presented it to SECO, but they could not accept this idea before the parliament has raised this issue to a priority to work on. Now in January the parliament finally raised this request.

I am also active in ETH, and I think that in institutions where there is a lot of focus the publishing of papers and less on the practical actions. In this environment, most people would be motivated to contribute, but are measured on the metric of papers. For this reason, there could possibly be a lack of energy and drive for change and action. People are already in a tension between the innovation and interdisciplinary work from CreaLab and what their direct supervisors from the relevant school they are employed want them to do. In the context of more academically focussed Universities with focus on publishing, this will be more pronounced. In my case, I already took days off to write research and funding proposals, since my boss did not agree that I stayed away from my office for this reason.

*What is your advice to other institutions trying to set up an interdisciplinary centre such as CreaLab?*

You need the right people with drive and energy to do so, which can hold the tensions that could possibly emerge. Furthermore, you need to respect the administrative rules and restrictions. Since you are already thinking widely out of the box in what you are doing, you need to comply at least with the form of what you do. You need to document very meticulously what you are doing. For this reason we always update the website with our newest projects and moves. This answers the question of whether what we are doing is relevant or not.

*What is your approach to measure value created to satisfy your stakeholder?*

For our clients, this is the departments we are working for as well as external stakeholders, the expectations are quite clear. This year we have for the first time a written commission. Normally we just worked without. There have initially be some measures from the departments of HSLU such as the requirement to obtain 50% of the budget in project support. This however was already fulfilled with the first project. The threshold was rather low. On our website we are very clear about the financing we receive from third parties.

- Support from 3<sup>rd</sup> parties CHF 3'248'512.
- Basis funding IS CreaLab CHF 1'151'972
- Other internal funding, HSLU departments CHF 492'400.–
- Total CHF 4'892'884.–

We document there all the projects we are doing and the categories they belong to and the origin and amount of the funds used for it. Hence we do not only document what we are doing but also how much money we invest into it. (A copy of this document is at the end of this interview) Another part are the publications, events and lectures we list on our website for information and transparency reason. If needed I will print out all of it on A0 and bring it to the stakeholder to show the magnitude of it.

There has been one example where the company cooperating with us was not satisfied, since it was said to be not specific enough. We proposed innovative marketing concepts. I think however he mistakes us for a marketing agency, since he only wanted to have a new layout and marketing presence. Otherwise most feedback is very positive.

*CHIC is an interdisciplinary initiative started by Marc Laperrouza at EPFL in collaboration with ECAL and HEC. In a pedagogic enterprise education approach, teams of designer, engineer and business people are developing a connected device using design thinking. In a trip to Hong Kong and Shenzhen the students are then immersed into the fast prototyping process and the Chinese manufacturing world.*

*What do you think of the fact, that CHIC is a purely pedagogic initiative focussing on enterprise rather than entrepreneurship education? How does your research relate to this question?*

We also have a module about design thinking and ideation where students come up with ideas and create 5-6 prototypes within one week. They learn how to pitch it, which they do in the end of the project. There is a reflection report in which they explain whether they would like to continue this project or not. Producing a product is surely an adventure, but the question is, what is the use of going to China in your case. It is important to make sense about it. Why are you going to China? If it is that students learn how the outsourcing works, this project is not following the current trend of nearshoring and producing locally. I believe the value added by the journey is not so relevant since it is about the past trend. The question is rather how can things be made here in a more reasonable and sustainable way. This goes in line with the environmental trend. What we are doing with the reflection report about whether they want to continue the project or not, is to make the students find out what they consider most reasonable for their lives. It is important to reflect on the idea but if students want to do something else, this is a pity, but that is the way it is. For example, in the winter school, the students proposed something to the SRG, which they took up and are using now. This is a perfect case. In DiBuDeCo (Distributed Business Design Collaboration) the students develop a prototype to a question raised by a company from the industry or by themselves. In this process, they are coached by other FabLabs from other regions around the world. This is another option to work intercultural. What is the use of going to China? There is no issue about the fact, that the product is not commercialised finally, but this is a real question mark for me. Surely it is fun to do this, but is there a pedagogic need?

