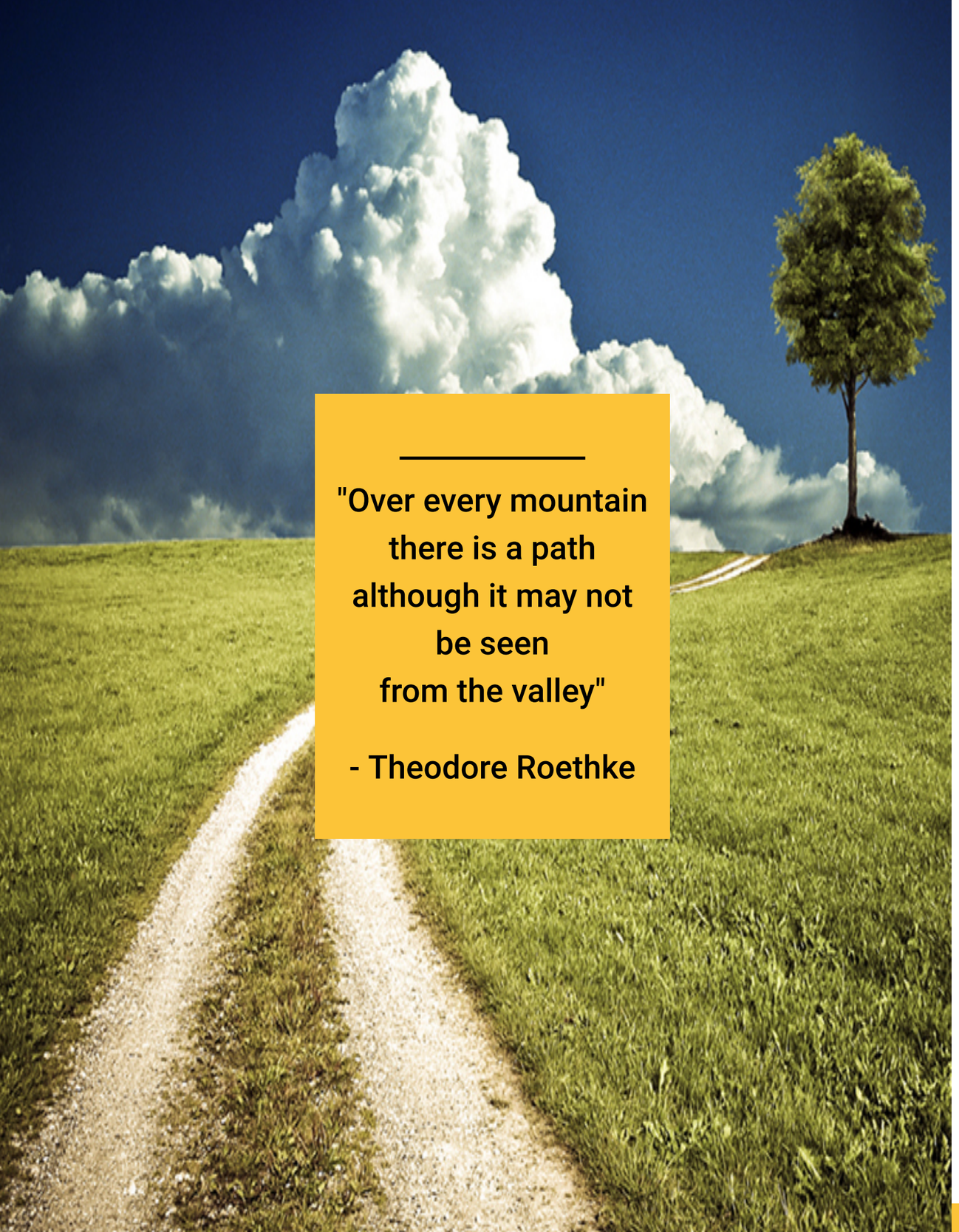
BOOTCAMP 2019 BOOKLET

ICT-ENABLED SOCIAL INNOVATION FOR SOCIAL GOOD



RESEARCH INTRO

Facing work settings keeps being a challenge for most students after their graduation. The concern of the skill gap between students and industry expectations has repeatedly been raised during the years. Universities have tried to increase student readiness and fulfill industry requirements. To this end, different approaches have been adopted to tackle technical and soft skills, mainly relying on capstone courses. In these cases, student projects adopt the idea of prototyping through industry customer-driven, startup-driven, innovation and creativity-driven. All these team-based project courses have provided adequate challenge for students to get acquainted with industry related technical and soft skills, primarily because of the involvement of external stakeholders.Experience based learning is one of the methodologies that allows students to develop their skills relying on their background and experiences as first proposed by Kolb. A strong emphasis is also put on inter- and multi-disciplinary teams in innovative courses, through experiential learning. Two years ago we incorporated external activities to our course, previously focusing on classroom activities only. External activities helped students work with real projects and cooperate with industry, government and startup ecosystems.Since then, we provide students a concrete learning out-come: to emphasize how important are technical skills, soft skills and exposure to external stakeholders to succeed in developing relevant projects. To this end, we formulated the following research question **(RQ): What skills can students gain from external stakeholders within an experiential course?**

To address the RQ, we designed a survey that consisted on asking each team to grade the initial and final value of dimensions related to soft skills (teamwork, communication,presentation, negotiation, and innovation), project management, technical challenges concerning the Bootcamp activity and involvement of external stakeholders. Teams provided the initial values after the stakeholders presented them with their challenges in Bootcamp Day 1. Final values were provided at the end of the project final draft delivery, Bootcamp Day 2, ready to be pitched on Bootcamp Day 3. Within the course scope, these three Bootcamp Days occurred with a distance of 40 and 50 calendar days respectively. The goal was to evaluate the variance of these two measurements and assess which dimensions have changed. We found that the perceived value of soft skills and project management dimensions being a challenge towards delivering the final project dropped. However, we did not notice any variance or improvement in technical skills. This is also justified from the fact that there was little input either from the course instructors or the stakeholders in this regard, due to the experiential learning nature of the course. Therefore we can conclude that the learning outcomes have improved for the course and propose a conceptual model to be adopted and further evaluated in the future.

RESEARCH SETTINGS

A. The course

Experts in Teamwork (EiT) is an MSc degree course based on the experiential learning approach. The course objective is for students to develop teamwork competences. In our village theme, ICT-enabled social innovation the aim is to collaboratively identify and propose specific innovative solutions for achieving the desired Sustainable Development Goals, as defined by the United Nations. In order to achieve its goals, the village uses resources provided from individual student competence, teams, learning assistants and village leaders.

B. The teams

Teams are commonly composed of students having different study background. The main character is the inter and multi-disciplinary composition of each team. Every team makes an effort to come up with an innovative idea. Team composition is decided from the village leader before the start of the course, taking into account discipline and gender balance. Diversity contributes to the skill set and background robustness in developing relevant, innovative solutions. Teams rely on this skill set at different stages of the course. The team size varies from 5 to 7 students at most. Self-structuring is common, and a balanced environment for making decisions helps in team sustainability. Furthermore, each team is required to apply group process theory, when coping with challenges and improving team dynamics.

C. The Bootcamp

The Bootcamp represents a three one-day event organized during the semester. It motivates students to develop relevant solutions and business concepts through Minimum Viable Product (MVP) prototypes, which can be field tested during and after the course, in realistic scenarios. Support is provided by the instructors through state of the art innovation tools and methods; by Innovation Norway in setting up ambitious goals for developing their future startups.Students go under several phases:
•Day 1: Practical exercises related to analogy thinking,brainstorming, idea selection, and solution proposal.

•Day 2: Focus on the idea development through lean methodology, prototyping, and business models.