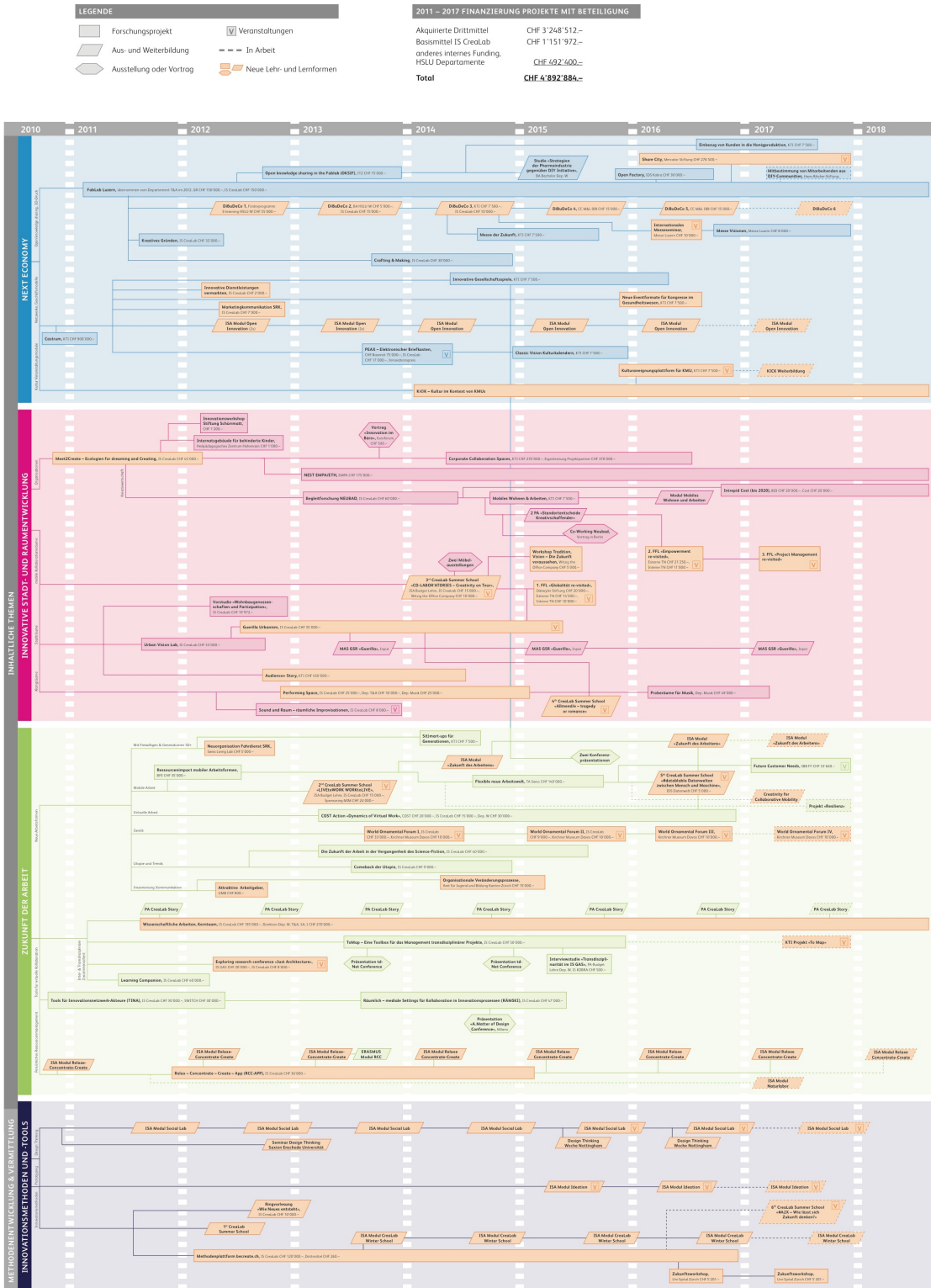
*How do you observe innovation in Switzerland happening in start-ups, in collaboration of universities and SME's and in established corporates themselves?*

It depends on the kind of innovation you are talking about. The real disruptive innovation such as developing an engine for cars while everyone still uses horses, is done by startups in the form of garage companies. We cannot over estimate startups.

Some are just doing some new ways of catering. Established companies are mostly improving the products already on the market. Universities are trying to elaborate on open questions existing in the market. Possibly they are also active in the spin-off business such as ETH.

There is a programme called “bridge” supported by CTI and SNF (Swiss National Science Foundation). They try to support people from universities to secure their idea in order to translate it into practice. There is a strong focus on disruptive innovation.

PROJEKTE IN ZUSAMMENARBEIT MIT DER HOCHSCHULE LUZERN, ALLE DEPARTEMENTE



Source: Zukunftslabor CreaLab 2017

## Appendix 14: pedagogic enterprise education check

These following criteria are drawn from Annex 1 of the paper “Creating conducive environments for learning and entrepreneurship – living with, dealing with, creating and enjoying uncertainty and complexity” by Allan Gibb (2002). It is a guide to the pedagogical challenge to simulate the entrepreneurial way of life in education.

In this analysis, I will check the congruence of CHIP and the proposed ideal by Gibb in the left section about innovation education and comment the application of it in CHIP in the right section.

Elements in green are well incorporated in CHIC
Elements in yellow are partly incorporated
Elements in red are not part of the initiative.

### *Developing Commitment*

focusing the programme on the participants own project	Currently the case
setting up peer review/counselling procedures to monitor progress	Peer review is taking place in team meetings, but is not standardised and depends on the team member’s personal abilities
individual counselling on project progress	Supervisor counsel students. Quality of counselling depends on quality of supervisor
formal presentations of project to other participants	The milestones are a formal presentation, which is done to supervisors rather than other participants
setting up independent panels for review	The panel of coordinators and supervisors at milestones are an independent panel
building sound links with resources	The links between tasks required by CHIC and the content learned in courses are sound



*Developing a strong sense of Responsibility*

exercises to develop parts of the proposal (finding customers, suppliers, negotiating with providers of resources ...)	All parts of the proposal are integrated into CHIC
encouraging development of action plan	There is a full action plan, to follow up in Trello
setting times for completion of certain activities	There Trello cards and milestones give a strong time guideline

*Developing a strong sense of Ownership*

a strong focus on the participant's project	Currently the case
exercises in defending the project in class	Done through milestones