•Day 3: Students learn how to pitch ideas, think international and create future startups

F. The external stakeholders

The external stakeholders are part of different sectors. Their role is to present a framework of practical social challenges,which can be tackled through information and communication technology (ICT) tools. Their participation in the Bootcamp days is key to the fostering of innovative ideas. We have tried to cover three crucial sectors (academia, government, and industry) when choosing stakeholders background, based on the triple helix model of innovation, Figure 1.In our case Trondheim Kommune represented the governmental body, Capeesh startup the industry and the

RESEARCH SURVEY

academia are represented by both students and scholars involved in the course.

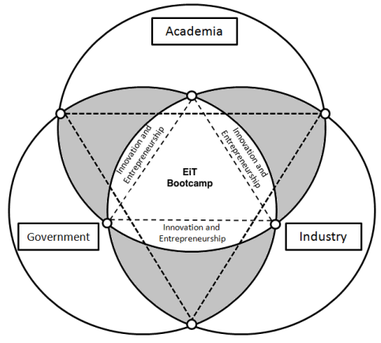


Fig. 1. Triple helix model triangulation

TABLE II

SURVEY INSTRUMENT

	Value
Soft Skills Challenge (teamwork, communication, presentation, negotiation and innovation)	
Technical Challenge	
PM Challenge	

G. SURVEY

Based on the RQ we guided our investigation. The survey involves questions regarding the Bootcamp external activity but with direct influence on the students learning outcome and performance.The investigation is performed based on a quantitative questionnaire where the same group receives the same treatment indifferent points in time. Dimensions considered for the investigation are grouped into soft skills (teamwork, communication,presentation, negotiation, and innovation) and technical skills(technical challenges, project management) acquired during the Bootcamp days.A. Survey Design Students are asked to answer the online questionnaires once after the initial Bootcamp presentation (Day 1) and after the first prototyping is developed (Day 2) based on MVP concept.Key dimensions they are supposed to rate with a scale from 1 to 5 are reported in Table II.The calendar time difference between the two surveys is approximately 40 days. To minimize bias, the respondents donot have the answers from the first survey available during the second one.

B. Data Collection

We conducted the study during the spring semester 2019,where each of the 4 teams involving 21 students, chose to develop a project within the village theme (ICT-enabled social innovation) tackling different United Nations (UN) goals.

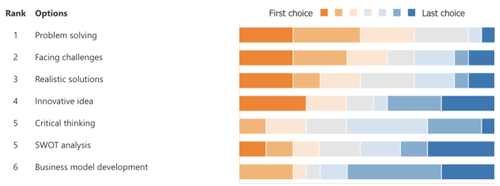


Fig. 2.Reasons for choosing the village theme and participating to the Bootcamp

First we wanted to evaluate the reasons for being part of this village theme. Figure 2 reports the expectations when choosing the village theme and participating in the Bootcamp. Later we noticed that, all the projects are different in nature but with similar complexity.

RESEARCH ANALYSIS

C. Data Analysis

Since we didn't know what to expect from the investigation and the same group is taken into consideration, we ran a two-tailed dependent paired samples t-test in order to compare the students perceptions before and after the first two Bootcamp Days. There are 4 teams involved of overall 21 participants.

1) Technical Challenge:

The scope of the experiential learning approach is not to address the technical knowledge of the students. On the contrary, it relies on their previous technical knowledge acquired in their competence field to be applied in the context of innovation for social good. We would not expect a significant drop in this value neither after the Bootcamp or along the course. H1: The perceived value of addressing technical challenge does not change after the Bootcamp Day 2.Indeed from the variance and the applied t-test, we can observe that the value has not changed for most of the respondents. Thus we can accept our hypothesis.

2) Soft Skills Challenge:

This is the key knowledge ac-quired during the course setting; thus we would hope that the Bootcamp contributes to this dimension significantly. Initially,from the variance, we notice a definite improvement for this challenge to drop; thus we state the following hypothesis.

H2: The perceived value of addressing soft skill challenges drops after the Bootcamp Day 2. After running the t-test on the data, we can accept this hypothesis.

3) PM Challenge:Some of the students within the teams might have previous knowledge regarding project management acquired from other courses. However, the setting changes in EiT Bootcamp since they have to cope with inter-disciplinary teams, which might not have been the case from their previous experiences. Thus, if this value drops, we can state that their skills in coping with project management in a more realistic pattern have improved.

H3: The perceived value of addressing project management

challenges drops after the Bootcamp Day 2. Indeed from the variance and the applied t-test, we can observe that the value has dropped for most of the respondents;thus we can accept our hypothesis.

BOOTCAMP INTRO

Subverting the marketing world since 2008

During EiT 2019, students of the TDT4850 village will work on developing innovative ICT solutions to solve social problems. The students will work with diverse customers, such as SFU Excited, Trondheim Municipality, Tekna, Sintef etc., as well as Innovation Norway (https://www.innovasjonnorge.no/en/start-page/). Drafting an application to innovation Norway to transform their ideas into innovative business concepts for the most motivated teams. The goal is to educate students on how they can become potential social entrepreneurs by solving existing problems and developing real-life solutions, with viable market potentials. Also, the students will learn how they can use and further develop IT skills to help them in their ideas and solutions. A critical need in STEM (science, technology, engineering, and mathematics) education, programming skills as well as entrepreneurial mindset are required to excel in the event.

Therefore, in the project, we want the students to act as entrepreneurs and get a hands-on approach with real-life problems. The Bootcamp should motivate students to develop relevant solutions and business concepts through Minimum Viable Product (MVP) prototypes, which can be field tested during and after the course, in realistic scenarios. Support is intended to be provided by the instructors through state of the art innovation tools and methods; by Innovation Norway in setting up ambitious goals for developing their future startups. The 3 one-day events will be organized during the semester. Students will go under several phases:

First phase (day 1) will be involved in practical exercises related analogy thinking, brainstorming, idea selection and solution proposal.

Second phase (day 2) we will put focus on the idea development through lean methodology, prototyping and business models.

Third phase (day 3) students should learn how to pitch ideas, think international and how to create future networking.

MEET THE TEAM

Letizia started to lead Experts in Team (EiT) Village in 2003 and has supervised more than 10 villages during the years. She believes that the EiT pedagogical approach that is based on interdisciplinary, independent and creative student work is beneficial for students' knowledge and growth. Letizia has more than twenty years' experience with IT projects in education, research, industry, and public sector and she tries to combine the four perspectives for the benefit of the students, who should always be the focus of all activities at university.

Orges Cico holds a MSc in Computer Engineering from the Polytechnic University of Turin, Italy and is currently a PhD student at NTNU. Orges research topic involves Software Engineering and Innovative Tech Startup models. His previous research is in Cloud Computing for Business Solutions and Cloud Software Reliability concerning Fault Tolerant Techniques.

BOOTCAMP ACTIVITIES

Foster talent development, soft and technical skills, social innovation through inter- and multi- disciplinary teamwork and ICT

Increased attitude towards students becoming changemakers

Development of valuable solutions that will contribute in the others social good, within and outside the course setting and NTNU ecosystem

Enable students to transfer soft skills from the classroom context into the industry and real life projects

Stakeholders

Stakeholder meeting in December. We decided on what **social innovation challenges** to address.

Bootcamp Day 1

Take one day to **inspire students**, channel that inspiration into **relevant new business concepts**, and learn **new innovation tools** along the way. The overall focus for the day will be put on practical activities depending on each team goal for the day.

We want the teams to exploit an **idea** for a business that includes basic information such as the service or product, the target demographic, and a unique **selling proposition** that gives a company an advantage over competitors.
Discuss with stakeholder your market potentials.

- Prepare a draft for Innovation Norway.
- Have you done research you want to patent?
- Exploit the Technology Transfer Office at NTNU.