*Developing capacity to cope with Risk, Money and Social Status*

developing a plan	Currently the case
developing 'what if' scenarios re. key assumptions in the plan	Encouraged by supervisors, but not formally stressed in instructions
explore ways to reduce the financial outlay (by subcontracting etc.....)	Outsourcing to China, no further exploring
exercises to get participants to see stakeholder perceptions	Customer and solution interview
discussions with existing businesses as to position in local society	

*Developing capacity to cope with Long and Flexible Hours by:*

time management exercises	Learning by doing
developing organisational systems	Tools like Trello are provided
presentations on managing time by other entrepreneurs	Brief introduction by Alex Wayenberg
setting systems for customer delivery schedules	
setting aside contingency time	

*Developing a sense of Freedom and Independence*

exercises on what it will be like to 'be on your own'	
exploration of what responsibilities freedom will bring	
interviews with existing entrepreneurs on what it means to them	Brief introduction by Alex Wayenberg
review of participant personal goals and the business	

*Developing capacity to Decisions under Uncertainty with Limited Data:*

exercises on making decisions with no or little hard data	Learning by doing
reviewing situations where there is 'paralysis by analysis'	
asking participants to use 'tacit' knowledge to make decisions	Learning by doing

*Developing ability to manage Interdependency on key Stakeholders*

identification of key stakeholders	Focus on customers
exercises on what stakeholders are looking for and why	Value proposition canvas
exercises on the way stakeholders learn and ways of educating them	

*Developing capacity to take Initiatives and be Proactive*

exercises on who they know and how well they know them	
exercises on the strategic development of 'know who'	

*Developing ability to cope with Income Fluctuations and Customer Dependency for Rewards*

setting a clear view of what levels of personal income are targeted	
review of what levels of turnover and margin these are based upon	
examination of how income might vary and how they will cope	
examination of ways of smoothing out income	
consideration of other ways of making income in an emergency	
consideration of role of savings	

*Developing ability to manage changes in Social and Family relations*

exercises in considering all family issues (divorce, succession, tax ...)	
'what if' scenarios on family affairs	
exploring how other entrepreneurs plan for family issues	

*Developing capacity to manage/control Holistic Task Structure*

exercises in clarifying exactly what participants will have to do	Explanations at ideation and kick off
developing training focused on these needs, simulations	Explanations at ideation and kick off

*Developing capability to Learn to Learn as entrepreneurs*

learning by doing	
mistake making	Encouragement to make mistakes and pivot
copying	From other examples
problem solving	Ideation weekend
experiment	With supervisors
peer review	With team members
feedback from stakeholders	With supervisors and potential customers

*Developing capacity to cope with Loneliness*

encouraging membership of clubs and associations	
time management exercises	
building links with peers and using counsellors	Work in teams and with supervisors

## Appendix 15: analysis from CHIC milestone feedback

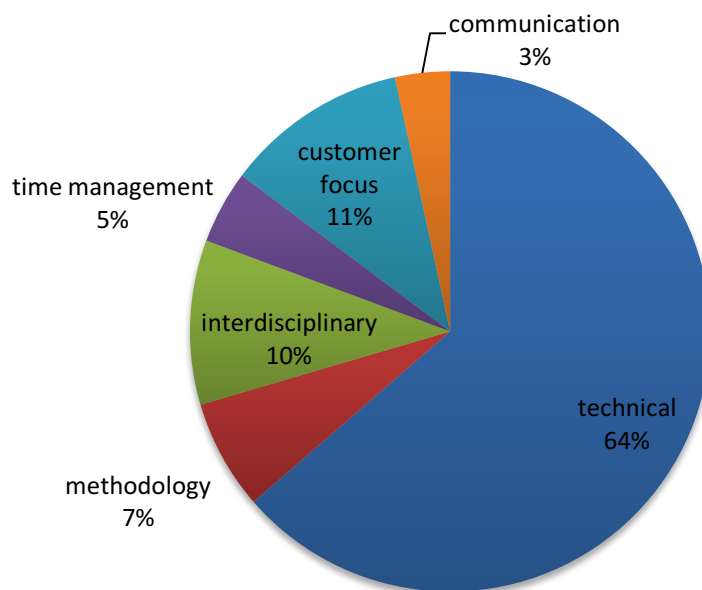
To draw some conclusions from the students' self-assessed learning, I merged the feedback collected by Marc Laperrouza in the past editions of CHIC into one table, which can be found below.

I classified the similar answers given by the students into categories. The findings have to be interpreted with great care, since the feedback is self-assessed and possibly not filled in with great care and my interpretation of the answers can be mistaken. There are five parts of the feedback, in which the students can report what they have learned. It comprises their own discipline, other disciplines, group work, project management and themselves.

This is the conclusion drawn from the analysis.