Bootcamp Day 2

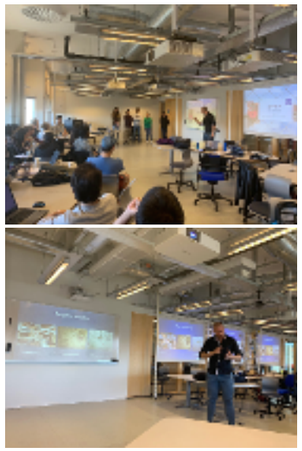
We want the teams to exploit an **idea** for a business that includes basic information such as the service or product, the target demographic, and a unique **selling proposition** that gives a company an advantage over competitors.

Bootcamp Day 3

Discuss with stakeholder your market potentials. Prepare a draft for Innovation Norway. Have you done research you want to patent? Exploit the Technology Transfer Office at NTNU. PITCH!!!!

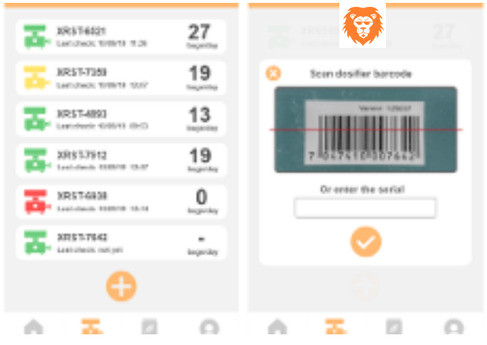
SAMPLE PROJECTS

Be Social



The project was created to help promote the social services that are available for internationals in Trondheim from the municipality and other organizations. The end goal was to help expats, refugees, and students succeed at living and thriving abroad through the use of a survey and app. The survey that the team created was used to assess how various internationals socially feel about living in Trondheim. Do they feel apart of Norwegian society? Do they have access to and knowledge about the social benefits available for them? The team has developed an app to go hand in hand with the survey. The aim of the app is to have a precise place for the survey, results, and community forum that internationals can turn to in Trondheim

Sanku Lion

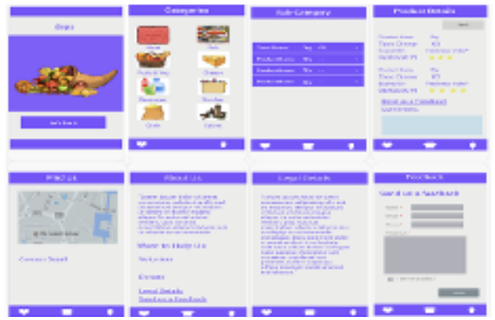


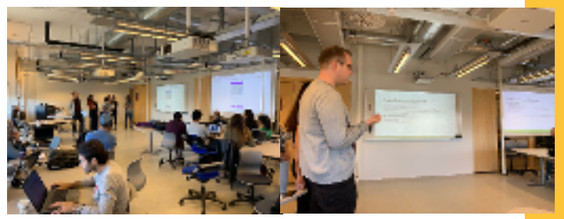
Sanku is working to address the significant problem ofmalnutrition in developing countries, especially for the population in rural ar-eas like in parts of Tanzania [1]. One of the UN Sustainable Development Goals is Zero Hunger [2] which states “End hunger, achieve food security and improved nutrition and promote sustainable agriculture”. Sanku is clearly working on supporting this goal, providing nutrients to populations in rural areas of Africa.