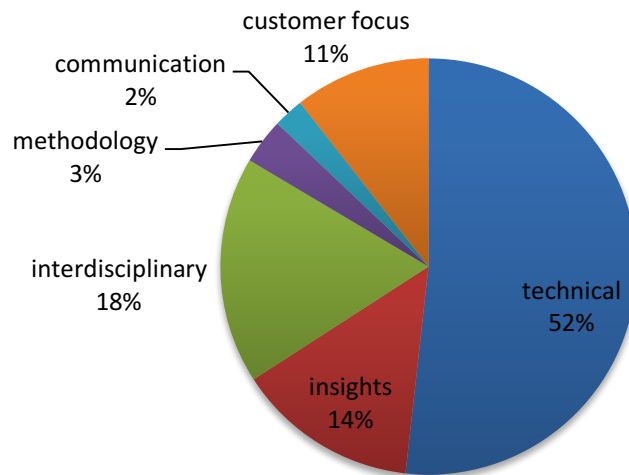
### *Learning in own discipline*

- Technical: discipline specific hard skills such as PCB or business model canvas
- Methodology: how to approach a task, strategies of working
- Interdisciplinary: interaction and overlap between the different disciplines
- Time management: how to cope with limited time resources
- Customer focus: all efforts are aimed at the end consumer
- Communication: communicate effectively



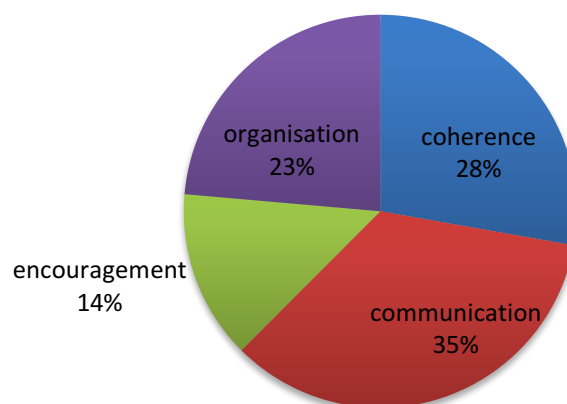
### *Learning in other disciplines*

- Technical: specific hard skills such as PCB or business model canvas
- Insights: understanding of how the other disciplines work and function
- Interdisciplinary: interaction and overlap between the different disciplines
- Methodology: how to approach a task, strategies of working
- Customer focus: all efforts are aimed at the end consumer
- Communication: communicate effectively



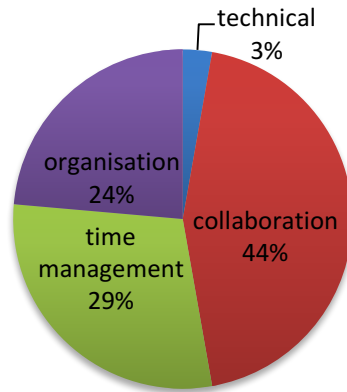
### *Learning in group work*

- Coherence: unite as a team and work on one common goal
- Organization: tools and strategies to organize group work
- Encouragement: cheer up each other and help out
- Communication: transfer ideas and wishes effectively



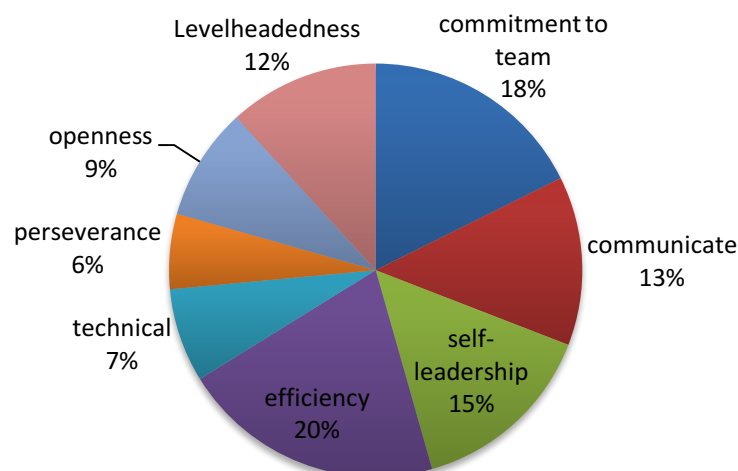
### *Learning in project management*

- Organization: tools and strategies to organize the project
- Collaboration: how to work as a team together and compromise
- Time management: how to cope with limited time resources
- Technical: specific hard skills



### *Learning about themselves*

- Commitment to team: feel ownership and responsibility of the project
- Communicate: express ideas and expectations effectively
- Self-leadership: gain emotional intelligence
- Efficiency: find ways to get to the desired outcome in an easier/faster way
- Technical: specific hard skills
- Perseverance: learn to fail and keep going
- Openness: accept new and different ideas
- Levelheadedness: cope with uncertainty and disagreement





## Data collection

my field	classification	other field	classification
Dependency with other fields	interdisciplinary	PCB	technical
hard to be on time, always smh goes wrong	time management	business model	technical
learn how to create a PCB	technical	design	technical
Learn to collaborate	interdisciplinary	business model	technical
learn how to create a mobile application, software	technical	design	technical
learn how materials can be useful in a health aspect	interdisciplinary	business model	technical
business model	technical	design	technical
pitch	communication	business model	technical
presentations	communication	pcb	technical
website	technical	connections	technical
Field experience with potential customers	customer focus	renders	technical
Got more experience with prototyping	technical	3D print	technical
Learn new skills: Swift, BLE	technical	Engineering insights	insights
3D printing,	technical	FRENCH	communication
Nothing really new	nothing	Mechanics, Business	technical
Take time to analyse before design is the most important	methodology	Personas	technical
Power consumptions and micro motors	technical	Value proposition	technical
What customer says is not What customer does	customer focus	How identify and understand the consumers' needs	customer focus
A good component without ressources is not a good one	technical	Value proposition Interview Engineering	insights
To make simple assumptions to approach a more complex system	methodology	There are many ways to approach and solve a problem	methodology
Know your customer profiles is really important to create design and visual identity	customer focus	They have other mindsets and so come across other constraints	insights
Technicals constraints affect a lot the design and the user experience	interdisciplinary	Engineers don't "dream" enough	insights
Defining specifications is crucial..	technical interdisciplinary, technical	To link design and engineering is not easy	interdisciplinary
Proper software solution is hard to decide & need work harder to learn	technical	Interviews really help to target customers profiles	customer focus
Hard to understand customer, their pains. Even harder to find what they need !	customer focus	To understand carefully the technicals problems	insights
The issues of finding reasonable priced yet decent components.	methodology	I have learned about minimalistic approach for design	technical
Adapting to new MCUs, understanding the different levels of sleep modes and deciding what needs to be an interrupt and what doesn't.	technical	Design for social media needs a bulk of surveys!	customer focus
Implementing multiple API's in the same project, with different connexion methods.	technical	Customer says not was does	customer focus
Trying to understand how the customers are going to use the app and then thinking about the best way to structure it	customer focus	So many constraints about the design, the price, the battery, the weight, etc...	technical
Dealing with different bikes dimensions, designing a non- invasive device. Threads are still a big problem	technical	Some specific vocabulary	communication

Facebook group is an awesome way to gather survey responses	methodology	The needs and desires of potential customers are hard to define.	customer focus
Breadboards are a pain and there's a big lack of proper breakout boards	technical	Making the application appealing to costumers.	customer focus
Keep the application running while the screen is off.	technical	Hard to progress in the project with all the constraints due to the bike	technical
Creation of Virtual Instruments for 3D tracking using an external device.		Defining our performance objectives : every component increases the final price	technical
Choosing carefully the words when talking about the product.	communication	Importance of Business Models in order to have a successful product	insights
Work on how people are going to feel when they use an object. Be creative, find a way to invent new feelings when you use, create interaction.	customer focus	Important considerations for choosing a MCU. .	technical
Creating a BM from scratch and make it confront to real life	technical	Design and engineering is the same but not with the same toys!	interdisciplinary
Deep knowledge of how sensor fusion algorithm work. How to write an app for multiple platforms.	technical	Never underestimate my team members' capabilities, especially, the engineers'. They are able to create a value proposition, that me, nor customers could ever imagine.	insights
Developing the hardware of the TIKKU sticks and implementing the low-level software functionalities.	technical	Interviews are more then needed for thinking a project,	customer focus
Creating the shape of the product, while taking in consideration the different components chosen by the engineers.	interdisciplinary	There is a very strong synergy between the disciplines, and it is interesting to see how we can apply the principles of one to another.	interdisciplinary
		Design, business, electronic and media interaction parts need to be strictly connected to achieve the final result.	interdisciplinary
More about competitors' analysis	technical	Importance of market research and customer interviews in order to find out what people really want and what not.	customer focus
How to do a good PCB	technical	Importance of blanks in logo design	technical
Refresh my C skills + sprints	technical	the importance of fonts in UX	technical
3D printing	technical	Now, I am a kind of an expert in BLE	technical
schematics	technical	How manufacturing constraints and ID design interact	interdisciplinary
PCB design	customer focus	Integrate electronics and mechanical components	interdisciplinary
Designing for people and not for myself	technical	how I find others work complicated	insights
Integrate electronics and mechanical components	customer focus	1.Engineering perspective = functional 2.Designer perspective = experience. 1.+2. = interesting gap with branding.	interdisciplinary
Difficult to have a clear and standard Customer profile and Value proposition after contacting customers.	methodology	Design and branding are really personal and it's hard to make everybody happy	interdisciplinary
Good documentation for a component makes life much easier	time management	Designing part and functional parts need a better combination	technical
Learn to manage my own experiments with the global speed of the project	technical	Build and test prototype is the best to solve problems	methodology
I've forgotten how hard it was to design a simple and efficient logo	technical	Very interesting to build a strong DNA of the product	technical
Difficult to find solution with esthetic and functional	technical	Properties of Materials.	technical
Deep understanding in ways to improve efficiency Battery conventionalities	technical	Branding is hard Mockup is more serious than I expect	technical
Challenging to test and debug when deployed	technical	Criteria in Name and Logo Selection	technical
More details about the behavior of IMU under special conditions of linear acceleration	customer focus	Important aspects about how a potential customer can feel attracted to the product (colors, visual identity)	customer focus
How market research and customer interviews can help to highlight the missing attributes in the products and give ideas to work on the interaction design	technical	The tools used for mechanical design and prototyping.	technical
How to use a SPI Bluetooth module. Firmware/Software Integration	technical	Steps required to Importance of communication between engineering and design to find sustainable and efficient compromise	interdisciplinary
Designing circuits while taking into consideration the constraints of mechanical and industrial design.	interdisciplinary	the design aspect is very interesting	insights
Design and engineering work in tandem, and you need to coordinate your work and deadlines.	interdisciplinary	How to build a platform independent web app	technical
make new UI controller	technical	Taking into account all the components and needs of the other disciplines	interdisciplinary