SAMPLE PROJECTS

DAPS-A solution to reduce food waste in Trondheim

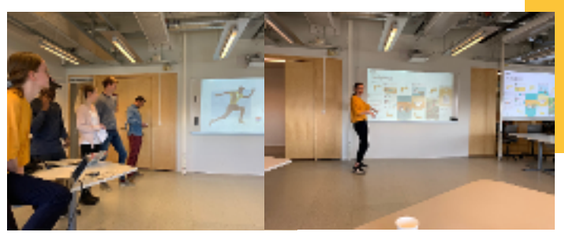
DAPS where expired food items from supermarkets are collected by volunteers, brought to a central storeroom at NTNU where the items are sorted and then redistributed to students and other interested customers. This process is supported by an App in which the current stock of the storeroom is displayed and interaction with the customers canhappen. An environmental assessment in the form of a lifecycle assessment was then performed to analyse how much the environmental impact of food waste could be reduced through this project. It was found out, that 529,8 tons of CO_2 emissions could be saved by carrying out this project. The resulting project thereby contributes to SDG 13, by reducing Trondheim's Carbon Footprint.





Halloo Capeesh

Halloo Capeesh has decided to create an app in cooperation with Capeesh language app. The principal function is to connect two participant with different nationalities and different native languages. With the aid of the app, participants will be able to learn a new language and to meet in person. This app add-on is designed as a multi-player game, and it's uniqueness comes from the fact that both players have to collaborate in completing some games in order to obtain coupon prizes (food,coffee,museum,etc) to enjoy together and move from chat conversation to face to face meeting. It is also relevant to mention that these games have to be played together, not individually, in this way the connection between participants will increase every time they play and win games as a "team".



DISCUSSIONS

We are able after analyzing the data to derive a conceptual model, Figure 3 to be utilized from future EiT villages. In the model we internalize the benefit of external activities. We can clearly observe that the students base their technical skills on their previous experiences and little or no influence comes from the stakeholders. Soft skills however are boosted from external activities which require active involvement of external stakeholders. The final outcome could be to deliver relevant projects for the course or even contribute to startup formation

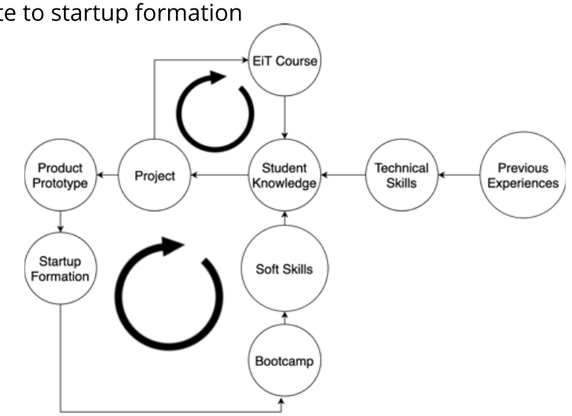


Fig. 3. EiT model for future villages

which can become part of future activities, thus creating a loop within the courses in future academic years.We were able to state validate our hypothesis related to students perception of challenges regarding soft skills, project management skills and technical skills based on the collected quantitative data. The drop in the first two dimensions helped us understand the usefulness of involving external activities, Bootcamp, where students could actively interact with the external stakeholders. Another important observation we made is that technical challenges perception didn't change. Although we tried to cover most of the relevant data, there is still a large set that still needs to be analyzed.

CONCLUSIONS

We designed our ICT-enabled social innovation course to allow students to interact with external stakeholders by conducting Bootcamp activities. We wanted to evaluate if students realized the relevance of this activity in improving their soft and management skills. To answer our question,we conducted a survey twice. Once at the beginning of the Bootcamp and again after the first MVP had been developed from the teams. We found that challenge perception of soft and management skills dropped after the collaboration with the external stakeholders during the Bootcamp Days and the EiT course. The technical challenge, however, remained the same since there was little contribution in this dimension either from the course or from the Bootcamp activities. Experiential-based learning also emphasizes that the technical contribution should derive from students personal, academic background and competencies.

We were able to propose a new model to be adopted in the future to the other villages in EiT which aligns external activities with learning outcomes. Nevertheless,our study leaves open questions that can be answered in future research. What is the potential of developing realistic products based on startup formation within the course? How can we involve further the stakeholders and what are their motivations and challenges to actively collaborate with students? Who of the three entities academia, industry, and government should address these collaborations in the future to foster social innovation and changemaker mindset among the students?