market research and costs	technical	I've learnt about PCB	technical
Working under stress	time management	Mechanical insights	insights
How to burn composants	technical	Business consideration & obtain samples	technical
Working under stress	time management	Fonts are important in presentations	technical
To make the cheapest design	technical	Mechanical part	technical
Business model has also been designed with insignificant eng. & des. pieces/decisions.	technical	Important components (e.g. battery) has to be fixed and accepted as soon as possible.	interdisciplinary
Integrating design in mechanical design	interdisciplinary	Design changes really fast	insights
Simulation can give an overview of how a system evolves, but never exact answers	technical	The matching of aesthetic design and mechanical design	interdisciplinary
Wireframing before design is important	technical	Little changes in technical part may have big consequences	insights
Designing the prototype is very interesting about taking decision in the past that could not be changed in the future.	technical	It's tricky to develop a design that match with the mechanical Design.	interdisciplinary
Altium Designer	technical	Heat transfer	technical
Further on native development & APP Front-end	technical	Firmware mechanism; UX tips; Mental flow	technical
Find the right price is a hard task ! ... Margins (through wholesalers) are much lower than I thought.	technical	Better understanding of PCB and some industrial concerns.	technical
Working out a realistic price estimation can be very tricky.	technical	Some details about google APIs	technical
Microcontrollers can be very moody. If it doesn't work, it doesn't always mean that the code is wrong	technical	Saw how complex are electronics ordering websites	methodology
Some key values are easy to store on Android. It can be very handy to simplify user's experience with the app	customer focus	You have to be very careful when working with electronics. Replacing a hardware part takes much more time than to replace a software code	technical
Learning to use the Android Studio Interface, starting from mockup to the real app	technical	Learning about price targets, defined by costs of production/sale and existing solutions/offers.	technical
Learning about shape and profile from already produced helmets in store.	technical	It is very enriching to work with design and engineering colleagues	interdisciplinary
It is very interesting to discuss the concept on facebook with strangers because they are trully honest and don't try to be nice	methodology	It is always important to consider costs' structure when developing a project	technical
Proper pcb design for debugging is capital for more complex designs	technical	Everyone needs to do their part, otherwise the project is delayed waiting on that missing part.	interdisciplinary
It's pretty hard to fit with security/legal requirements and being innovative in the same time	technical	The full cost estimation of a marketable product.	technical
The costs estimation is especially challenging, as too many inputs are unknown	technical	i love seeing the pcb design, and Id evolution	technical
A good debugging technique is important to correct errors as fast as possible	technical	Fundamentals of Web design, including CSS3, HTML5 and Javascript	technical
The small technical detail take a long time to sort and figure out. (Internal ridges for structure, screw placement, modeling buttons...)	technical		
How to conceive a multiplatform app in all its details, taking care about its distribution channels.	technical		
Ux, is going well and all the features being implemented	technical		
<b>Classification count</b>		<b>Classification count</b>	
<b>technical</b>	<b>56</b>	<b>technical</b>	<b>44</b>
<b>methodology</b>	<b>6</b>	<b>insights</b>	<b>12</b>
<b>interdisciplinary</b>	<b>9</b>	<b>interdisciplinary</b>	<b>15</b>
<b>time management</b>	<b>4</b>	<b>methodology</b>	<b>3</b>
<b>customer focus</b>	<b>10</b>	<b>communication</b>	<b>2</b>
<b>communication</b>	<b>3</b>	<b>customer focus</b>	<b>9</b>

group work	classification	project management	classification	myself	classification
Important to communicate effectively when disagreement	communication	No management	time	Flexibility	levelheadedness
Believe in other's ideas and help them implement it	encouragement	Hard to keep a plan and have an horizontal hierarchy	management	Compromise and leader needed	levelheadedness
Communication is important	communication	No management		Not focus only on my field	openness
Communicate is often difficult and even more between engineers	communication	Hard to work together	collaboration	Collaboration	levelheadedness
Communicate with people with different knowledges is great	communication	Hard task	collaboration	Keep your vision but know to be flexible	levelheadedness
Not everybody is understanding what I say in the same way	communication	Collaborative tools for PM	collaboration	Monitor every tasks takes too much time/efforts	efficiency commitment to team
Communication and involvement are essentials	communication	How to write requirements	organisation	common trust is needed	
We need communication	communication	Tools to be organized: Trello, Slack	organisation	Talk first with the teammates before doing on my one = time saved	communicate
Better communication and group alignment are essential	communication	How to set up a great group dynamic using efficient tools	organisation	Communication of my work without time delay would enhance the group alignment	communicate
Organised meeting where everyone is there is important to solve problems	organisation	Slack / Google Slides	organisation	Work in a group and have expectations from others is really motivating	commitment to team
A strong and common ground is essential to develop ideas together	coherence	Be fair	collaboration	Work with engineers is really interesting to make critical choice	commitment to team
A clear and common image of the goal is crucial for team alignment.	coherence	Coordination takes time and requires a structure	organisation	It's always good to convince yourself before convincing others.	efficiency
Communication is crucial.	communication	Compromising	collaboration	Self-learning is less effective than talking with others (teammates)	efficiency
Collaboration is most effective	coherence	A good team coordination requires every teammate's involvement	collaboration	Already knew it but it's hard to focus on one specific goal and go on that direction, I have too many ideas that confuse me sometimes.	efficiency
Hard to understand what others mean and to make your point as we have all different knowledge and background.	communication	People working with different timings and manners are hard to coordinate.	collaboration	I should stop assuming people know what I'm talking about.	communicate
Timing is a pain. Meeting with people 5km away is already trouble...	organisation	We need to take the right decision and find compromise to achieve our goal	collaboration	I'm bad at taking final decisions and stop considering different possibilities	efficiency
It is complicated to find a suitable meeting time for everyone and to be straight to the point and not rediscuss the whole project at every meeting	organisation	A clear timeline is essential	time management time management	I need to start making the most out of this project, and not just the minimum part.	commitment to team
Complicated to find a suitable meeting time for everyone.	organisation	Need to devote time.	management	Maybe be more involved in the group discussion on the slack app	commitment to team
Finding a meeting time is complicated.	organisation	Must communicate.	collaboration time management	I should communicate more on my work, not only during meetings and milestones	communicate
Hard to define our main objectives, being innovative and relevant	coherence	As "usual" very hard find the time to meet all together.	management	Discovered that I like to organize and manage teamwork.	technical
Love to have group discussion with all those different backgrounds, even if it's not always easy	communication	A design can, will, and maybe should be heavily modified anytime	collaboration	Discover that a team of people from different backgrounds is the best way to come up with new concepts and ideas	openness

How brainstorming with people from different disciplines can be so enriching.		Hard to keep up with many different tools.	organisation	Give yourself plenty of time.	levelheadedness
It's interesting to get a feedback from people in different fields,	encouragement	Too many platforms, tools, means of communication	organisation	Group work is something i need to create and expand my vision of interaction.	commitment to team
	encouragement	Maybe too many different platforms, but I like the idea of Trello so we can be aware of our project progress	organisation	I can take the challenge of working out of my confort zone and have good results.	levelheadedness
See how complementary our points of view can be	coherence	Too many platforms, tools, means of communication	organisation	Realise that the theory I've learned is quite easy applicable in reality	efficiency
Listen to how people think a project and get inspired every meeting. How from any discipline you can be so much creative!	encouragement	Good schedule needs to be followed	time management	Ability to multitask	efficiency
		Importance of splitting the project into well defined small tasks and always planning ahead the further development steps.	organisation	french	communicate
Idea sharing is essential.	communication		time		
See how important is to clearly define the common goals and development step in order to avoid misunderstandings. and how our analysis as a group allows us to get better results.	coherence	Managing time/schedule is key.	management	To not give up when nothing works	perseverance
	coherence	Better use of scarce resources such as time and money.	time	keep calm and stay cool	perseverance
go for the gold	coherence	The importance of time resource	management	Time management	efficiency
Stay calm and do as much as you can	organisation	Have a time dedicated to the project is more than important	time	Always keep in mind how others thinks	openness
go for the gold	coherence	.Take the time.	management	Adopting a beginner's mind and asking why not or what if helps to understand the interlocutor's perspective.	openness
Share your problems with the others to find solutions	encouragement	Strict organization is important	organisation	Changing and start angain can be good.	levelheadedness
how difficult it is to work together fairly distribute the tasks	coherence	time management is difficult	time	Need to consider more than just my discipline and think about linking knowledges.	openness
Speak about every single thing /using gif to show my emotion	communication	Estimate how long does a task will take is difficult	management	Not having everything on my shoulder help me to work better, with clear goal.	efficiency
Challenging to find consensus	coherence	How manage our budget efficient and do not waste money	technical	Less is more, simplified design to essential user experience	technical
NO everyone can be happy	coherence	Google slide is the best tool ever made for good organization	organisation	Stress can motivate me to better my best.	efficiency
					perseverance,
Difficult to cover all the important details at the general meeting	organisation	Follow everything, even if it's not your field	collaboration	Keep trying...Change the way I work (from individual to together)	commitment to team
It's good to stop someone who's speaking about something out of the subject	organisation	Pivots or iterations are much easier at the beginning of an interdisciplinary project.	collaboration	I can discover and apply learnings from this project into more aspects of my daily life	self-leadership
Hard to make a common ground	coherence	A meeting at the same time every week is better than changing it every time	collaboration	The applications of the skills (interviews and team work) I learn in CHIC for my courses	self-leadership
Its is better to talk with the example	communication	Project planning with defined priorities.	time	manage my time and work load, work in a group	commitment to team
Different disciplines working together could be more efficient	encouragement	It's essential to make concession to win time and not being stuck in the project	management,	Stick to the roadmap is very important not to be late.	efficiency
How communication is vital in order to create a product where multiple areas are involved	communication	Difficult to well assigned the tasks	collaboration	It became easier to share my work with others instead of wanting to take care about everything by myself	communicate
Keep in mind personal goals (master or bachelor thesis) of each member and project common needs	organisation	"Divide and Conquer"	organisation	Need to better manage my time	self-leadership
communication between different fields	communication	Sprint	time	Found peace inside me	self-leadership
Idea sharing is always the best way to discuss and come up with new solutions	communication	Better management techniques in order to dedicate enough time for each activity	management	don't be afraid to start again	perseverance
			organisation		

The importance of consensus about the main directions of the project. Rely on others for things you aren't too familiar with/ don't know.	coherence	At a certain stage, every detail should be discussed in order to ensure feasibility for business, engineering and design solutions.	collaboration	yolo	self-leadership
Meet often with team	encouragement	Communication allows for efficient work find a moment to put all together, leave space for each discipline	collaboration	Sleep is important Clarify "Why we do" is more important than "How or What we do".	self-leadership
Work by distance	organisation	Coordination is essential. The necessity of fixing and meeting deadlines in team tasks to not to delay other people's work	collaboration time management time	At the end, we have to admit that we don't have the perfect product, deal with it and do our best. Deal with what we can do, but keep in mind what can be improved further.	technical levelheadedness
Having faith in people	encouragement		management	To not lean too much on others and take more responsibility	openness
Work hard and play hard	coherence	Plan more time than expected for each task	management	To lead more the design aspect and be less influenced by the engineers and always push their limits "The thinking that has brought me thus far has created some problems that this thinking can't solve" A. Einstein.	self-leadership
Work by distance	organisation	Hard to manage everything	organisation time		technical
share workload and communicate	communication	I need an extra day per week	management time		self-leadership
Mechanical design must to be discussed face-to-face to move forward.	communication	Time management is difficult	management	Think more about the product than the tasks I need to be more prepared for the elevator pitch ! To make a good presentation I must not follow a speech but rather deeply understand what I want to say and then "improvise" last minute.	commitment to team
At some point a decision has to be made even if it's not the perfect one, otherwise nothing advance	coherence	Work with efficiency	time management	When presenting something, people don't necessarily have the same background as we do. The line between dumbing down and simplifying is thin.	communicate
Design and engineering really have to progress together Speaking english make communication harder and time waist.	coherence	Try to take advantages of every team members Informal discussions are more important than formal meeting	collaboration	Should spend less time on details when there are other priorities	communicate
Mechanical Design VS Industrial Design The clearer the specifications, the better the problems are solved.	coherence	Aiming too high is conter productive	collaboration	I need to improve my time management. Making something work is easy, but making something work all the time in any condition takes time	efficiency
	communication	We really need to have the Marshmallow game in mind.	collaboration	Maybe be more implicated in other discipline choices and issues	commitment to team
Try to better understand others' tasks and challenges Team building matters a lot, we had a beer once, although we did not work it was profitable for the team ! Scheduling meetings with large groups is still complex. It's better to split in smaller groups when possible Meetings are hard to arrange but it's the only way we can make sure everyone is working in the same direction	encouragement	Trust each other is the key Difficult to lead the design with a so complex engineering doubts	collaboration	I need to catch up ! Because of me, we don't have common shape to discuss.	commitment to team
	coherence	Having a common image of the final product is the key to achieve common ground.	collaboration	I feel really bad about not having done a better work for this milestone, because of a lack of time	commitment to team
	organisation		collaboration	It was good to see the firmware running on the PCB Take into account the delay of outside worker (i.e. 3d printing) because it can be unpredictable sometimes.	technical efficiency
	organisation	Parallel Communication is the most important and sometimes it can be hard to reach somebody. Explaining with a drawing is much easier	collaboration	Success is the best motivation.	self-leadership
It's difficult to find time to meet all together.	organisation	Meetings with everybody is not always useful at this stage of the project	collaboration	i feel really good about this projet hopes it continues	self-leadership
Still the meeting time issue Meetings are really hard to plan with everyone, especially me. I think we improve our way of communication about our own scope.	organisation	Tests are very useful to approve a step of the project. We should test our prototype/mock up more often. To move forward more efficiently, it is sometimes better to meet just with the right person from the group instead of everyone	technical	I should speak up my concerns as soon as I have, waiting is unproductive.	communicate
The communication is very important to have good results	communication		collaboration		

Effective communication is vital to solve problems on time The insight of other disciplines is always helpful and can be applied to other fields. Importance of communication to avoid misunderstandings and conflicts.	communication encouragement communication	There is more efficient and less efficient phases in the project through time It is important to manage time properly to reach goals on time Communication between the disciplines make the project advance much faster. Importance of having backup plans in case something goes wrong...	time management time management collaboration	<b>Classification count</b>	
Nice group, we need to keep it that way Design should be discussed and decided as soon as possible with the whole team.	coherence communication	the project is well managed by all of us, it's cool Coordination between all the members is crucial	organisation collaboration collaboration	<b>commitment to team</b> <b>communicate</b> <b>self-leadership</b>	<b>12</b> <b>9</b> <b>10</b>
<b>Classification count</b>		<b>Classification count</b>		<b>efficiency</b>	<b>14</b>
<b>coherence</b>	<b>20</b>	<b>technical</b>	<b>2</b>	<b>technical</b>	<b>5</b>
<b>communication</b>	<b>25</b>	<b>collaboration</b>	<b>32</b>	<b>perseverance</b>	<b>4</b>
<b>encouragement</b>	<b>10</b>	<b>time management</b>	<b>21</b>	<b>openness</b>	<b>6</b>
<b>organisation</b>	<b>17</b>	<b>organisation</b>	<b>17</b>	<b>levelheadedness</b>	<b>8</b>